

Cultivating Sustainable Small-Enterprise Networks:

**A Way to Enhance
Value, Competitiveness and Resilience**

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Cultivating Sustainable Small-Enterprise Networks:

A way to enhance value, competitiveness and resilience

Het cultiveren van netwerken voor duurzaamheid in het MKB:
Een manier om waarde, concurrentie en veerkracht te vergroten

Thesis

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus

Prof.dr. H.G. Schmidt

and in accordance with the decision of the Doctorate Board

The public defense shall be held on
Tuesday November 2, 2010 at 13.30 hours

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Acknowledgements

This multidisciplinary research has required thoughtful advice and assistance from many people. Beginning such an adventure as a mid-career professional at the age of 50 required exceptional support from my work colleagues, my family and my friends, and, of course, my academic advisors. So, I would like to thank Professor Don Huisingsh of Erasmus University and Professor Susan Manring of Elon University for their unflinching support during this seven year process. I also thank my wife for putting up with the many hours I was sequestered in my office and the many hours I spent away from home researching and participating in the PhD. I also want to thank my many friends and colleagues at Elon University who supported me with guidance and encouragement along the way. These include Dean John Burbridge of the Love School of Business, my good friend Dr. Jim Drummond and especially Dr. John Sullivan, who planted the seeds for this work so many years ago and who has never stopped being an inspiration and an example of how to lead a thoughtful life. A great deal of thanks also goes to my friend and colleague Dr. Manfred Wentz, a Hohensteiner now with NCSU. His advice has been invaluable as well.

My father died during this process along with his beloved Burlington Chemical Company, and my mother has been critically ill with cancer while this work was completed, but both supported my efforts to do this research in so many ways. Thanks for all you have done.

Other acknowledgements must also include my colleagues from the case companies: Burlington Chemical Company, especially Mike Scott, the Teague Family of Reedy Fork Dairy Farms, and Eric Henry and Tom Sineath of TS Designs, Inc. Without the permission and trust of these people and their organizations, which allowed me to join and learn together, this journey would not have been possible.

I have also had the remarkable opportunity to work personally with many of the North American leaders in the field of sustainable development that are cited in this dissertation. Dr. Peter Senge of MIT, the Team at Sustainable Enterprise Academy at York University in Toronto Canada, Joe Laur and his wife Sara of Seed Systems, Dr. Sally Goerner of the Integral Science Institute of Chapel Hill, NC, Dr. Stuart Hart and Dr. Mark Milstein of Cornell University, Mr. Ray Anderson of Interface, Inc., and the list can go on. All of this work is built on the intellectual foundations carefully laid by many others and I remain humbled to stand on the shoulders of giants to work with the small firms that are the backbone of our economy.

Summary

The author's experiences and successes in the 1980's using "green chemistry" as a leading strategy in the transformation of a textile chemical company's financial success, led to research on the potential of "sustainability" as a new strategic lens to improve value creation in small to medium sized enterprises (SMEs). Sustainability was offered as a useful strategic lens to aid in transforming SMEs to produce greater value in a world defined as "hot, flat and crowded", meaning, a world where population pressures on resources, global warming, and the development of global trade are fundamentally changing the nature of enterprise and the consumer's concept of the role of the corporate enterprises.

The dissertation research proceeded along the following steps:

- Pursue background research on sustainable development and the concepts for creation of sustainable enterprise
- Develop research questions to discover what role "sustainability" might play in strategy planning and successful business strategies for SMEs
- Examine the role of SMEs in the global economy
- Explore the role and theory of SME network behavior and performance within the boundaries of sustainable development
- Report the results of three action research cases where a sustainability lens and transformational framework were inserted as major influences on strategy development over a five-plus year period
- Summarize findings and develop suggestions for ongoing research

The research questions developed were directed at discovering: what were the important attributes of sustainable enterprise that could lead SMEs to become more successful, how could these attributes be inserted into the activities of SMEs, and what were the impacts of defining a sustainability lens and inserting it into the strategy of three SMEs?

Furthermore, there are many regions of the world where networks of SMEs have been found to create markets and unexpected synergies. Exploring these examples exposes the complexity of network formation and the architecture and behavior of such networks, but also produced some new understandings as examples of networking behavior from the Internet were contrasted with the performance of SME networks. It was found that networks of SMEs could form and dissolve rapidly; the term "ad hoc" network was coined to describe such behaviors. It was also observed that ad hoc networks could be extremely detrimental to the global physical and fiscal environments if their behaviors were not tempered by a realization of the need for sustainability and its associated behaviors.

The globalization of markets seems to have forced SMEs to choose between *hyper-efficient behaviors*, which create brittle, mono-focused low-price driven networks and have few environmental or social conscience boundaries, versus more *resilient, socially, environmentally and financially-bounded networks* that tend to be regional or local. The big questions addressed are whether SME networks can develop a hybrid structure that allows for adequate efficiency within a broad-based, "rightly understood" creation of value for large number of diverse stakeholders, and whether the win-lose war of either "local" or "global" can be supplanted by multi-scale sustainability?

A transformative framework was developed based on the work of leading theorists on sustainable enterprise to encourage development of hybrid strategies and actions. This action research framework is outlined and consists of a series of educational and diagnostic exercises with the chosen firms, based on extensive dialogues with the owners/entrepreneurs of the firms. The anticipated results sought to balance the inputs and outputs of the corporation through inclusion of heretofore ignored stakeholders that creates new customers. The results were analyzed by value mapping of the new sustainable investments. This framework was used by the author on three SMEs as a lens to help the owners and managers of these firms to find a path forward out of their failing incumbent strategies.

Three action research cases are presented:

- Burlington Chemical Company, Inc. - the author's textile chemical manufacturing firm that was failing due to globalization of the textile industry.
- Reedy Fork Dairy Farm – A family farm located in central North Carolina, USA that was failing due to wide fluctuation and decline of liquid milk prices.
- TS Designs, Inc. - A custom apparel printing company that was also failing due globalization of the textile market in the southeastern USA.

The overall results of the action research projects were successful. Two of the three SMEs were adequately transformed as a result of sustainable lens insertion and new strategy implementation. They continue to survive and thrive after 5 plus years of strategic intervention. The textile chemical company did not survive due to inadequate understanding and actions related to “creative destruction” of the incumbent business model, however, even in failure, this case provides support for the idea that sustainable strategies can provide unique competitive advantages

The finding of the research indicates that sustainability is a useful foundation for formal strategy-planning processes for SMEs. It forces consideration of internal and external factors and provides a new communication channel for communication and inclusion with new stakeholders. A sustainability lens provides for a broader definition of success that transcends but is inclusive of economic profitability and provides stability and control (resilience) within operations of SMES and networks of SMEs. The key concept of enterprise creating abundance for as many stakeholders as possible and thus expanding opportunities for many, rather than limiting value to strictly economic profits for shareholders, was a key metaphor for the success of these cases.

Opportunities for further work remain in correlation of SME network behavior and other measureable networks such as the Internet. There also remains a great opportunity to study the resilience effects of the sustainability lens on creation of value for adopting SME firms and perhaps even the creation of new forms of SME network business structures

Samenvatting

‘Groene chemie’ was een strategie in de omvorming van een chemisch textielbedrijf waarmee de auteur eind vorige eeuw ervaring opdeed en successen boekte. Daaruit vloeide onderzoek voort naar de mogelijkheden van ‘duurzaamheid’ als een nieuwe strategische benadering voor waardecreatie in kleine en middelgrote ondernemingen (MKB). Deze benadering zou het MKB kunnen helpen meer waarde voort te brengen in een wereld die ‘hot, flat and crowded’ was. Het gaat om een wereld waarin de toenemende bevolkingsdruk en de gevolgen daarvan voor het beslag op natuurlijke hulpbronnen, klimaatverandering alsook de globalisering van de economie bezig zijn de aard van de onderneming fundamenteel te veranderen. En daarbij komt nog de veranderende opvatting van de consument over de rol van ondernemingen.

Het onderzoek voor deze dissertatie kende de volgende stappen:

- Onderzoek naar de achtergronden en grondslagen van duurzame ontwikkeling en de concepten voor duurzame ondernemingen,
- Formulering van onderzoeksvragen om te ontdekken welke rol ‘duurzaamheid’ zou kunnen spelen in het strategisch beleid en succesvolle bedrijfsstrategieën voor ondernemingen in het MKB,
- Onderzoek naar de rol van ondernemingen in het MKB in de wereldeconomie,
- Verkenning van de rol van ondernemingen in het MKB in netwerken, de theorie van het gedrag van deze ondernemingen in netwerken, en de theorie van het gedrag van alsmede hun presteren binnen de grenzen van duurzame ontwikkeling,
- Verslag van de resultaten van drie *cases* waarin duurzaamheid en een raamwerk voor transformatie werden ingezet als belangrijke beïnvloedingen van strategieontwikkeling gedurende een periode van meer dan vijf jaar,
- Samenvatting van de bevindingen, met onderzoeksaanbevelingen.

De onderzoeksvragen richtten zich op de bepalende kenmerken van duurzame ondernemingen, de manier waarop deze in het MKB ontwikkeld konden worden, en de gevolgen van het inzetten van een duurzaamheidsbenadering in de strategie bepaling van drie ondernemingen in het MKB.

In veel gebieden in deze wereld zijn netwerken van ondernemingen in het MKB in staat gebleken markten te creëren, en onverwachte synergie-effecten. Het verkennen van deze voorbeelden laat de complexiteit zien van de vorming van netwerken, en van de architectuur en het gedrag van zulke netwerken. Dat leidde tot nieuwe inzichten uit de vergelijking van netwerk gedrag op het internet met netwerkgedrag in netwerken in het MKB. Laatstgenoemde netwerken bleken zich snel te kunnen vormen en oplossen. De term *ad hoc* netwerk werd geïntroduceerd om zulk gedrag te beschrijven. Verder bleek dat *ad hoc* netwerken uiterst schadelijke milieu-effecten konden hebben op wereldschaal als hun gedrag niet ingeperkt werd door overwegingen op het gebied van duurzaamheid.

De globalisering lijkt ondernemingen in het MKB gedwongen te hebben tot een keus tussen twee gedragsalternatieven: *hyperefficiënt gedrag*, dat broze netwerken voortbrengt waarin ondernemingen uitsluitend gericht zijn op lage kosten, terwijl ze weinig milieu- of sociale grenzen zien; versus meer *veerkrachtige, sociaal, milieu- en financieel begrensde netwerken* op een meer regionale of lokale schaal. De belangrijkste vraag is of netwerken in het MKB een hybride structuur kunnen ontwikkelen waarin voldoende efficiency

mogelijkheid is in een bredere, welbegrepen waardecreatie voor een groot aantal verschillende stakeholders. Kan de ‘welles-nietes’ strijd over lokaal óf mondiaal vervangen worden door duurzaamheid op meerdere schaalniveaus?

Voor dit onderzoek is een transformatief raamwerk ontwikkeld op basis van het werk van toonaangevende theoretici over duurzaam ondernemen. Het is gericht op het stimuleren tot hybride strategieën en acties. Dit raamwerk voor actieonderzoek bestaat uit een serie educatieve en diagnostische oefeningen met de betrokken ondernemers en ondernemingen. De oefeningen zijn gebaseerd op langdurige gesprekken met directeur/eigenaren van de ondernemingen. De opzet was dat de resultaten van de toepassing van het raamwerk een balans zouden laten zien tussen de inputs en outputs van de onderneming - door de betrokkenheid van tot dan toe genegeerde stakeholders — op een manier die nieuwe klanten zou opleveren. De resultaten werden geanalyseerd door de waarden in kaart te brengen van nieuwe, duurzame investeringen. De auteur gebruikte het raamwerk bij drie ondernemingen in het MKB als een instrument om de eigenaars en managers van deze bedrijven te helpen een alternatief te vinden voor hun falende strategieën. De cases in het actieonderzoek betreffen de volgende ondernemingen:

- Burlington Chemical Company, Inc. het chemisch textielbedrijf van de auteur, dat in moeilijkheden verkeerde door de globalisering in de textielindustrie.
- Reedy Fork Dairy Farm, een familiebedrijf in North Carolina in de VS; dit bedrijf kampte met enorme fluctuaties in de melkprijzen.
- TS Designs, Inc., een textieldrukbedrijf dat ook in problemen was gekomen door de globalisering van de textielmarkt.

De resultaten van het actieonderzoek waren in het algemeen succesvol. Twee van de drie MKB's werden omgevormd door de implementatie van een nieuwe strategie gericht op duurzaamheid. Deze bedrijven bestaan nog steeds, en doen het — meer dan vijf jaar later — nog steeds goed. Het chemisch textielbedrijf bestaat niet meer door een ontoereikend begrip van wat ‘creative destruction’ betekent voor een bestaand bedrijfsmodel. Hoe dan ook, al ging deze onderneming ten onder, deze case laat zien dat duurzaamheidsstrategieën concurrentievoordeel kunnen opleveren.

De resultaten van het actieonderzoek laten zien dat duurzaamheid een bruikbare onderbouwing kan leveren voor processen van strategieformulering in het MKB. De ontwikkelde methode leidt ertoe dat interne en externe factoren in beschouwing genomen worden, en levert een nieuw communicatiekanaal naar nieuwe stakeholders. Een duurzaamheidsbenadering geeft een bredere definitie van succes, waarin begrepen economisch resultaat. Deze benadering levert stabiliteit en beheersing (veerkracht) in de bedrijfsvoering in het MKB, en netwerken van ondernemingen in het MKB. Centraal staat het creëren van overvloed voor zoveel mogelijk stakeholders. Zo ontstaan er kansen voor meer stakeholders, in plaats van dat winst voor aandeelhouders terugloopt. Dit onderzoek geeft zicht op nieuw onderzoek naar het gedrag van netwerken in het MKB en andere netwerken, zoals die op het internet. Vervolgonderzoek zou zich verder moeten richten op de effecten van duurzame ondernemingsstrategieën op de veerkracht van ondernemingen en netwerken in het MKB, en misschien zelfs het ontstaan van nieuwe netwerk bedrijfsstructuren in het MKB.

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Powerpoint Presentations

Moore, S. B. (2007). Using Sustainability to Create Competitive Advantage. Ouroboros Holdings, LLC.

Moore, S. B. (2007). Overcoming Market Disruption Using Sustainable Enterprise and Disruptive Innovation. Ouroboros Holdings, LLC.

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Moore, S. B. and L. W. Ausley (2004). "Systems thinking and green chemistry in the textile industry: Concepts, technologies and benefits." Journal of Cleaner Production **12**: 585–601.

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Manring, S. and S. Moore (2006). "Creating and managing a virtual inter-organizational learning network for greener production: A conceptual model and case study." Journal of Cleaner Production **14**(9-11): 891-899.

Acronyms and Abbreviations

AATCC	American Association of Textile Chemists and Colorists
ATMI	American Textile Manufacturing Industry
BCC	Burlington Chemical Company
BOP	Base of the Pyramid
BP	British Petroleum
CEOs	Chief Executive Officer
Chaebols	South Korea's industrial conglomerates
COO	Chief Operating Officer
BGH	Bovine Growth Hormone
CAFTA	Central American Free Trade Agreement
CSSP	Center for Simplified Strategic Planning
CER	Corporate Environmental Responsibility
CSR	Corporate Social Responsibility
CT	Change Team
CWT	Centum Weight, that is, per 100 pounds
DfE	Design for the Environment
EPA	Environmental Protection Agency
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GE	General Electric Corp.
GM	General Motors Corp.
GMO	Genetically modified organism
HMM	Hart-Milstein matrix
IHA	International Hosiery Association
IP	Intellectual property
IT	Information Technology
LEEM	Longitudinal Establishment and Enterprise
LC50	acute toxicity
LOHAS	Lifestyles of Health and Sustainability
M.I.T	Massachusetts Institute of Technology
MNEs	Multinational Enterprises
NAFTA	North American Free Trade Agreement
NC	North Carolina
NCDEM	NC water authority
NGO	Non-governmental organization
NICs	Newly-Industrialized Countries
NOEC	No Observed Effect Concentration
NOP	National Organic Program
OECD	Organization for Economic Co-operation and Development

OEM	Other equipment manufacturer
OSHA	Occupational Safety and Health Administration
POTWs	Publically Owned Waste Water Treatment Plant
PVC	Polyvinyl chloride
QED	Quantitative Economic Development
R&D	Research and Development
ROI	Return on Investment
SEA	Sustainable Enterprise Academy
SBA	Small Business Administration
SMEs	Small to Medium Enterprises
SOL	Society for Organizational Learning
SWOT	Analysis of Strengths, Weaknesses, Opportunities and Threats
TNCs	Transnational corporations
TBL	Triple Bottom Line
TSD	TS Designs company
U	The “U” diagram was developed in Senge’s book <i>Presence</i>
UNCTAD	United Nations Conference on Trade and Development
USDA	United States Department of Agriculture
WET	Whole effluent toxicity monitoring and acute toxicity limitation
WTO	World Trade Organization

1 Cultivating Sustainable Small-Enterprise Networks: A Way to Enhance Value, Competitiveness and Resilience

Sustainable enterprise as a paradigm is becoming a vital component of competitive strategic planning at all levels of society and enterprise (Drucker 1993; Hawken 1993; Hampden-Turner and Trompenaars 1997; Wilber 1998; Wheatley 1999; Ziman 2000; Wilson 2002; Senge 2004). In particular, as the sustainability paradigm has become more integrated in the new fabrics of commerce, business strategists are purporting that a focus on “sustainability” or “sustainable development” (World Commission on Environment and Development. 1987) provides business advantages as determined by the vitality, abundance and prosperity of the enterprise’s stakeholders.¹ The hope of sustainable enterprise is to use the vitality of entrepreneurs and capital markets, which are accustomed to rapid market changes, to speed transition to greater abundance and efficiency in production and consumption before the planet becomes exhausted (Anderson 1998).

As will be discussed in later sections, it is especially important for small to medium sized enterprises (SMEs) (Organisation for Economic Co-operation and Development Environment Directorate 1989) to be fully engaged in these efforts because SMEs represent over 80% of global enterprise. As the number of smaller firms continues to increase globally, their cumulative ecological and social footprints will become increasingly significant (Ács and Yeung 1999). Increasing numbers of people working in these firms versus larger firms may indicate a growing preference for working in SMEs (Granovetter 1984). Consequently, as the literature review in Chapter 2 documents, SMEs will play a more powerful role in the 21st century marketplace (Ács and Yeung 1999).

1.1 Triple-Bottom-Line Sustainability as a Lens for Value Creation in Small Firms

The future social, economic and environmental impacts of SMEs and especially networks of SMEs are specifically addressed in a article published by the author in the Journal of Cleaner Production (Manring and Moore 2009). The results of this research these impacts may be either positive or negative, and it is important to explore the risks and rewards of intentionally incorporating particular sustainable enterprise principles and strategies as part of a coherent business strategy for small firms because their number are increasing. Equally important in the research is the need to document whether adopting such strategies helps firms create value and develop real advantages over competitors in the short and long-term. Such knowledge seems critical to the survival of small firms in both global and local markets increasingly subject to the *Hot, Flat, and Crowded* conditions of the 21st century (Friedman 2008).²

¹ Throughout this document, the term “stakeholder” means any person or entity that is linked in any fashion to the organization, environment, society, government or community in question. For example: all living beings are stakeholders in the global environment and as a result, everyone is a stakeholder in any organization that uses natural capital. However some links are more robust than others due to distance and immediacy of feedback. For example, being a purchaser of local produce, a tax payer in my county and a global citizen of the environment may make me a more robust and involved stakeholder in a local farm than I would be to a Chinese farmer located half a world away where my links are less robust and direct.

² Thomas L. Friedman has examined the impact of the “flattening” of the world, and argues that globalized trade, outsourcing, supply-chaining and political forces have changed the world permanently for both better and worse. He also argues that the pace of globalization is quickening and will continue to have a growing impact on business organization and practice.

The author's powerful experience of developing and applying a sustainability lens to envision new strategic possibilities and to build value and vitality into his own small firm, Burlington Chemical, convinced him of very strong advantages³ in seeking an integrated social, economic, and environmental strategy. It also led the author to enter into Action Research (Argyris, Putnam et al. 1985) projects using "narrative" strategic approaches and mechanism (Langley 1999) with the two other firms described in this dissertation, both of which were failing and seeking new paths forward out of deteriorating incumbent markets.

The sustainability lens the author used in this research rests on two key principles:

- All business decisions include the Triple Bottom Line (TBL) principles, that is, human, economic, and environmental bottom lines (Elkington 1994; Elkington 1998) as a critical basis for their vision, strategy development and actions.
- Instead of looking at their firms in isolation, SMEs view themselves as members of the network of life or "web of life" (Capra 1996) within whatever they consider their community to be. This means incorporating environmental, civil society, and economic development stakeholders as serious members in their networks.

This *sustainability lens*, as I shall refer to it, offers new clarity to the concept of *sustainable development* as resilient, adaptive, intentionally cultivated, stakeholder networks linked by "free enterprise, rightly understood"⁴ (Capra 1982; Hawken 1993; Smith and Cannan 1994; Capra 2002; Smith and Haakonssen 2002; Hart 2005) and focused on TBL strategies. The hope is that this form of SME and SME-network development may provide a new paradigm for achieving and maintaining social and economic vitality along with the environmental sustainability originally emphasized in the Brundtland report (World Commission on Environment and Development. 1987). In this view, *sustainable enterprise* becomes an idealized goal for a corporate organization that strives to balance TBL value-creation and, by doing so, creates abundance and vitality in the marketplace by expanding opportunities for all stakeholders. This means all "isms" (socialism, capitalism, environmentalism, etc.) are moderated in favor of Schumacher's Buddhist Economics, a middle-way, balanced economics that is appropriate for all stakeholders of the planet (Schumacher 1973).

1.2 Background Experience

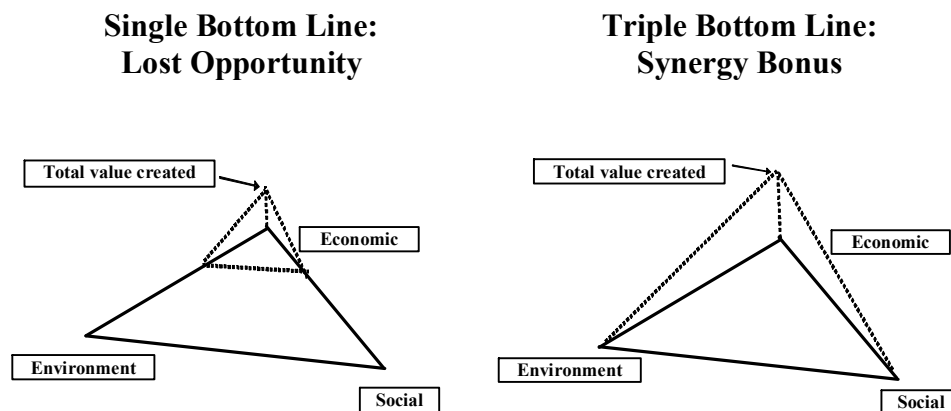
This author's personal journey with using sustainability ideals to develop competitive advantage for SMEs began in 1980 before the formal, environment-centered metaphors of "sustainable development" were conceived by the Brundtland commission in 1987. As a junior Vice President of Research and Development at Burlington Chemical Corporation (BCC) the author was responsible for product development and environmental compliance for a small textile chemical manufacturing firm. Changes in market and environmental policies in the mid 1980's created a mandate to transform BCC's textile chemical product line by increasing the biodegradability and

³ As described later, the financial returns for BCC were significant.

⁴ The concept of "free enterprise, rightly understood" refers to free enterprise perfectly aligned with a complete and true idea of democratic freedoms. It also envisions markets rightly understood to function in the interest of as many stakeholders as possible and towards the creation of democratic freedoms and justice. It is distinct from laissez faire "free markets" unaligned with societal ethics. This view of Adam Smith comes from Alexis DeTocqueville as explained by Dr. S.J. Goerner in a private meeting March 25, 2009.

lessening the toxicity of its products. During the period from 1983 through 1995, as BCC focused on greening its products, developing new production processes and re-engineering its approach to the textile market, the company grew from \$2 million dollars in revenue to over \$60 million due in large part to increased sales of dyes and high performance specialty chemicals that resolved critical environmental challenges described by Ausley and Moore (Ausley and Moore 2004). Broadly positive to multiple stakeholders, these experiences resolving production-related environmental challenges were published in the *Journal of Cleaner Production* (Ausley and Moore 2004).

The importance of understanding stakeholder networks evolved as a concept for me as the research cases produced for this dissertation unfolded. Within the three action research cases I found the richer and more complex the stakeholder relationships managed by the firm, the greater the opportunity for value creation. For example, specifically in the Reedy Fork Dairy case, we were able to map the farm inputs and then map the value of the outputs of the dairy farm in two circumstances. The first was where “milk” was viewed by the stakeholders as a commodity. Later in the case, it was mapped after the farm was converted to produce “organic milk”. In both situations, the inputs required to run the farm and produce the “milk” were very complex. However, when the dairy was selling commodity milk, there was only the selling “price” as a single determinate of value. However, after the organic transition, the value proposition for organic milk was much broader and interconnected, because the stakeholders were purchasing and valued the type and complexity of the inputs.



Opportunity Expansion Due to Sustainability (Hart, 2005)

Figure 1-1 Increases in “Value Space” or “Opportunity Space” as Depicted by Dr. Stuart Hart
Increase is created by inclusion of environmental and social stakeholders as the area above a triangle created by the three pillars of sustainable development: economics, environment and social responsibility.

Defining value as managing complexity for customers creates “good will” and the more good will one can create with a product or service, the higher the value of the product. Stuart Hart graphically describes these opportunities in Figure 1.1, where the single opportunity space created from a one dimensional value proposition of “lowest price” is compared with the opportunity space created when the valuation is expanded to include stakeholder concerns that include environmental and social responsibility.

My experiences in these cases also taught me that, in many traditional American SMEs, there is little differentiation between the entrepreneur and the company itself in the eyes of the market, employees or the shareholders (Blackford 2003). Consequently, in such SMEs, developing a *strategic transformation process* that intentionally incites the radical changes necessary to link social and environmental equity to increased profitability, required the researcher have and deepen a *personal and professional* relationship with the entrepreneurs involved.

In BCC's case, to obtain approval for sustainability changes the author had to develop methods to enlighten the company's stakeholders (family and investors) to the value of those changes. The organizational changes induced by successfully integrating social, economic and environmental performance as an intentional strategy produced a much deeper relationship between BCC and its incumbent community of textile stakeholders, as well as developing new stakeholders that were heretofore unheard and uninvolved.

The value of the US textile market community (network) became even more apparent, post 1995 as the textile industry collapsed under the weight of NAFTA trade policies and the firm was forced to try and recreate itself in new markets where there were no historical network connections (Johnson 2003). As BCC tried to leverage its "green" technologies outside of the textile industry, it became apparent how valuable the textile market network was to the success of the firm. BCC discovered that the network relationships developed over 50 years of active participation as a member were more important than intellectual properties, manufacturing capabilities or other tangible assets and that recreation of those relationships was very difficult.

Just how difficult this synergy would be to reproduce in markets outside of textiles was a very important realization in understanding how critical the concepts of "creative destruction"⁵ as an intentional strategy would be in reengineering this firm. All of these issues will be discussed in later chapters and in the individual case studies as part of this dissertation.

1.3 Why the Paradigm of Sustainable Enterprise is Important

Why is developing a "paradigm" for sustainable enterprise within the context of "free enterprise, rightly understood" so important? First, a new paradigm together with an adequate metaphor of *sustainable enterprise* must exist to enable and create the possibility of change. A paradigm is a framework that explains how change occurs in scientific disciplines, but because epistemology is such an integral part of a discipline's perception of reality, Kuhn (Kuhn 1962) argues that scientists who use different paradigms to explain the same phenomena literally exist in different worlds. In this author's opinion, this effect is also true in business, which has developed its own metaphors, lexicon and framework of understanding. So, just as scientists debating the relative merits of competing paradigms often talk right through each other, using the same words to discuss different realities, so too do businessmen discussing the concept of "sustainable enterprise." (Christensen 1997)

As long as we lack a paradigm that effectively and positively aligns social, economic and environmental health to value creation, it will be virtually impossible to resolve the tensions

⁵ "Creative destruction" is a term that evolved from the economist Joseph Schumpeter who believed that capitalism had to destroy many incumbent business and technologies to allow investment and growth in new ones. The rapid evolution of the globalization of markets and technology sparked a renewed interest in Schumpeter, most notable are the works of Clayton Christensen (e.g., his 1997 book, *The Innovator's Dilemma*).

between the goals of traditional environment-centered sustainability and the goals of economically-successful, value-creating business. As long as we cannot envision and research within a paradigm that includes sustainability and economically successful enterprise, then enterprise and sustainability will always be in conflict (Montalvo 2002).

The second catalyst for the conception of sustainable development produced by “rightly understood” free enterprise comes from the apparent lack of “fitness” exhibited by traditional capitalism, entrepreneurship and free markets in both the economic meltdown of 2007-8 and growing social and environmental crises such as global warming. As Kuhn says, “A paradigm is an accepted model or pattern that gains status because they [sic] are more successful than their competitors in solving a few problems that the group of practitioners has come to recognize as acute” (Kuhn 1962, p. 23.). Consequently, the evolution of a new paradigm of sustainable enterprise for business (Hart 1997) is being simultaneously driven by the disastrous route of late 20th century neo-liberal capitalism (Costanza, Graumlich et al. 2007), and the socio-economic potential of rightly understood, enterprise networks.

Of course, while narratives of successful enterprises that link sustainable practices to vitality, abundance and prosperity provide the vision and the motivation for change (especially if such successes also translate into creation of a growing market for goods so produced, see (Sen 2000), metaphors alone cannot provide sufficient material confirmation of the value of sustainability strategies. So, while some resolutions of tensions produced by the emerging sustainable enterprise paradigm are occurring, in this author’s opinion, more examples of clear, measurable results produced by real world enterprises practicing triple-bottom-line, stakeholder network “sustainability” are needed.

If there were cases where a well-substantiated paradigm for sustainable enterprise produced new approaches to markets and consumers to resolve the tension between current practice and the specter of social, economic and/or environmental collapse, this would be a valuable resource. Therefore, the goal of this research is to better understand how “sustainability” could be understood by small firms, and how to insert a sustainability lens into the strategy planning process for several firms and record the results. There remain, however, lingering questions as to how and why the idea of sustainable enterprise evolved as it did during the end of the 20th century and just how important this concept should be for SMEs.

1.4 Why Sustainability Strategies for SMEs Now?

To normalize this paradigm of “sustainability” one must first explain how history, science, economics, and social research align to create the concept of the “triple bottom line” as an effective enterprise strategy that insists on balancing economy, ecology, and society towards durable and dynamic societal sustainability (NAC 2003). For example, in the behavioral archetypes described in *Limits to Growth* (Meadows 1974) or *The Tragedy of the Commons* (Harden 1968), it is population growth and consumption that eventually overwhelm the benefits of non-sustainable economic development (Senge 1990). Since this vision retains the sense of inherent conflict between economic growth and sustainable development, a paradigm that resolves these tensions must provide a new narrative.

Never before has society and developing markets had available the low cost technological resources, global information networks, and materials of the 21st century (Thurow 1999),

(Friedman 2000; Roome 2001). So, while there were “limits to growth” using 20th century technologies and processes, the resources produced by 21st century technology provide great opportunity for entrepreneurial, “sustainable enterprise” leaders and people of social and ecological vision (Hollender and Fenichell 2004). Technology has provided even small firms (once considered less competitive in global markets) the necessary tools of market intelligence, technology transfer, logistics, and communication systems. These resources enable smaller firms to compete for pieces of global markets that were traditionally unapproachable, and perhaps even to overcome some of the traditional advantages of larger firms. (Surowiecki 2002; Friedman 2005); (Acs 1988; Manring and Moore 2004)

The advent of the World Trade Organization and the formation of regional trading blocs such as the European Union and the North American Free Trade Region have been predictably positive and negative, and certainly disruptive to the status quo. They have removed policy barriers to global trade, opened new marketplaces to competition (Friedman 2005), spread the availability of low cost labor and created trading communities (Freeman 2005). But, they have also been destructive to local and regional markets, spurring discussion of “technology enabled globalization” as a disruptive, Schumpeterian economic force (Schumpeter 1942; Christensen 1997; Metcalfe 1998; Hart 2005).

The competition among firms for workers, materials, energy, and customers is fierce under the new conditions of globalization (Christensen 1997; Hart 1997; Friedman 2000). The entrance of foreign firms (large or small) into what were once closed regional or national markets can rapidly destroy traditional trade practices and the communities that were dependant on them (Wheeler, Fabig et al. 2002; Freeman 2005). The rate of change can be so swift that it outstrips the ability of policy makers to provide sound economic and social bridges between old and new market paradigms (Sen 2000).

Under such fiercely competitive conditions, what kind of organizational strategies can provide a roadmap for a successful enterprise in an ecologically healthy, resource-limited future with burgeoning demand? Socio-ecological models that interrelate historical, social, economic, environmental and global trends (Costanza, Graumlich et al. 2007) are producing more reliable projections of the impacts of human development activities on planetary ecologies. These models are forecasting the 21st century as a nexus for business, society, and the global ecosystem (Costanza, Graumlich et al. 2007). They propose the need for radical change to and perhaps even the destruction of the current business paradigm based in the industrial revolution (Hart 2005), accompanied by movement towards the previously mentioned concept of “free enterprise, rightly understood.” Several trends in support of this postulation are noted below:

- Human population growth and increasing spread of capitalism and consumption has produced negative impacts on the global environment. Populations have grown from three to over six billion people within a generation and population growth continues, albeit slower than in the last half of the 20th century. However, projections indicate that over nine billion humans will occupy the planet by 2100 (Meadows, Meadows et al. 1992; Costanza, Graumlich et al. 2007). There is serious doubt as to the ability of the planet to “carry” such a population load using current technologies and development methods.

- While science continues to expand rapidly, and is being translated into global commercial technology and material goods at an ever quickening pace (Capra 1982; Ziman 2000; Gallagher 2001; Costanza, Graumlich et al. 2007), the translation of scientific information into more efficient technologies (engineering) is not occurring at anywhere near the same rate. For example, while the manipulation of matter on the molecular level (nanotechnology) and other emerging technologies offer hope in a world of declining natural capital, they are proving to be difficult to translate into daily effects. Some projections estimate 50-100 years for nanotechnology to become part of routine materials engineering.
- The Information and Communication Technologies (ICT) revolution is producing unprecedented opportunities for development of global markets. The globalization of markets and trade is projected to enable economic growth and development of consumer markets for commercial technologies and material goods in the majority of societies. Current projections indicate that 250 million new workers and consumers will enter the world marketplace every 10 years starting in 2005 (Drucker 1954; Friedman 2000; Freeman 2005). These conditions are producing entrepreneurial enterprises at a surprising rate. The rise of “virtual organizations” and globalization of technologies is further enabling an explosion of entrepreneurship and new business formation (Manring and Moore 2004; Friedman 2005). However, without a full realization and valuation of the global environmental and social commons to accompany the globalization of markets, there can be few checks and balances circumventing inequities that will eventually limit economic growth. Historically, contentious issues surrounding the equitable balancing of “global commons” have not yielded to technological solutions, but require action by “civil society.”

Therefore, humanity and capitalism faces a dilemma that demands resolution: to redefine development and capitalism to become “sustainable” in a fuller world with shrinking natural capital. This is why, in the author’s view, a sustainable enterprise lens is critical for strategy planning in smaller firms.

1.5 The Research Questions

This dissertation’s primary objective is to better explicate the value of using a “sustainability lens” to incorporate the principles of sustainable enterprise into the strategic plans for small to medium sized businesses. Since SMEs comprise over 80% of all global enterprise, it is important to understand the potential results of adopting such strategy in “real world” circumstances, which are discontinuous, disruptive and highly competitive, and to develop frameworks to incorporate such strategies into SMEs if positive results emerge.

The circumstances and concepts described in this first chapter have produced several formal research questions to be addressed by this dissertation:

- What are the implications of ‘sustainable development’ on the evolution of business strategy for SMEs in an era of globalization of markets, communications, and technology?
- Can utilizing the paradigm of sustainable enterprise provide new, core competencies creating value, abundance and prosperity enabling SMEs to flourish during times of great

change in technology, globalization of markets, and the resultant environmental and social conditions?

- What methods of education and transformation can be used in SMEs, and which were successful within the three action-research cases explored?
- What are the directions for future research in this area?

1.6 The Research Process

As discussed in previous sections of this chapter, the development of a framework for integrating a sustainability lens into the strategic planning process for SMEs began as an evolving strategic process rather than a preordained one (Hampden-Turner and Trompenaars 1997). The opportunity to work with the firms described in these cases was a result of opportunity, serendipity and geography initially, rather than the result of intentional design. A great note of thanks is offered to all the stakeholders that have been involved for this opportunity.

“Sustainable transformation” as an intentional strategic objective, became part of the enterprise planning process at the author’s firm, Burlington Chemical Company (BCC), in 1983, and ended in 2007 with the sale of the company. Some details of this process were published in the *Journal of Cleaner Production* in 2004 (Ausley and Moore 2004). Further findings on the organizational implications of sustainable SME transformation strategies that evolved after 1995 were also published in the same journal (Manring and Moore 2004) (Manring and Moore 2009).

As a direct result of the author’s business and personal relationships with the firms TS Designs Inc and Reedy Fork Dairy, the opportunity for Action Research projects evolved beyond Burlington Chemical, but had very *similar transformational goals*. These projects began as a result of those personal and professional relationships, but only continued because positive results were achieved.

The Action Research project with TS Designs began around 1993 and the project with Reedy Fork Dairy began in 2001. The projects matured at different times, closing with Reedy Fork Dairy in 2007, and continues with TS Designs through 2009.

As a chemist trained in the methods of empirical research, learning the tools and practice of becoming an Action Researcher in the messy “real world” has been full of challenges, both professional and personal. Balancing objectivity and measuring the results of the change process, while coaching colleagues through the journey towards a more sustainable enterprise, has been a most difficult challenge. However, both are integral parts of any Action Research project (Argyris, Putnam et al. 1985).

Action Research is defined under the umbrella of Action Inquiry or Action Science, which is the deliberate use of any kind of plan, act, description and review cycle, for inquiry into action within a field of practice (Argyris, Putnam et al. 1985). Specifically, Action Research has four steps (learning loops) that differentiates this research from other types of inquiry (Tripp 2003):

1. Develop a strategic plan from visioning
2. Act on the strategic plan
3. Create data from actions

4. Analyze and reflect on data
5. Re-plan strategy and begin again

Greenwood and Levin's (Greenwood and Levin 1998) "co-generative" Action Research model was selected as an approach, as it allowed the researcher to realize both an internal role, i.e., an insider must continue to 'live' with the decisions made, and an external role, i.e., as an outside advisor that helps produce a co-learning process and has a professional interest in the outcome. The insights that the researcher discovered from these two roles as an engaged insider and objective outsider, resulted in the ability to produce a meaningful narrative case summary (Greenwood and Levin 1998).

The data gathering techniques used in this research most closely follow the "narrative strategy" summarized by Langley (Langley 1999). The author was present and active in many day-to-day activities of these firms, and in depth interviews and formal educational presentations were conducted over many years with the owners and key managers of each firm. There was a high level of trust and honest exchange of ideas that developed from this close relationship, which allowed for a depth of information transfer that was unlikely using other approaches. As is discussed by Langley, the narrative strategy for such research requires a great deal of time and certainly limits the number of studies that can be conducted due to these limits. There will be a more in-depth discussion of this process in later chapters.

In the three cases developed for this dissertation, the author induced on the firm's owners an evolving vision that the world was becoming, as Thomas Friedman's book says, *Flat, Hot, and Crowded* (Friedman 2008), and that each firm needed an intentional strategic process that would produce a more competitive firm to face this situation. The author suggested that becoming more sustainable (Hart 1997) would produce the following benefits (Senge 2008):

1. There is significant money to be saved
2. There is significant money to be made
3. You can provide your customers with a competitive edge
4. Sustainability is a point of differentiation
5. You can shape the future of your industry
6. You can become the preferred supplier
7. You can change your image and brand

As discussed earlier, developing an intentional strategic process to incite the radical changes necessary in a traditional American SME, linking social and environmental equity to increased profitability, required the Action Researcher to have and deepen a *personal and professional* relationship with the entrepreneurs involved. Here the role of the Action Researcher promoting a *change initiative* must be as both a *change agent* and an *advocate* for the owners. The ethical position being touted, in this case, sustainable transformation, cannot be seen by the entrepreneur as more important than his/her personal interests. The researcher must be seen as objective enough to balance these positions.

Finding a critical eye that enables a cyclical Action Research process (Tripp 2003) with the following attributes: planning, acting, observing, recounting, reflecting and documenting the process and results, requires a professional discipline that severely juxtaposes all the participant's personal and professional realities. While the nature of Action Research is by definition empirical, Action Research is, nevertheless, a giant leap from laboratory science since the only control variable available to the researcher is adherence to the process itself (Argyris, Putnam et al. 1985).

When immersed in the heat of the battle with all three firms described in these cases, the author had no difficulty integrating into each enterprise's management, readily becoming part of each management team as a valued member. The author's most difficult challenge was keeping to the goals and objectivity of the Action Research process during the highly emotional, very critical, crisis driven situation of everyone wrestling with creating a new paradigm for "our" business. While passion and excitement were abundant, objectivity and a disciplined adherence to the process design were difficult to maintain.⁶

These projects became very personal for the researcher and the entrepreneurs because sustainable transformation is a very personal matter for the leaders of SME firms. The business case for sustainable transformation, despite the list provided by Senge above, is not something that is easily and quickly translated into financial results.⁷

However, an effective transformation process builds an emotional fire in the belly and in the soul because sustainability can produce a very cohesive vision that moves beyond economic returns (Anderson 1998), (Maslow 1943; Maslow 1968; Spreitzer, Sutcliffe et al. 2005). The wonderful part of all three of these projects was the process of connecting the vision and the passion of sustainability with the realization of improved economic performance and expanded social, ecological and economic opportunities for each firm. The missions that evolved from the passion of these visions became palpable goals that permeated throughout these projects.

Recounting the case histories for each of these efforts in a scientific, third person voice was not possible due to importance of emotional and ethical decision-making within the process. These research experiences have been deeply personal for all the stakeholders on many levels. The management teams of TS Designs and Burlington Chemical became friends of the author as well as honored colleagues. The Teague Family of Reedy Fork Dairy became like a part of the author's own family. This personal connection is certainly one of the challenges of Action Research recognized in the literature (Argyris, Putnam et al. 1985). This seems especially true in SMEs, where the businesses are intertwined with the identity and lives of the owner-entrepreneurs. (Argyris, Putnam et al. 1985) Therefore, these cases read more like narratives, rather than the traditional third-person voice business cases found in many journals. There is,

⁶Becoming part of the "management team" in a small firm required projecting an emotional as well as financial involvement. Indeed, without the understanding that the most important data from this research would come via dialogue and an adherence to the predetermined process for the action science, it would have been even more difficult to maintain objectivity concerning both the process and the outcome. This is a significant difference between working on quantitative data from impersonal interviews within large firm versus working within a narrative strategy within SMEs. The above comments are not an apology nor a rehash of the role of the action researcher, that is thoroughly discussed within the literature of earlier times, however it is a statement on the fundamental difference of qualitative research within SMEs versus quantitative or qualitative research in large firms.

⁷Sustainability by definition implies long-term value and returns, while in American businesses, in particular, success is often measured in short-term financial terms.

however, precedent and guidance for such narratives found in the works of Barbara Czarniawska, and these techniques are used within the case presentations (Czarniawska-Joerges 1997; Czarniawska-Joerges 1998; Czarniawska-Joerges 1999).

This personal factor is a significant difference between Action Research within the SME realm, as opposed Action Research in larger firms; just as size is a significant factor in the differences between large and small firms on many different levels (Acs 1990). The emotional and mental models that evolved between the Action Researcher and the managers of SMEs, are personal (Blackford 2003) and take very large amounts of time and personal energy (Granovetter 1984; Langley 1999). Therefore, if mistakes or a mishandling of the role of the Action Researcher occurs during a project, not only are there business related consequences, the consequences are also personal for the researcher and the managers of the firms. The relationship between the researcher and the enterprise is a two edged sword and has great similarity to the relationship between the entrepreneur and their businesses. In other words, not only will mistakes during an Action Research project cost everyone on a business level, but the losses impact personal and family relationships as well.

The importance of “trust” and a personal connection between the change agent in such a transformation project and the owners of the SME firm cannot be minimized (Marshall and NetLibrary Inc. 1995; Marshall and NetLibrary Inc. 2000). Because the financial evidence connecting sustainable behaviors in enterprise and increased profits remains conditional (Montalvo 2002), invoking the additional dimensions of stewardship and ethics, on a personal level for the entrepreneurs involved is absolutely necessary to build the vision for sustainable transformation. This may be a limitation towards integration of sustainability into strategic planning for smaller firms until the financial links between such strategies are normalized (Montalvo 2002).

1.7 Organization of the Dissertation

The dissertation is organized into Chapters around the research questions.

Chapter 1: *Cultivating Sustainable Small-Enterprise Networks as a Way of Enhancing Value, Competitiveness and Resilience*

Chapter 2: *A Literature Review: The Importance of SME Networks and the Conditions Needed for Them to Create Long-term Value.* A review of the concepts and progress towards development of “sustainable enterprise” are presented along with a literature review on the role of the SME in the global economy. Discussion of the role of technology, networks, and the limits to growth, on the size and organization of business enterprises in the 21st century is presented.

Chapter 3: *Frameworks and Tools for Developing a Sustainable Enterprise Strategy.* Stuart Hart’s Sustainable Enterprise Strategic Framework (Hart, 2005), Montalvo’s Organizational Behavior Framework (Montalvo 2002), and the “sustainability advantages” described by Bob Willard (Willard 2005) are shown to be tools that enable the incorporation of sustainable technologies in formal strategic planning processes for SME planning. Sustainability is presented by these scholars as a leverage point that may produce opportunities for both disruptive and incremental competitive strategies. The tools of Hart, Montalvo, and Willard are shown to be compatible with existing strategic planning templates that are increasingly being utilized by

many small businesses (Bradford and Bradford 1990). There is also an extensive discussion on network effects and the idea of developing an intentional process for examination of SME stakeholder networks as part of a sustainable enterprise strategy.

Chapter 4: *Action Research Methodologies: Introduction and Background for the Case Studies.* Action Research techniques were designed to fully develop educational approaches for three SMEs, which agreed to provide the author access to owners, managers and employees of the firms. This essentially produced an experimental space allowing the author to educate on the use of sustainability as an innovation driver. The educational tools, techniques, and references for these techniques are cited and described.

Chapter 5: *An Introduction to the Research Cases*

Chapter 6: *Burlington Chemical: Research Study #1*

Chapter 7: *The Reedy Fork Dairy: Research Study #3*

Chapter 8: *TS Designs: Research Study #2*

Chapter 9: *Summary of the Three Research Studies*

Chapters 6-8 present three case studies: Burlington Chemical, Reedy Fork Dairy Farm and TS Designs, Inc. An introduction and summary is included for each. These cases describe the business environment and behavior of the firms, broadly since the companies were formed, but with a special focus upon their development during the period of 1990-2006. It was during this period that this author acted as a consultant to each firm as an action researcher. Each firm was introduced to the principals of sustainable development and the author worked within the management teams seeking to find ways to innovate and build value via a transition to a triple bottom line strategy. This particular timeframe was a period of collapse within the incumbent markets of all three firms, due to globalization. All three companies studied are located in North Carolina, USA, which was a geographic area heavily impacted via the loss of textile, agricultural and furniture production companies, which moved to lower cost locations in Asia and south America. These circumstances forced each firm to recreate itself, during which time the opportunities provided by sustainable development were added to strategy development process.

Care is taken in the presentation of the cases to describe the education and transformation process that led to the inclusion of sustainable enterprise as a possible mental model that could provide additional competitive advantage in these firms. The cases are recounted, using case study methodology as described by (Naumes and Naumes 2006) and presented in a narrative format as described by (Czarniawska-Joerges 1997; Czarniawska-Joerges 1998; Czarniawska-Joerges 1999; Czarniawska-Joerges and Hernes 2005).

Chapter 10: *Summary and Findings.* This final chapter integrates the findings from the three case studies and attempts to address the research questions and to ask the questions that have risen as a result of this work. This chapter will also discuss the successes and flaws discovered in the action research approach and the insertion process used with the three companies. This is the conclusion of the dissertation.

2 A Literature Review: The Importance of SME Networks and the Conditions Needed for Them to Create Long-term Value

As the world and its marketplaces begin to reflect “flat, hot, and crowded” conditions, how our local, regional, national and international societies network together will become critical. Leaders of competitive firms will need to understand the conditions under which local SME networks produce the greatest sustainable value, and how best for these resilient and innovative networks to interact with global ones, not as an either-or situation, but as a mutual discovery of opportunities for cooperation that bring long-term stakeholder values through understanding and taking advantage of synergies that are truly efficient and effective. This chapter explores the literature on: 1) the role SMEs play in the global market; and 2) the conditions needed for SMEs and SME network to create long-term value.

2.1 Sustainability as an Impetus for Organizational Change in SMEs

In recent decades, business leaders have come to a fundamental realization that there is no longer an “away.” Global communications and the Internet have reduced the feedback loop delays for companies that insult the social and environmental commons, making their behaviors in many cases rapidly transparent, and subject to global scrutiny.⁸ The world continues to shrink as markets flatten and there is no place where companies can hide environmentally or socially irresponsible behaviors.

By the last two decades of the 20th century the media and interconnection of markets also produced a new awareness that ignoring the consequences of environmental, social, and economic impacts of 20th century economic development, resulted in a false sense of capitalism, one that is not “rightly understood” and which an ever larger demographic does not find sustainable. Growing evidence indicates the traditional processes of economic development are impairing the global commons such that, if allowed to continued unabated, the resultant conditions threaten enterprises’ customers’ ability to behave as consumers (Bakan 2004). This threat is fundamental to the currently promoted vision of laissez-faire capitalism and possibly even to the existence of the corporation itself.

Realizing that, as the 21st century emerges, globalization, population pressures and social inequity were bringing even greater environmental, social, and economic challenges, business began to seek new approaches to maximizing the value of its activities. These strategies necessitate basic changes in market capitalism and the corporation, as circumstances force businesses to address the issues of sustainable production and consumption (Bakan 2004; Hart 2005; Barber 2007). Economics, behaviorism, legal precedent and policy pressures have all created new drivers for enterprises to invest in these radical strategies (Montalvo 2002).

In short, much of the impetus for the development of sustainable enterprise comes from the growing societal perception that perhaps economic “growth” as defined by GDP is *not* the answer to poverty or population growth, and that consumption must be controlled through

⁸ Throughout this thesis, the term *commons* is defined in Hardin’s terms from his 1968 article, “The Tragedy of the Commons”. Here “the commons” or “commons” refers to a resource that belongs to all stakeholders or is used in common by all stakeholders. In old English law, the common (or commons) was a tract of ground shared by residents of a village, but belonging to no-one. It might be grazing grounds, or the village square, but it was property held in common for the good of all.

policy, not unfettered market behavior (Wheeler, Zohar et al. 2005). Such realizations have induced worldwide research efforts measuring the effects of the current unsustainable behaviors on future markets and enterprise profitability. This research, in turn, has led to the evolution of new paradigms envisioning new sustainable paths forward (Hawken 1993; Barber 2007; Costanza, Graumlich et al. 2007).

In the opinion of this author, enterprises that wish to be engaged in profitable business activities and seek to survive over the long term have little choice but to seek the competitive advantages to be gained from adopting at least some principles of sustainability (Montalvo 2002) (Collins and Porras 1994). They must envision what will define success in the conditions of the future and find competitive advantages from adapting to the emerging situation.

Still, management frameworks that encourage sustainability as a competitive advantage face a fundamental challenge: how to transform enterprises when essential changes are in tension with their primary short-term profit motive.⁹ In an analysis of Mexican firms' willingness to adopt "cleaner technologies," Montalvo (Montalvo 2002) discovered three behavioral factors that must be present to "spark" change in corporations towards environmentally responsible behaviors:

- Internal managers' *attitudes* that investments in cleaner technologies (sustainable business practices) are cost effective and a long term resolution of environmental risk.
- Management's *internalization* that adoption of cleaner technologies relieves external social and market pressures on the firm.
- Management's *perception* that the organization has the technology and organizational skill sets to allow them to innovate in the realm of cleaner technologies.

This can be restated as the idea that businesses will transform their intentional strategies, if they have the incentive, examples, capabilities and resources to do so, and if these changes increase profits. It is very important to understand that the disconnect between profits and environmentally- and socially-responsible corporate behavior forms the primary hurdle to sustainable enterprise (Senge 2004).

Willard (Willard 2002), who has designed tools to demonstrate the links from sustainability towards improving economic performance for business, argues that firmly linking sustainable behaviors to profitability is the result of a normative process of strategy development. Hart and Milstein (Hart and Milstein 2003) also indicate that intentional enterprise strategies must discover competitive advantages within an environmentally constrained, consumer driven global economy of 6.5 to 9 billion people. Hart additionally (Hart and Prahalad 2002) insists that by adding 3 billion new consumers during the 21st century, enterprise is on the verge of a great period of growth, but only if that growth is sustainable. The process of combining these two frameworks into strategic planning processes for SMEs is the essence of the action research cases discussed in subsequent chapters.

However, for SMEs in particular, strategic changes and the paths towards those changes must make "sense" from an owner's very practical point of view. "Explicit efforts at sense-making

⁹ I would like to mention here that I have not ignored the broader ethical concerns of sustainability, such as the "Requiem Scenario" (Senge, 2005), but for the purposes of this work, I wished to limit my vision by the lexicon of the enterprise, making the business case for sustainability, strictly based upon the limited perspective of the enterprise.

tend to occur when the current state of the world are perceived to be different from the expected state of the world, or when there is no obvious way to engage the world” (Sutcliffe, Weick et al. 2005, p. 409). The owners and entrepreneurs managing SME firms do not have boards of advisors to help them make decisions in many cases, therefore, “to deal with ambiguity, interdependent people search for meaning, settle for plausibility and move on to the next set of challenges (Sutcliffe, Weick et al. 2005, p. 419). In this fashion SMEs must be given enough information to concur that the future is going to be “hot flat and crowded” and that it makes “sense” to consider actions that include sustainability.

This research findings incorporated into this thesis indicates that *the objective of most research on sustainable enterprise is to understand and describe the link(s) between social and environmental sustainability and profitability. These are the links that must exist for sustainability to be a sensible forecast of the future for SME owners.* The links between profits and sustainable behaviors are beginning develop and produce organizational changes, especially in large multinational enterprises (MNEs) responding to challenges and opportunities of sustainability. This provides examples for SMEs. Sustainability changes in MNEs are becoming more visible due to:

- New policies and reporting standards requiring transparency; (<http://www.globalreporting.org/Home>)
- The linking of sustainable behaviors to economic performance; (<http://www.sustainability-indexes.com>)
- And, just recently, the use of advertising touting sustainable behaviors as a competitive advantage (World Business Council for Sustainable Development 2002).

Still, while the news that large global firms are realizing benefits from sustainability changes makes such change more attractive, little study has been put into addressing how to make effective change in SME firms, the small to medium sized ones where 80+ percent of the world’s business is carried out. The primary focus of this thesis research is exploring the competitive advantages and value-add potential of the author’s Sustainability Lens and strategic transformation process in which:

- All business decisions take the Triple Bottom Line (TBL) principles, that is, human, economic, and environmental bottom lines into consideration.
- Practitioners and participants strive to expand *sustainable development* conceptualized as resilient, adaptive, *intentionally cultivated, stakeholder networks* linked by “free enterprise, rightly understood”. To do this, SMEs view themselves as members of a living network and strive to more clearly incorporate environmental, civil society, and economic development stakeholders as serious stakeholders in their networks.
- Change agents work with SME owners, management, and teams to create an intentional strategic process for effectively moving through transformative change.

As discussed later in this chapter, consciously cultivating stakeholder networks along with TBL principles can improve both environmental and corporate sustainability by expanding the diversity of stakeholders and providing additional interconnections even among global SME networks. Since this approach to sustainability expands the number and types of stakeholders

participating in a network, it also increases the learning loops for the SME and as well as the diversity of opportunity. Such effects may result in SME networks that are resilient over the long-term and could result in rapid implementation of disruptive clean technologies, since such companies have fewer incumbent practices and allegiances to discard before adopting new ones. The recent publication of *Panarchy: Understanding transformation in human and natural systems* has provided cohesive models of what the design and constraints of sustainable business networks might look like through incorporation of scholarship from studying stable ecosystems and economics (Gunderson and Holling 2002).

To lay the foundation for exploring how this Sustainability Lens, network cultivation and transformation process can benefit small firms as well as the global economy, this chapter provides a literature review of: 1) the important role SMEs play in the global marketplace; and 2) the conditions needed for “sustainable” development of SME networks.

2.2 The Importance of SMEs in the Global Marketplace

In his recent study of the role played by small firms within the U.S. economy, Audretsch (Audretsch 2002) delineated the basis of a fundamental and ongoing shift in research perspectives on enterprise size that has occurred over the past quarter century or so. The “traditional static” view, as Audretsch refers to it, proceeds from the long-standing assumption that small enterprises generate economic and social costs because they do not possess the requisite scale to achieve optimal operational efficiencies. As a consequence, small firms typically have lower levels of factor productivity than their large counterparts and this, in turn, severely constrains their capacity to provide their workers with wages and benefits equivalent to industry norms. In this view, small enterprises are vulnerable to abnormally high rates of business failure, owing to their competitive disadvantages vis-à-vis larger rivals in product/service and in factor markets. According to Audretsch, major corollary of this static, economy-of-scale conception of small enterprises posits that they are also less innovative than the market-share leaders in their respective industries because they lack the capital to finance formal research and development activities, and the scale and scope needed to recoup their outlays on innovation inputs.

In the early 1980s, however, Porter's work (Porter 1980; Porter 1985) on the exploitation of niche or focus strategies initiated a revision of the long standing assumption that enterprise size invariably displays positive correlations with competitive performance and innovation. Even apart from inroads on narrow or peripheral markets, small and medium-sized enterprises (SMEs) were found to possess certain key advantages that enabled them to respond in a timely and flexible manner to rapidly evolving market environments and technological regimes. Within the field of industrial economics, empirical studies demonstrated that entrepreneurs do not enter into growing sectors to capture a small share of the above-mean profits available within them. Instead, from a “dynamic emerging” perspective on industry structures, it was found that small start-up firms were not simply lower-case clones of larger incumbents but functioned as: “*agents of change* through innovative activity” (Audretsch 2002. p. 17). Beginning with Acs and Audretsch's (Acs and Audretsch 1987; Acs 1988) pioneering work, empirical studies showed that SMEs are able to compete successfully and, in fact, to replace larger enterprises owing to the substantially higher rates of product and process innovation per worker that they are able to realize.

It is also important to put this conclusion into historical perspective. Network effects in the late 1980's were very small in comparison to 2005, most likely due to Internet influences and the flattening of the global economy (Friedman 2005). The application of this "dynamic" or "evolutionary" perspective, as Audretsch (Audretsch 2002) would later call it, led at least some scholars to conclude that small firms actually enhance macro-economic efficiency, both directly and by compelling larger enterprises to either change or fall by the wayside. Shuman (Shuman 2006) would certainly concur. The networking of communications and global supply chains has certainly accelerated the evolutionary process by rapidly inducing evolutionary and creative destruction effects (Schumpeter and Opie 1934; Schumpeter 1942; Andersen 2004; Hart 2005).

While central to a full appreciation of the transition that has taken place in approaches to the study of SMEs within industrialized economies, Audretsch's analysis did not explicitly incorporate the over-arching influence of substantive trends that had unfolded in the world at large. It is not merely that advances in the concepts, methods, and data bases associated with small and medium-sized firms are now disclosing competencies or advantages that were previously unrecognized. Fundamentally, the production and consumption of goods and services has undergone a paradigm shift owing to those concurrent economic, political, social, and cultural trends that may be associated under the rubric of globalization. Facilitated by accelerating progress in information- and communications technologies, globalization has enabled enormous changes in production networks, including the decomposition of production and marketing activities previously conducted in house by dominant multinational enterprises (MNEs) within their home nations and overseas subsidiaries.

At the same time, governments around the world have jettisoned inward-looking, import-substitution development models bolstered by protectionist barriers and embraced outward-oriented export growth strategies demanding liberalization of cross-border trade, production factor and information flows. Both organizational and national boundaries have become increasingly fluid and indistinct, while consumers have not stopped demanding products and services that fit their diverse needs and preferences. This, in turn, has compelled enterprises of all sizes to discard the large-scale, centralized production chains operating under tightly-integrated, hierarchical organizational structures in favor of flexible systems that encompass cooperative commercial alliances, knowledge networks, and the capacity for rapid innovation (Manring and Moore 2004). Taken collectively, these developments have raised and broadened the contributions of SMEs to local, regional, national, and global economies.

It was only in the late 1980s and early 1990s that the rising importance of SMEs in the converging national development and globalization processes was acknowledged by the world's leading international organizations, such as the United Nations, the International Monetary Fund, and the World Bank recognized the role of small-, medium- and even micro-sized entities in the growth and modernization of the newly-industrialized countries (NICs) of the East Asian region. Thus, for example, in 1993 the United Nations Conference on Trade and Development (UNCTAD) (United Nations 1993) issued a pivotal report on the role of small and medium transnational corporations (TNCs) for the future of non-OECD developing economies in Asia, Latin America, and Africa, as well as the transitional economies of Eastern Europe. The UNCTAD monograph documented the significance of globalizing SMEs as generators of employment, foreign exchange receipts, and the diffusion of knowledge, promoting rapid growth

and disseminating opportunities for populations that had previously stood outside of an international economic system dominated by the interests of MNEs in the developed West.

While the prospective benefits of nurturing SMEs had already been recognized to some extent by the governments in Western Europe and North America through the establishment of “industrial districts” serving niche markets, policy-makers in developing countries began to see that rather than being alternatives to reliance upon overseas producers of exports that could only be rendered efficient through consolidation, SMEs formed the backbones of their respective economies. Emphasizing the economic functions of small- and medium-scale entities within the Malaysian economy, Abdullah summarized the revised view:

SMEs contribute a vital role as they tend to: create more jobs per unit of capital compared to large enterprises; serve as a training background for upgrading and developing the skills of industrial workers, technicians, managers and entrepreneurs; provide the impetus for inter-firm linkages to the domestic economy; play a vital complementary role to large corporations and are a major vehicle for transferring or developing technical know how; reduce import requirements and consequently save foreign exchange (Abdullah 2002, p. 181).

Although the overwhelming bulk of the published research on SMEs has been conducted within the developed world, their prospective economic importance for developing nations has become increasingly apparent.

There is, however, an even broader framework in which SMEs are now construed as agents of change, one that encompasses what Cheah and Cheah (Cheah and Cheah 2005, pp. 37-39) have designated as the four dimensions of sustainable global development — economic, ecological, social and, at bottom, ethical imperatives. In their estimation, not only are SMEs crucial agents of change in the transition from a Mass Production System (MPS) to a Sustainable Production System (SPS), but in performing this role, SMEs have the potential: to lessen or even reverse the environmental damage associated with large-scale, standardized production and consumption; to enhance social functioning through collective learning; to reduce social disparities and conflict; and to encourage a normative shift from competitive to cooperative values. As Cheah and Cheah emphasized, “at present, the possibilities offered by a new SPS are at an infant stage and these possibilities confront significant constraints” (Cheah and Cheah 2005, p. 51). Nevertheless, as the potential of SMEs to serve as economic change agents is manifested, it is possible that they may serve as catalysts in the evolution of sustainable ecological, social, and ethical systems on a world-wide basis, if sustainable behaviors can be linked to success for practicing firms as Montalvo (Montalvo 2002) highlights.

The empirical study of small- and medium-sized enterprises is woefully inadequate relative to their prospective contributions. During the past two decades, a vast, sprawling body of studies on SMEs has come into existence. As noted in passing above, most of these works have been conducted in North America, the European Union, and a handful of Asian economies. Consequently, their relevance to the developing world is questionable. Moreover, study databases have generally been restricted either to a single national economy, or more often, to either a narrowly-defined economic sector and/or a regional cluster of enterprises construed as either a local milieu or as a geographically-bounded network. While research carried out within

these focused settings has allowed scholars to develop insights into SMEs (in themselves and/or in comparison with large-scale enterprises), their reliability is inherently low. The external validity of findings from studies confined to a single nation, district, or cluster necessarily reflect variable macroeconomic, policy and sector conditions that are subject to change over the course of time. The resulting impacts are reflected in a lack of congruence in cross-study results; indeed, contradictory findings are the norm within this domain. Moreover, the likelihood of inadvertent (or even intentional) researcher bias during sample selection and construction is high. Such biases, discussed in Chapter 4, Action Research Methods, may be inherent in SME research due to the personal nature of the owners to their firms. Even the most basic variables utilized in the published literature on SMEs display a frustrating lack of definitional standardization. For example, where the U.S. Small Business Administration (SBA) defines a “small business” as one with criteria such as 250, 200, or 100 workers; revenues of less than \$10 million, and so on, in their attempts to operationalize independent variables, some of the studies reviewed in this chapter arbitrarily divide the larger from the smaller organizations within a given sample.

Although some of the assertions that have been put forth concerning SMEs rest upon readily quantifiable outcome variables, as, for example, their employment effects or productive efficiency, others steadfastly resist quantification. Researchers have attempted to measure such qualitative phenomena as level of “innovation” or degree of “flexibility,” for instance, in a bewildering variety of ways, none of which are entirely satisfactory or command consensus (Bhattacharya and Bloch 2004). Data-gathering instruments used in this burgeoning subject area range from exceedingly complex econometric models to surveys and questionnaires, interview protocols, and observational methods that are idiosyncratic. Moreover, and especially in large-scale longitudinal studies using data-bases with a substantial time lag between original collection/construction and analysis, we frequently encounter a tandem moving target problem. On the one hand, those small firms that have attributes associated with success (e.g., those that are innovative, have a propensity to export, etc.) tend to become large enterprises over time; on the other hand, the market/operating conditions that prevailed at the time of data collection are subject to change. The net result is that valid the generalizations that can be made about SMEs are few in number and of limited analytical value.

With all of these provisos in mind, then, and acknowledging that the review presented below is necessarily selective, the remainder of this review consists of four broad sections. Section II focuses on enterprise stability, share of national output, and the employment effects of SMEs. Section III covers the knotty question of SME innovation attributes, including innovation output, sources of economic knowledge, geographic clusters and networks. Section IV is addressed to the international activities and roles of SMEs, while the concluding segment of the survey touches upon SME flexibility, use of information technology, collective learning, and generation of social capital.

2.2.1 SME Stability, Share of National Output and Employment Effects

Audretsch (Audretsch 1995) has observed that, within the United States and other OECD economies, some generalizations can be made about enterprise size in relation to enterprise stability or duration. Across enterprises of all sizes, firm entry (or “birth”) and exit (or “death”) rates are surprisingly high. Furthermore, exit rates also tend to be highest in those industries in which entry rates are above the mean. On the whole, the likelihood that a firm will exit an industry (or die) declines with both its age and its size. New firms (which tend to be small) and

small firms are far more likely to go out of business than entities that have been in business for a longer period of time and/or have more than 500 full-time employees. From his econometric analysis of all manufacturing firms in the U.S. economy, Audretsch (Audretsch 2002) reported that in every major sector, the birth rate and the death rate of SMEs exceeds that of larger enterprises. The expansion rate for SMEs also exceeds that of larger organizations, while the contraction rate of the large organizations exceeds that of smaller firms, and, across time, net employment gain is higher in small firms than it is in large ones (p. 22). In short, at least within the U.S. manufacturing sector, SMEs are less stable than larger firms and, taken collectively, they account for an inordinate share of industry-wide churn.

If anything, small enterprises in developing economies appear to be even less stable than their counterparts in the developed world. Drawing upon the results of field studies from one Latin American and five African economies — the Dominican Republic Botswana, Kenya, Malawi, Swaziland and Zimbabwe — Mead and Liedholm (Mead and Leidholm 1998) reported that enterprises with less than 50 workers are “in a constant state of flux” (p. 64). While the annual rate of start-up for comparably-sized firms in OECD economies is 10 percent, the corresponding rate within these six economies ranged from approximately 20 percent in Kenya to over 30 percent in Botswana. The mean rate of enterprise deaths for the five African economies in this composite study was 12.9 percent. Contrary to results reported for Portugal (Mata 1991; Mata 1994), across the entire six-nation sample, start-ups with the smallest number of workers firms were more likely to survive throughout the period 1989-1995, than enterprises that were larger at the time of start-up. It seems that size and maturity matter.

As Mulhern and Stewart (Mulhern and Stewart 2003) have observed, in most industrialized countries the share of output in manufacturing and in total GDP attributable to SMEs (variously defined) has increased steadily since the early 1980s. According to these researchers, the growth of SME national output share between 1990 and 1998 has been reported in the United States, Western Europe as a whole, Italy, Greece, Norway, Japan, South Korea and Taiwan. In the main, enterprises defined as being “small” or “small/medium” have come to command a larger proportion of total manufacturing production during the final two decades of the twentieth century.

Turpin (Turpin 2002) has observed that small firms in developing nations are particularly vulnerable to economic dislocations. He noted, for example, that in the immediate aftermath of the Asian currency/financial crisis of 1997-1998, among some 200,000 enterprises surveyed in the East Asia region, 18 percent of small firms ceased a major business activity and over 25 percent reduced their business activity. Nevertheless, in Indonesia, the contribution of small enterprises to GDP actually increased (from 37.96 percent in 1997 to 41.89 percent in 1999), while that of both medium and large declined (respectively: 19.84 percent to 17.47 percent; and 42.20 percent to 40.64 percent). On the basis of these statistics, Turpin concluded that while an alarming high percentage of small businesses in Indonesia pared back or shuttered operations as a consequence of the Asian crisis, those that were doing well before the crisis erupted continued to thrive.

Turning to conventional measures of business performance, using data from Australian Bureau of Statistics, Dunlop (Dunlop 1992) found that small Australian manufacturing enterprises (those with less than 100 workers in this study's data set) were, for the most part, less technical efficient

(in terms of total factor productivity) than enterprises with more than 100 employees. Within the 90 industries that Dunlop analyzed, there were 52 in which technical efficiency of larger enterprises exceeded that of small manufacturing firms by one percent or more; in 34 of those sectors, the disparity was 3 percent or more. In fact, there were only 9 manufacturing sectors in which the total factor productivity of small firms was greater than that of the larger enterprises by greater than one percent. Nevertheless, the difference in profit margins between the large and small firms in Dunlop's sample was not statistically significant (13.94 percent for large firms vs. 12.96 percent for the small firms). Focusing exclusively on labor productivity within Finnish manufacturing firms as a whole, Hohti (Hohti 2000) found that, across the years 1980 through 1994, enterprises with 10-49 employees recorded average labor productivity that was 16 to 35 percent less than the manufacturing average for Finland as a whole, while those manufacturing firms with 250 or more workers exceeded the mean labor productivity rates for the Finnish manufacturing sector in every year encompassed in the analysis. On the whole, these studies indicate that labor productivity in small manufacturing enterprises (along with total factor productivity) does tend to be lower than that of large firms. This stands to reason: within manufacturing, SMEs tend to be more labor-intensive than large firms which tend to substitute technology for labor as they have greater access to capital than smaller firms.

While SMEs in the developed world have generally increased their share of national output, this is not universally the case. In his studies of Portuguese manufacturing firms, Mata (Mata 1991; Mata 1994) found that small firm start-ups (less than 100 workers) not only died at a faster rate than larger enterprise, their growth rate was well below that of industry norms. Mata commented that these findings, “challenge the conventional view of small business flexibility and their superior ability to succeed where large firms fail” (Mata 1991, p. 58). In a subsequent longitudinal study, Mata (Mata 1994) found that among Portuguese manufacturing firms established in the year 1983, a full 20 percent died during first year in business, while 50 percent shuttered their operations within four years. Not only was the churn rate here above OECD norms, Mata reported a significant positive correlation between firm size at the time of establishment and the likelihood of their survival. They explained that small Portuguese manufacturing firms suffered from lower quality managements that were unable to accurately estimate their actual ability when deciding to enter a given industry. Access to capital and technology were not adequately addressed in these studies.

Mulhern and Stewart (Mulhern and Stewart 2003) documented the long-term decline in SME share in Venezuelan GDP share from 1961 through 2000. They attributed this erosion in SME share of national manufacturing to two factors: (1) the failure of Venezuelan SMEs to innovate relative to large firms within that nation; and, (2) a business environment that was generally hostile to SMEs. During most of the time period under analysis, Mulhern and Stewart (Mulhern and Stewart 2003) observed, the Venezuelan government pursued a policy of state-led industrialization, focusing on import substitution through government-owned manufacturing enterprises financed through oil export revenues. When the state departed from this course during the period 1989 through 1993 and instituted temporary liberalization reforms, the SME share of Venezuelan manufacturing output rose substantially. After 1993, however, official development policy shifted back to a protectionist regime and the long-term downward trajectory in manufacturing SMEs share of national output resumed.

As Abdullah (Abdullah 2002) wrote, “the most popular argument in favor of SMEs is that they create substantial employment opportunities” (p. 190). This is abundantly clear in the developing world, for as Cheah and Cheah (Cheah and Cheah 2005) have reported, in many poor nations SMEs, “represent almost the only employment opportunity available to a large proportion of the population” (p. 29). Taken in aggregate, the empirical literature strongly suggests that small firms in both developed and developing economies over-contribute to job creation, job destruction and net employment gains. This does not seem contradictory to models from nature, i.e. competitive ecosystems, where small organisms are numerous and live and die at a relatively faster rate than their larger counter parts (Montalvo 2002).

Using Longitudinal Establishment and Enterprise (LEEM) data from the SBA, Audretsch (Audretsch 2002) calculated the percentage change of employment owing to new manufacturing firms (firm births) between 1990 and 1995. For the sample as a whole, there was a 12.76 percent increase in employment due to the birth of new firms over that time span; but for small enterprises (20 workers or less) there was an increase in employment of 144.69 percent resulting from the start-up of new businesses. By the same token, loss of jobs due to firm deaths for the sample as a whole was 15.92 percent. The loss of jobs from the death rate was 12.79 percent for corporations with more than 500 workers, 19.37 percent for enterprises with 20 to 499 employees and 28.69 percent for enterprises with less than 20 employees. Using the same data base, Audretsch (Audretsch 2002) calculated that the employment expansion rate for large manufacturing corporations (more than 500) that survived throughout the 1990-1995 period was slightly more than 10 percent; the corresponding figure for enterprises with less than 20 employees was nearly 33 percent. Moreover, the job contraction rate for incumbent firms varied directly with size; the largest firms lost the highest percentage of jobs, small firms suffered the lowest percentage of job loss. Taking all of the data into account for firms that remained in operation over the entire period, Audretsch (Audretsch 2002) concluded that between 1990-1995, employment levels at large enterprises (more than 500 workers) declined by 8.47 percent; by contrast, small enterprises (less than 20) enjoyed a net increase in employment of 21.25 percent.

Johansson (Johansson 2004) studied net employment creation among small and large firms within the Swedish information technology sector between 1993 and 1998. During those six years, firms with 500 or more workers in 1993 experienced a 25.58 percent loss in jobs by 1998, while those with 200 to 500 workers pared back employment by 12 percent. By contrast, among Swedish IT enterprises with less than 200 workers net employment rose by slightly more than 10 percent. Firms created after 1993 (a preponderance of which had less than 200 workers at start-up) added 13,697 jobs to the sector, approximately 9 percent of total employment within the Swedish IT industry. In this study, then, net employment levels displayed a strong inverse correlation with both firm size and firm age.

In partial contrast to the unambiguously favorable findings of Audretsch (Audretsch 2002) and Johansson (Johansson 2004) on the role of SME in job creation, Hohti's (Hohti 2000) study of employment in the Finnish manufacturing sector revealed that while net employment for the sample as a whole was negative, there was a slightly higher rate of net job loss among the smaller firms. Hohti remarked that both the bulk of the job losses and the emergence of a negative disparity from the mean among small firms occurred during the period between 1990

and 1994; that is, at a time when the Finnish economy as a whole was undergoing a significant contraction.

Returning to Mead and Liedholm's (Mead and Leidholm 1998) six-nation study, the researchers observed that within the five sub-Saharan African economies encompassed within it, more than two-thirds of all registered jobs were in enterprises with fewer than 50 workers. The most significant correlation found for all six nations in the study was that between 1989 and 1995, the average annual employment growth rate for enterprises that survived through 1995 from time of start-up ranged between 13 percent to 16 percent a year, that is, twice the growth rate of GDP of their respective national economies.

On the other hand, the vast majority of the enterprises in the study did not grow at all in terms of employment; instead, employment expansion was restricted to a small minority of these enterprises, most of which were located within urban districts. Focusing on Kenya, Mead and Liedholm (Mead and Leidholm 1998) noted that the employment level of small enterprises in that economy illustrated just how heavily these entities are affected by macro-economic conditions. In 1994 (a year in which Kenyan GDP per capita growth was stagnant) registered employment in the nation's small enterprises grew by nearly 100,000 jobs. However, incumbent enterprises added only 27,000 new jobs while firms that went out of business lost 157,000 jobs and 1994 start-ups contributed 227,000 workers. In 1994, then, net employment at incumbent firms shrank, but many of these same workers found employment at recently-established small firms.

In 1995 (a year when Kenyan GDP per capita rose at an above-mean pace), net employment at existing enterprises climbed by slightly over 100,000 workers, but new job creation due to start-ups were less than 97,000. In Kenya, as in all five of the other developing economies in this study, when the national economy is stagnant, existing SMEs suffer job losses but newly-established enterprises contribute to net job growth in excess of these levels; when times are good, existing enterprises add jobs at a very rapid rate, but the contribution of enterprise start-ups to net job creation tends to decline.

Finally, most studies have reported that wage rates paid to workers at SMEs are substantially below those provided by larger firms. *Inter alia*, Brown, Hamilton and Medoff (Brown, Hamilton et al. 1990) have observed that enterprise size is positively correlated with both wages and total compensation across study samples, time periods, and national economies. Using 1989 data for the U.S. manufacturing sector, Brown, et al. (Brown, Hamilton et al. 1990), found that employees at entities with more than 500 workers earned 35 percent more in total compensation than employees at smaller companies and 37 percent more than workers at companies with 100 or fewer employees. Similarly, Audretsch (Audretsch 1995) reported that small U.S. manufacturing firms with sub-optimal production scales paid their workers only 80.5 percent of the mean industry wage rates. Even after adjusting for job quality, Hohti (Hohti 2000) reported that employees at Finnish manufacturing firms with more than 500 workers earned at least 10 percent more than their small counterparts in all years between 1980 and 1994.

On the whole, the findings of the studies reviewed in this section suggest that SMEs do, in fact, contribute more manufacturing jobs on net than larger enterprises in both developed and developing economies, and that their share of GDP has risen since the 1980s. Taken as

individual entities, they are a less stable source of employment than large firms, they are far more vulnerable to economic downturns, and they can be severely affected by changes in official development policies. Taken collectively, SMEs can serve as an engine of job creation during both periods of economic expansion (via incumbent firms) and retraction (through start-ups). On the other hand, small enterprises are less efficient in terms of labor and total factor productivity, and tend to pay lower wages as a consequence. In summary, the key determinant of their growth rates — and capacity to provide employment — appears to be their capacity to innovate. So, it is to that topic that this survey now turns.

2.2.2 Innovation, Networks and Clusters

Until the early 1980s, the principal measure used to gauge an enterprise's innovativeness was its annual per worker expenditures on formal research and development programs. It was assumed that these product and process innovation inputs would necessarily translate into new products as well as to improvements in existing offerings and production processes. Without exception, studies employing this yardstick demonstrated that innovation intensity is powerfully related to enterprise size; in OECD economies, formal research and development activities dominated large firms, notably MNEs, which expend more capital per employee than their smaller counterparts in the vast majority of industries (Bhattacharya and Bloch 2004). In the developed world, approximately 80 percent of all R&D activities within privately-owned firms takes place in enterprises with more than 100,000 employees, and in most sectors, large enterprises have much higher R&D intensity ratios (Eden, Levitas et al. 1997).

In 1982, however, the U.S. SBA introduced an index of actual innovation outputs and researchers began to examine enterprise innovation activities other than those taking place through designated R&D departments. Since then, as Hansen (Hansen 1992) has observed, virtually every study of innovation indicators undertaken within the United States and other industrialized economies has concluded that innovation is far more widespread than official statistics indicate, and several researchers have argued that undercounting of informal inputs to innovation has been skewed against SMEs. For example, after surveying some 1,842 Dutch firms, Kleinknecht (Kleinknecht 1987) calculated that because official (OECD) statistics did not capture informal research and development activities (the assignment of personnel outside of a designated R&D department to an innovation task, for example), they understated the collective contribution of firms with less than 500 workers by nearly 50 percent (9 percent reported against nearly 18 percent actual) and that of firms with 10 to 49 workers by an even wider margin. Montalvo (Montalvo 2006) would also agree that capturing unplanned innovation metrics remains an inconsistency in innovation research due to three factors.

- There is much emphasis on individual determinates, rather than understanding and measuring collective factors leading towards innovation;
- There are no sound models for testing collective interactions leading towards innovation;
- There is dissonance between cognition and behavior, which can also be further described by Alvarez and Barney (Alvarez and Barney 2007) as the difference between discovery and creation theories of entrepreneurship.

More recently, Roper (Roper 1999) reported that the innovation intensity of small firms (500 workers or less) in Great Britain was 13.9 percent higher than the ratio reflected in official statistics while that of their German SME counterparts was 2.4 percent greater.

Yet even when adjustments are made to counteract the exclusion of informal R&D, it is likely that conventional approaches grossly underestimate the innovativeness of SMEs. There is, to begin the problem of small, incremental changes in products and, more especially, production processes that are not counted as innovations. As Audretsch (Audretsch 1995) has remarked, the bulk of commercially significant innovation is incremental in nature, involving the development, application, and re-application of existing knowledge with little or no scientific advance. Since the early 1980s, according to Piergiovanni, Santarelli, and Vivarelli (Piergiovanni, Santarelli et al. 1997), empirical studies conducted in North America and Western Europe have consistently demonstrated that even those small firms that report negligible expenditures on *formal* R&D provide a significant share of innovative output most of which is incremental, as opposed to radical, in nature. This is a topic of further discussion in Chapter three of this thesis where the existential style of strategy planning within SMEs is contrasted with the need for a more formal strategy planning process.

In tandem studies utilizing SBA innovation output indices, patent citation data, and trade journal innovation report counts, Acs and Audretsch (Acs and Audretsch 1987; Acs 1988) tested the conventional assumptions that: (1) large firms (more than 500 workers) are more innovative than small ones across industries; and, (2) that innovation rates are higher in those industries in which market share is highly concentrated, i.e., in sectors in which a few large firms predominate. They concluded that across all industries, the average rate of innovation by small manufacturing firms was 43 percent higher than that of large enterprises. They did find that large firm innovation rates are significantly greater than those of small enterprises within mature industries that are capital-intensive, advertising-intensive and display a high degree of market concentration.

On the other hand, within sectors that are rapidly growing and in which total innovation and the use of skilled labor play a large role, small firms are far more innovation intensive. Indeed, within the 35 most innovative industries, the ratio of innovations per employee for firms with less than 500 workers was 6.64 times than that of larger enterprises (Acs 1988). Intriguingly, Acs and Audretsch (Acs and Audretsch 1987; Acs 1988) discovered that while large firms have an innovation advantage in highly concentrated industries, many of the most innovative small enterprises in their sample(s) were active within those same industries, implying that they were able to compete against larger rivals on the basis of superior innovation outputs. Audretsch (Audretsch 1995) subsequently found that small firms are far more effective in translating innovation inputs into actual innovation. Indeed, he found that a simple correlation between R&D inputs and innovative outputs across all manufacturing industries was 0.84, but for the largest firm in the sample it was only about 0.40.

Many empirical studies focusing upon the relationship between enterprise size and innovation *outputs* have shown that small enterprises are considerably more innovative than their large firm competitors. Hansen (Hansen 1992), for example, surveyed 598 manufacture firms to determine the proportion of total sales that they had obtained from products introduced in the prior five years. Even after controlling for the influence of firm age, small manufacturing companies were significantly more innovative in terms of sales derived from new product introductions; across

the entire study sample, both firm size and firm age were inversely correlated with innovative output measured in this manner.

In their study of Dutch manufacturing and service firms, Kleinknecht, Reijen and Smits (Kleinknecht, Reijen et al. 1993) reported that enterprises with 10 to 49 workers introduced 0.79 innovations per 1,000 employees over a four year period as compared to 0.19 innovations per 1,000 employees in enterprises with more than 500 workers. Using a similar study design with a sample Irish manufacturing firms, Cogan (Cogan 1993) reported that the smallest firms in his study (less than 5 workers) had introduced 1.02 innovations per 1,000 employees, in contrast to a mere 0.03 innovations per 1,000 workers among enterprises with more than 500 workers. Santarelli and Piergiovanni (Piergiovanni, Santarelli et al. 1997) found that across all Italian manufacturing industries, enterprises with less than 200 workers had implemented 13.2 innovations per 1,000 employees while the comparable ratio for larger enterprises was only 0.7 innovations.

There is some evidence that small enterprises are able to implement product innovations far more rapidly than their larger competitors. Turpin (Turpin 2002) found the mean time between the completion of R&D on a product innovation and its actual commercialization was six to twelve months among small Australian manufacturing enterprises (less than 20 workers) as compared to a mean implementation time of one to two years for enterprises having more than 100 employees.

The widely-reported innovation output superiority of small enterprises has not gone unchallenged. Tether (Tether 1998) argued that the most commonly used yardstick (number of innovation per employee) does not capture the variable economic value of innovation outputs. Examining the commercial value of 443 product innovations introduced by British manufacturing firms between 1977 and 1990, Tether reported that large companies (those with more than 500 workers in this study) were responsible for almost all of the higher value innovations while the bulk of the lower value innovations came from small firms. He noted still further that the impact of product innovations on sales growth was much higher among the former and that the most innovative small firms (as measured by innovations per worker) enjoyed only modest increases in revenue growth.

Using data from the Business Longitudinal Survey published by the Australian Bureau of Statistics, Bhattacharya and Bloch (Bhattacharya and Bloch 2004) attempted to determine whether the determinants of innovation are the same for small and large enterprises and whether they differ in high-technological and low-technological opportunity industries. They reported that in both high- and low-tech sectors, innovative activity increased with mean firm size, albeit at a decreasing rate. They also contrasted their findings on this count with Acs' and Audretsch's studies.

Although the generalization that SMEs are more innovative (when measured by outputs adjusted for firm size) than larger enterprises has not been conclusively validated, it is nonetheless apparent that small enterprises are far more innovative than their expenditures on R&D activities would suggest. The question naturally arises: Where do SMEs obtain their innovation inputs? The broad answer is from various forms of knowledge spill-over derived from external sources.

One source of spill-over stems from the migration of individuals to small firms (including enterprises that they found), who bring innovative knowledge with them to their new positions (Acs, Audrestch et al. 1994; Audrestsch 2002), but also the influence of the Internet and search engines such as Google, provides ready access that was unavailable prior to the mid 1980's. However, the documented principal source of innovation inputs for SMEs appears to be spill-overs from third-party firms or from research institutions such as universities and state-sponsored technology centers. The former may include supplier or customer organizations that are vertical elements within the enterprise's production chain, commercial organizations that do not compete with that enterprise but that share a common knowledge base, as well as competitors that are horizontally related to the enterprise.

Taken collectively, these external sources of spill-overs constitute complex networks in which SMEs participate as both generators and recipients of innovative knowledge (Porter 1996; OECD 2000). As will be discussed in Chapter 3, such synergistic network effects are known and can be described well enough to allow for the analysis of a firm's stakeholder network and its boundaries to be used in designing an intentional innovation path for SMEs (Watts 2003; Goerner, Dyck et al. 2008; Goerner, Lietaer et al. 2009). Because innovation often entails tacit knowledge that is difficult to encode but readily transferred on a face-to-face basis, these networks are most frequently conceptualized as geographically-bounded clusters (Watts and Strogatz 1998).

Consistent with these assumptions, Antonelli (Antonelli 1994) and others have maintained that the appropriate unit of analysis for SME innovative activity is not the individual firm taken as a stand alone unit, but the innovation system of which it is an integral component. In the case of SMEs, these networks can be described as their 'community of stakeholders.'

The perceived value of this network is a primary argument for inclusion of as many diverse stakeholders as possible within a firm's network. Given this conception: empirical analysis is progressively focusing on networks and clusters of SMEs, as they combine the advantages of small scale with several benefits of large scale, enhancing SMEs' productivity, rate of innovation and competitive performance (Piscitellio and Sgobbi 2004). According to Audrestsch (Audrestsch 2002), one of the key paradoxes of ongoing globalization, "is that even as the relevant geographic market for most goods and services becomes increasingly global, the increased importance of innovative activity in the leading developed countries has triggered a resurgence in the importance of local regions as key sources of comparative advantage" (p. 35). This is further reinforced by Shuman (Shuman 2006) and the mechanism at least partially defined by Watts (Watts 2003) and Strogantz (Strogatz 2003) and Johnson (Johnson 2001).

Jaffe (Jaffe 1989) was the first researcher to investigate the spill-over of research carried out by universities into the private sector. Using patent data, he found that academic research in the fields of biotech, electronics, and optics was a significant source of innovation outputs among SMEs in the same geographical regions. Jaffe found that small enterprises in such areas as California's Silicon Valley and the Route 128 area around Boston benefit substantially from local university research at such institutions as Stanford and M.I.T. The presence of these university research centers, Jaffe concluded, increased local innovation both by attracting private firm R&D and by augmenting its productivity.

Audretsch and Vivarelli (Audrestch and Vivarelli 1994) studied innovation output (as reflected in patent citations) across fifteen Italian regions. They reported that while a significant share of inter-regional innovation output variance was due to formal R&D, there were also significant associations between aggregate regional innovation and levels of university research across regions. They also found that small firms (less than 100 workers in this study) benefited considerably more from external sources of new knowledge (including university research) than larger enterprises.

In a widely-cited study, Feldman (Feldman 1994) investigated the source of 3,241 commercially significant innovations introduced within thirteen U.S. manufacturing sectors in 1982. She found that in-house R&D was relatively more important for the large firms in her sample, while spill-overs from university research were far more important in generating innovative output of the smaller firms (less than 500 employees). Feldman calculated that small enterprises drew more than twice as much of their innovative input from university research as their larger counterparts did.

In a study of the sources of innovative input used by 204 SMEs engaged in the production of scientific instruments within New York State, MacPherson's (MacPherson 1997) survey and interview data revealed that those firms that combined in-house R&D with inputs from external specialists were considerably more successful in their product development efforts than those who relied exclusively on their own research and development programs. Interviews with the CEOs of the 129 innovative SMEs in the sample (that is, those firms that had introduced a new or improved product between 1989 and 1993), indicated that they typically combined ideas from in-house research with complementary knowledge from independent consultants, universities, and government research centers. By contrast, the non-innovators in MacPherson's study made considerably less use of knowledge spill-overs from external sources. In this study, innovative firms typically garnered inputs from external sources for the purpose of enhancing the marketability and/or commercial value of new products on their respective drawing boards, that is, at the later stages of the product innovation process.

Surveying 576 manufacturing enterprises in Great Britain, Love and Roper (Love and Roper 1999) identified network intensity as a strong predictor of the number of product innovation that these firms brought to full commercialization in 1995. They found that network intensity was inversely correlated with R&D outlays per worker and with technology transfer from parent companies to enterprise subsidiaries. Love and Roper's principal finding was that external knowledge spill-overs from networks served as an alternative or substitute source of innovation inputs. In other words, "in each case, investments in R&D, technology transfer and networking are acting as substitutes" such that those firms with low (or no) levels of R&D/intra-firm technology transfer had the highest network intensity-to-product innovation ratios" (Love and Roper 1999, p. 51).

Schmitz (Schmitz 2000) investigated local network cooperation within SME enterprise clusters located in Pakistan, India, Mexico, and Brazil. He reported that the variable intensity of network cooperation along both vertical (suppliers and customer) and horizontal (competitor) lines was associated with superior performance. Schmitz observed that the degree of network cooperation is not necessarily constant, that it tends to increase or decrease in response to major opportunities or crises. During periods when competitive pressures are mounting, cooperation along vertical

lines tended to increase substantially, as the entire production chain responded in a coordinated manner. On the other hand, across all four clusters, Schmitz found that horizontal cooperation (among competitors) was weaker than expected (p. 329).

The impact of network support upon the success of newly-founded businesses (measured by sales growth) was examined by Bruderl and Presiendorfer (Bruderl and Presiendorfer 1998) through retrospective interview data from the CEO/founders of 1,710 enterprises that had been established in Upper Bavaria in 1985 and 1986. Bruderl and Presiendorfer reported that the extent/frequency of weak network ties (that is, to associates rather than family members or other intimates) was cited by their subjects as a significant factor in enterprise growth success.

Chell and Baines (Chell and Baines 2000) analyzed data derived from questionnaires sent to 104 owner-managers of SMEs located in two British cities along with critical incident interviews conducted with 34 of these participants for the purpose of determining the extent to which networking enhanced the commercial growth of these small businesses. A full 71 percent of the subjects in this studied said that they had gathered important business information from their customers, while 57 percent of the participants recalled gathering information from other business owners-managers. In fact, the subjects with whom Chell and Baines spoke allowed that much of the knowledge gained from the latter came from exchanges with the owner-managers of competing enterprises, “suggesting a degree of cooperation and trust discordant with the idea of cut and thrust competitive behavior” (Chell and Baines 2000, p. 201). Chell and Baines then disaggregated their results by phases in an enterprise growth-orientation, dividing the SMEs into declining, plateau-ing, rejuvenating and expanding categories. On this basis, they found a much stronger association between CEO networking (frequency of contact with “weak tie” associates) in expanding enterprises than was present among businesses in plateau-ing or declining stages.

As noted in passing above, network knowledge spill-overs used as innovation inputs are believed to be geographically bounded to at least some extent. Many scholars have investigated innovation exchanges within regional or district-wide clusters of SMEs on the supposition that geographical proximity facilitates the transfer of tacit knowledge through informal channels.

Within this body of literature, Saxenian's (Saxenian 1990; Saxenian 1994) studies of SME semiconductor start-ups in Silicon Valley are among the most widely referenced works. Deriving her information through multiple data-gathering methods, Saxenian concluded that the concentration and the success of Silicon Valley information technology SMEs could not be completely explained by the availability of a skilled work force within that region. She found that complex networks consisting of research institutions (notably Stanford University) trade associations, local business organizations and a host of specialized consulting, marketing research, public relation and venture capitalists facilitated the transmission of innovative knowledge across individual agents, firms, and IT sub-sectors.

Saxenian stated that Silicon Valley semiconductor start-up activity occurred in two waves. The first wave took place as small pioneering IT firms freely exchanged personnel and collaborated with each other. Many of these entrepreneurial enterprises were commercially successful due to high rates of innovation that they achieved via network activities. Collectively, they unbundled production and adopted flexible design and manufacturing technologies: these firms were niche oriented within the industry-wide production chain: some focused on chip design alone, others

on fabrication processes, others on engineering and design services, and still others on fast turnaround manufacturing. But as these firms grew and became more bureaucratic, they responded to threat of competition from Japan/East Asia by investing in high-volume production lines and undertaking cost-cutting measures while neglecting network exchanges. As a consequence, they began to lose market share to Asian rivals. This characteristic of SMEs — shifting value definitions under competitive or policy pressures and losing network synergies — was also seen in the cases described in Chapters 6-8 of this thesis.

In the 1980s, however, Saxenian found there was a second wave of semiconductor start-up activity, as newly-founded small firms entered into formal alliances and networks partnerships with customers and suppliers to monitor changing markets and jointly redefine products and processes. These second-wave SMEs recaptured clustered network innovation competitive advantages. Writing in 1990, Saxenian (Saxenian 1990) asserted that the success of small enterprise start-ups was: “inseparable from a regional environment that is not only rich in skill and know-how, but one which fosters new firm formation and collective learning” (p. 95). In her 1994 follow-on to this work, Saxenian (Saxenian 1994) drew a sharp contrast between the success of small semiconductor start-up firms in Silicon Valley and the decline of the IT industry firms in the Route 128 region around Boston. The latter had initially benefited from M.I.T. knowledge spill-overs and the availability of a high-skill labor pool, but as these firms grew and matured, they became increasingly isolated. Eventually, their failure to generate collective knowledge through networks and alliances led to declining innovation and competitiveness.

Revisiting semiconductor innovation clusters in their 1997 study, Almeida and Kogut (Almeida and Kogut 1997) compared the innovation-related patenting activity of 176 small and large enterprises. Their analysis suggested that small firms are linked to regional knowledge networks to a much greater extent than large firms, and that the SMEs in their sample acquired knowledge and diffused innovations within regional clusters. By contrast, the larger enterprise in the study had stronger network ties outside of their respective regions, notably to Japan. Elaborating on this point, the researchers noted that, “the cooperative pattern in the U.S. (semi-conductor industry) shows...a dense national small firm network, with larger firms bridging nations” (pp. 29-30). A key driver of SME innovation, according to Almeida and Kogut (Almeida and Kogut 1997), was the knowledge brought to start-up firms by their founders, gained, in large measure, from their activities in IT firms located within the same regions; indeed, 88 percent of the 176 semiconductor firm founders in this study were employed in the same region prior to the formation of their respective start-ups. Among the reasons for the success of small firm start-ups was that they had gained initial funding from venture capital firms to explore new fields. Partially as a consequence, small firms tended to innovate in less concentrated areas of technology, pursuing deep niche strategies while larger firms focused their attention on crowded fields of innovative activity.

Prevezer (Prevezer 1997) examined clustering behavior among small- and medium-sized biotech enterprises in the San Francisco Bay area. He found that SMEs in the areas of therapeutics, diagnostics, and equipment/research tools formed intense innovation networks, while those involved in chemical, food, and agricultural products sub-sectors engaged in much less networking activity. Clustering patterns among the biotech firms that Prevezer analyzed were organized around universities and research hospitals. Unlike the IT industry, the biotech SMEs in

this study were attracted by other small and medium sized companies utilizing the same broad knowledge base, but they were repelled by the proximity of direct competitors.

In Schmitz's (Schmitz 2000) estimation, the wave of research into non-tech industry networks or clusters that began in the 1990s was triggered by the export success of Italy's industrial districts (p. 325). In an early study in this setting, Camagni (Camagni 1991) explored clusters within Italy's textile district. Unlike the IT and biotech clusters of the United States, textile production by SMEs in this region had been in continuous operation for centuries. In Camagni's analysis, the key to the success of these SMEs was the existence of a local milieu held together by personal/family relationships, district-specific culture, and a collective learning tradition that extended back for generations.

In his study of core Italian industrial regions during the 1980s, Antonelli (Antonelli 1994) found that the clustering of SMEs with complementary research and development activities led to the emergence of geographically-bounded technology districts. Individual firms within these districts benefited enormously from the R&D activities of other firms within their network clusters. External knowledge spill-overs, in turn, were strongly associated with increases in total factor productivity levels among participating firms with comparatively small investments of in-house R&D. Antonelli (Antonelli 1994) concluded that, "intra-mural R&D activities carried out by each firm generate a flow of technological, learning, and training opportunities that are spread throughout the regional environment and benefit the firms that are localized in the region" (p. 28).

Piergiovanni, et al., (Piergiovanni, Santarelli et al. 1997) used patent citations across 20 Italian regions over the period 1978 through 1986 along with a literature-based counting procedure of innovations reported during the year 1989 to determine the degree to which university and corporate R&D knowledge spilled over to SMEs at the regional level. Their results indicated that small firms had substantially greater reliance upon spill-overs from third-part private and university research as a source of innovation inputs than large enterprises, while the latter depended to a much greater extent upon internal research and development programs. For both the small and large firms in their study sample, Piergiovanni, et al. found that in-house R&D had a positive effect upon product and process innovation, but university research was a significant innovation input only for the smaller enterprises in the sample. The SMEs also drew heavily upon innovations from firms located within their respective regions but working outside of their specific industries. The researchers commented that the capacity of Italian manufacturing SMEs to utilize externally-generated knowledge was, at least partially, a function of their existing complementary knowledge. Indeed, Piergiovanni, et al. asserted that many of the SMEs in their study engaged in research and development for the primary purpose of improving their capacity to assimilate and exploit externally developed technological knowledge.

The results of their study of innovation in Swiss manufacturing firms led Arvantis and Hollenstein (Arvantis and Hollenstein 1996) to conclude that extensive participation in external networks had a powerful positive impact upon their innovation capacity. This network effect was observed for both small and large enterprises, but it was substantially stronger among the small firms in the study. Maillat, Lecoq, Nemeti, and Pfister (Maillat, Lecoq et al. 1995) traced the recent evolution of the Swiss Jura Arc region as a local system of production and innovation linked to the development of new technologies. During the 1970's, Maillat, et al. (Maillat, Lecoq

et al. 1995) stated, the region's small-scale producers of watches, measuring instruments, and optical devices broke up pre-existing innovation networks based on conventional micro-engineering and formed new configurations based upon micro-electronic technologies. According to the researchers, the cooperation and trust that these SMEs developed prior to the 1970s facilitated their recombination into new alliances. The participants in these networks steadfastly resisted all formal contracts in favor of handshake agreements based upon tacit understandings and values that were deeply embedded in the established legacy of their common milieu. The new network ties formed to exploit advanced technologies enriched the milieu since, “the learning processes they engender(ed) contribute(d) to the increase in the creative capabilities of the milieu” (Maillat, Lecoq et al. 1995, p. 261).

The association between the adoption of a new production technology by plant managers and attributes of the local environments in Great Britain was investigated by Harrison, Kelley and Gant (Harrison, Kelley et al. 1996). From the responses of 962 managers at manufacturing plants participating in 21 industries within the machining-intensive durable goods sector, the researchers learned that 52 percent had adopted at least one machine tool that was numerically controlled, computer numerically controlled or a component of a flexible machining system. Harrison, et al., (Harrison, Kelley et al. 1996) found that the probability of technological adoption was significantly greater in localities that displayed a high degree of urbanity, that is, location in a metropolitan (as opposed to non-metropolitan) setting and a suburban (as opposed to downtown urban or a rural) community. Most importantly, they found a strong correlation between technological adoption, on the one hand, and the degree of industry diversity within the plant's immediate environment, on the other. On the other hand, Harrison and his co-authors found no support for the hypothesis that industry specialization within a locality is associated with manufacturing technology adoption.

Audretsch (Audretsch 2002) noted that there is an unresolved debate between those scholars who claim that innovation-related knowledge spill-overs is stronger within regions that have a high degree of specialization and those who maintain that diversity or complementary knowledge facilitates technology transfers within geographic clusters. Audretsch (Audretsch 1995) himself has argued that when information from outside an industry is relatively important as an input to innovative activity, newly-established firms tend to have a competitive advantage vis-à-vis incumbent firms; this association tends to lend indirect support to the “diversity” or “complementary knowledge” position. Along with Feldman (Feldman and Audretsch 1999), Audretsch tested the relative predictive power of the specialization and diversity hypotheses. Using patent citation data from innovation clusters across the United States, Feldman and Audretsch found when a given region has higher levels of industry diversity, external knowledge spill-over is substantially greater than when a region is dominated by a single industry. They concluded that, “that diversity across complementary industries sharing a common base—a crucial qualification—results in greater returns to R&D” (p. 427), and that this, in turn, promotes innovative effort.

The diversity argument is congruent with Shane's (Shane 2000) findings on how entrepreneurs discover technologically-based commercial opportunities. Through a set of eight in-depth case studies, Shane found that all of the entrepreneurs who used an innovation developed at M.I.T. (a 3-D photography process) had some background knowledge that allowed them to recognize a viable product opportunity. None of the eight entrepreneurs (all of whom founded small

companies on the basis of the M.I.T. process) had a background in the specific field (optical technology) of the original invention. Instead, each of them possessed complementary knowledge in such areas as cartographic displays, that they combined with the M.I.T. process to recognize and exploit diverse commercial opportunities. The innovation process, Shane asserted, hinged upon recognition, rather than an active search for information. The findings of this study imply that innovations are more likely to arise among agents who have diverse pre-existing knowledge. However, there is an emerging creation theory of innovation promulgated by Alvarez and Barney (Alvarez and Barney 2007) that promotes the idea that not only is recognition or discovery an important determinate but that the path, process, and intention allow for creation of innovation.

Several studies published over the past fifteen years qualify the empirical generalization that SMEs in rapidly growing industries derive above-mean innovation benefits from their participation in geographically-clustered networks. Rogers (Rogers 2004) investigated the impact of networking through the analysis of data collected from 4,500 Australian enterprises between 1994 and 1997. Consistent with the research reported thus far in this section, he found that networking intensity was associated with higher rates of innovation across all of the enterprises in the study. He also reported that small enterprises rely upon external knowledge networks as a source of innovation inputs to a far greater extent than do large enterprises. However, the association between network activity and innovation in *non-manufacturing* sectors was observed only among large and medium-sized enterprise; among *non-manufacturing* enterprises there was no statistically significant association between network intensity and innovation for small enterprises.

Karlsson and Olsson (Karlsson and Olsson 1998) studied the early adoption of advanced process innovations within a sample of 270 machinery, electrical, and instrument manufacturing enterprises located within three Swedish counties. In this study, enterprises with 10 to 50 workers were classified as small firms while those with more than 50 employees were classified as large firms. Using this cut-off point, Karlsson and Olsson found that that university research and exchanges with customers served as important channels of information that had a positive effect on the adoption of technologically-advanced manufacturing firms for the large firms in the sample, but not for the small enterprises. Indeed, among the small firms, location in a rural county with no major university was associated with a higher likelihood of early process innovation adoption.

Results presented in Keeble's (Keeble 1999) study of 598 manufacturing and service British SMEs presented a somewhat strong challenge to the regional or local network hypothesis. Using data collected between 1990 and 1995, Keeble found that SMEs located in the network rich, South East core region of Great Britain grew faster and reported more innovations than firms located in Britain's peripheral regions. Nevertheless, SMEs located in those peripheral areas had a much better record of *continuing* innovations and substantially higher R&D intensity ratios. On this second count, Keeble (Keeble 1999) speculated that SMEs located outside of core technology-rich regions may try to compensate for, "environmental handicaps by pro-active engagement in research and development to an even greater degree than their counterparts in core regions" (p. 289). He also noted that SMEs located in core regions experienced substantial higher closure rates than those in peripheral regions, that innovations were steadier and more consistent across years among the latter, and that peripheral SMEs tended toward process

innovations that enabled them to compete on the bases of rapid service and lower price/cost advantages, while those in core regions focused on niche markets and advances in product design.

In a study of 330 SMEs located in rural areas of Great Britain, responses from CEOs to a mail survey indicated that these enterprises do not necessarily require participation in a local network to achieve high rates of innovation (North and Smallbone 2000). The CEOs of these firms stated that location in a relatively remote region was not a major constraint on the innovation capacity of their firms and that a relative lack of spill-overs from local enterprises had not exerted a significant influence on their development of process and product improvement performance. Two-thirds of North and Smallbone's (North and Smallbone 2000) sample disclosed that they relied principally upon in-house research and development and that their external innovation inputs were derived from suppliers and customers outside of the region that were accessed through advanced telecommunications channels. The most innovative enterprises, North and Smallbone's added, had made significant contributions to their local communities despite the absence of spill-over clustering. Within the study sample, the most innovative enterprises added a mean of eight jobs to their payrolls between 1991 and 1996; during the same time period, firms judged to be moderately innovative augmented their respective work forces by a mean of four positions, while the least innovative entities reported no net employment growth.

Within two South Korean regions that Hassink (Hassink 2001) investigated, SMEs were not deeply embedded in local innovation networks. In both the labor-intensive enterprises of Kyongbuk-Taegu province and the high-tech firms of the Kyonggi region, external innovation inputs were derived principally from long-reach vertical production networks, from suppliers and customers located in other regions of Korea and/or outside of the country altogether, most notably in Japan. From his interviews with 38 government and academic experts working in programs aimed at developing SME innovation capacity in these two regions, Hassink learned that the contribution of local SME innovation networks was comparatively minor. Study participants reported that rather than an autonomous, grassroots network, South Korea's industrial conglomerates (*chaebols*) essentially determined the location of government-designated SME industrial districts and the functions of the SMEs within them, leading the researcher to conclude that, "the strong growth of these districts is thus almost entirely exogenously, rather than endogenously, generated" (p. 1384).

In a study of 228 small (less than 250 worker) West Midland manufacturing enterprises, Freel (Freel 2000) also found that local networks were of marginal importance for innovation activity. Although a higher proportion (21.1 percent) of the innovative firms in this study reported contact with university research agencies between 1994 and 1996, exceeding the non-innovators (13.2 percent) on this count, the bulk of the external knowledge spill-over effects among the innovators were with extra-regional and international entities, notably suppliers and customers. In addition, Freel reported low levels of cooperative activity among SME competitors. Only 14.1 percent of the innovator firms and 9.3 percent of the non-innovators engaged in any form of joint venture with firms in the same industry.

Madill, Haines, and Riding (Madill, Haines et al. 2004) received responses to a postal questionnaire from the CEOs of 111 technology and 75 non-technology SMEs located within the Ottawa region. Contrary to findings appearing in several other studies, the technology industry

enterprises in this sample had fewer linkages to firms within the Ottawa cluster than did the non-technology industry SMEs, and the latter valued network participation as a source of innovation spill-overs to a greater extent than the former. Madill and his colleagues explained this result by speculating that the technology firms may have experienced difficulty in finding qualified peers within the regional environment.

Contrary to the association between innovation and job creation reported by North and Smallbone (North and Smallbone 2000), Kalantaridis and Pheby's (Kalantaridis and Pheby 1998) study of SMEs in the Bedfordshire region of Great Britain found an inverse correlation between these variables. In a region that the researchers characterized as having low levels of innovation activity, the size-adjusted job creation rates of non-innovative enterprises in the study were on average twice as high as those of the innovative firms during the period 1990 to 1996. This finding prompted Kalantaridis and Pheby (Kalantaridis and Pheby 1998) to assert that government programs to enhance the innovative propensity of SMEs would not necessarily reduce unemployment rates in backward regions.

From the results of the empirical studies of SME innovation networks reported above, we can reasonably surmise that small and medium-sized enterprises can overcome comparatively low levels of internal research and development intensities by drawing upon knowledge spill-overs from external parties, including universities, independent consultants, customers, suppliers and other SMEs. The innovation capacity of SMEs that participate in network activity *can* be enhanced by exchanges of tacit knowledge communicated on a face-to-face basis among geographically clustered entities. Complementary knowledge shared by firms across narrowly-defined industries does appear to drive entrepreneurial innovation, and this is particularly true of SMEs operating in high-technology sectors.

Innovation networks can come together in a fairly short period of time (as in the case of Silicon Valley's semiconductor industry or the San Francisco Bay's biotechnology cluster), and grow rapidly thereafter through firm start-ups. Alternatively, regional SME innovation clusters may have been grounded in associations that extend decades or even centuries into the past, as in the Italian and Swiss industrial districts, with the cooperative norms of the local milieu enabling participants to respond to opportunities and challenges arising from ongoing technological advances. On the other hand, SMEs located within peripheral regions are able to utilize linkages to entities outside of their respective regions to acquire external innovation inputs and at least some have successfully innovated through in-house research and development activities. Moreover, non-technology SMEs can attain high rates of innovation by taking part in geographically-bounded networks.

The strength and the knowledge spill-over capacity of SME innovation networks appears to be influenced by business environment and business norm variables; it appears to be highest within industries that are either extremely competitive or participants in clusters that have a tradition of cooperation along horizontal lines. Government policies and programs can facilitate the emergence of regional innovation systems, notably through the extension of academic research programs into local settings, but they can also suppress their emergence through policies aimed at developing national and international production chains. Under the appropriate conditions SMEs can become an integral part of globalization processes either through their individual activities or through collective forms (Manring and Moore 2004). As we shall see in the next

section of this literature review, the scope of SME activities and effects has grown beyond local and national markets as a considerable portion of small and medium-sized enterprises continue to undergo internationalization. However, as the literature has shown, there remains a strong case for innovation synergies for SMEs within geographical or specialized niche-based networks that may not translate internationally. The reasons for this are not yet clear.

2.1.4. SME Internationalization, Innovation and Cross-Border Alliances

Globalization processes and their underlying determinants (world-wide digital information systems, reduced barriers to trade and direct investment, and the like) have clearly contributed to an expansion in the scope of SME activities and their effects during the past two decades. While most SMEs are not as international in their orientation as the large, multinational enterprises (MNEs) that continue to dominate cross-border flows, there can be no doubt that small and medium-sized enterprises are increasing their rate of participation in overseas markets (Lu and Beamish 2001).

In many instances, clusters of SMEs have arisen in response to MNE factor cost reduction efforts, as multinationals out-source intermediate input manufacturing and assembly work to developing economies for the purpose of exploiting low-wage labor pools. In other cases, however, SMEs have arisen or grown to service global markets outside of MNE-dominated production chains. There appears to be a strong association between SME innovation capacity, on the one hand, and degree of internationalization, on the other. The thrust of SME internationalization processes has occurred through exports, as opposed to the deeper involvement entailed in direct investment (Chen and Huang 2004). Nevertheless, at least some SMEs have established overseas production subsidiaries, with a preponderance of these enterprises pursuing deep niche strategies aimed at narrowly-defined but highly lucrative markets in host economies (Kohn 1997). Several studies have shown that SMEs are able to overcome the competitive disadvantages inherent in their size by working through cooperative networks grounded in their own regions/nations and through an extension of these networks into fluid international alliances (Piscitellio and Sgobbi 2004).

Empirical studies have demonstrated that innovation capacity can serve as the cutting edge of SME internationalization. There is a very strong association between an SME's innovativeness and its propensity to export, which implies that the internationalization of SMEs may occur on the basis of high value-added activities rather than as an artifact of labor cost advantages.

Most studies have shown a direct correlation between firm size and propensity to export. Dividing a sample of more than 7,000 West German manufacturing firms located in Lower Saxony into small (less than 50 workers), medium (51 to 250 workers), and large (more than 250 employees), Wagner (Wagner 1995) found that the probability of export activities was, indeed, strongly correlated with enterprise size. In this study, 30 percent of the small, 59 percent of the medium-sized, and 84 percent of the large enterprise sold a portion of their products into foreign markets between 1978 and 1989. Nevertheless, Wagner noted that many of the most successful exporters in his sample were small enterprises and, within this study group, propensity to export was positively influenced by human capital intensity, domestic market share, and the use of advanced production technology.

Small enterprises with above-mean labor skill profiles that participated in niche domestic markets and that dedicated a high share of their capital expenditures to the purchase of modern production equipment were far more likely to export than small firms lacking these attributes. Wagner (Wagner 1995) also observed that the apparent export advantage of large firms in this sample may have been partially an artifact of exports contributing to employment growth; that is, some of the medium and large firms in his sample appear to have been small firms that grew in size as a consequence of their success in overseas markets.

Lefebvre, Lefebvre and Bourgault's (Lefebvre, Lefebvre et al. 1998) study of 236 Canadian SMEs yielded a robust association between export success and the translation of knowledge spill-overs from local networks (including university, customers, suppliers and competitors) into product innovations. Unambiguously, those firms that continuously explored new product opportunities through collaborative research and development and that had stronger links with external sources of innovation spill-over had a correspondingly stronger presence in global markets. Lefebvre, et al. concluded that in the view of the SME CEOs who took part in their study, "an increased presence in global markets requires more proactive, aggressive and externally-oriented R&D related capabilities" (p. 374). The responses of the subjects to Lefebvre, et al.'s questionnaire suggested a bi-directional relationship between innovation network participation and export performance: product innovation driven by network knowledge spill-overs allowed SMEs to participate in foreign markets; overseas activities enabled enterprises to expand the number, diversity, and geographic range of their innovation-knowledge networks.

Sterlacchini (Sterlacchini 1999) conducted interviews with the CEOs 143 small (less than 200 workers) Italian manufacturing firms in six industries (clothing, knitwear, wood and furniture, footwear, plastic products and dies), all of which had below mean R&D intensities. Within this sample, the salient source of product and process innovation was not formal research and development activities, but, instead, incremental changes in product design, production engineering, and pre-production development. The strongest determinant of export intensity (overseas sales as a percentage of total sales) was enterprise status as a sub-contractor to Italian MNEs. Nonetheless, export performance was positively and significantly influenced by the intensity of expenditures on design, engineering, trial production and, more modestly, to the innovative content of enterprise capital stock.

After noting that an extraordinarily high 97 percent of Taiwan's manufacturing output is generated by SMEs, Yang, Chen and Chuang (Yang, Chen et al. 2004) reported significant correlations among firm size, R&D intensity and propensity to export for manufacturers of textiles and consumer electronic products. In fact, virtually all of the firms in this study were SMEs. The mean size Yang, et al.'s "R&D intensive" group was 136 full-time employees (FTEs), while that of the "non R&D" group was 45 FTEs. Within Yang, et al.'s sample as a whole, firm size was positively associated with propensity to export. More importantly, Yang and his colleagues found that high technological capability embodied in firms (as measured by R&D technology import and training investment) was a consistent predictor of export performance. Those enterprises that devoted an above mean proportion of their budgets to the purchase of high-tech production equipment and to the training of their respective workers in its usage (the R&D group) were much more likely to sell a portion of their products abroad than

those categorized by the researchers as non-R &D entities: 78.3 percent of the R&D firms engaged in export activities as opposed to 40.8 percent of the non-R&D enterprises.

Among others, Gomes-Casseres (Gomes-Casseres 1997) has reported that in SMEs often utilize joint ventures and other types of alliances to increase their competitiveness in global markets. In an in-depth study of seven small U.S. computer-technology firms, Gomes-Casseres found that when firms are small relative to their rivals, they use alliances to gain the economies of scale and scope needed to participate in international markets, but when they are large in *relative* terms, they tend to avoid alliances. The alliance behavior of SMEs in high-tech industries that compete internationally, then, may be influenced by the capacity of individual enterprises to pursue deep niche marketing strategies both at home and abroad.

The use of domestically-based cooperative networks by small and medium-sized Italian clothing manufacturers to grow export sales was investigated by Berra, Piatti and Vitali (Berra, Platti et al. 1995). In contrast to a pattern of establishing wholly-owned subsidiaries abroad common to Italian MNEs in this industry, the SMEs in this study organized their international efforts in accordance with the same network model that they used in Italy. Through cooperative strategies of joint ventures, commercial and distribution agreements, manufacturing licensing, long-term subcontracts with a broad range of overseas partners, the SMEs in Berra, et al.'s study built rich, diverse networks across national borders akin to those in their home regions. They focused principally on developing contacts with SMEs alliance partners in “niche and rich” markets. Within this sample, for example, roughly half of all SME agreements were aimed at penetrating or growing within the Japanese market for high-end men's clothing.

From the responses of 156 Taiwanese SMEs in four industry sectors, Chen and Huang (Chen and Huang 2004) developed a typology of four generic types of cooperative arrangements that they may use to jointly exploit overseas markets: (1) establishment of upstream and downstream joint after-sales service centers; (2) establishment of joint distribution warehouses; (3) development of products with regional characteristics, and (4) building of joint domestic and global distribution channels. The vast majority of the CEOs of these companies were enthusiastic about export opportunities, but a majority also indicated that they had a low level of confidence in the capacity of their firms to enter overseas markets independently. On the other hand, those with the highest degree of confidence in their own ability also displayed a significantly greater propensity to enter into strategic export alliances with other Taiwanese SMEs.

From his examination of UNCTAD data, Buckley (Buckley 1997) reported that SMEs tend to avoid foreign direct investment as a means for capitalizing upon the process and product innovations that they develop. As a rule, Buckley noted, small and medium-sized enterprises evince a strong preference for non-equity technology transfer through patents and licensing agreements as opposed to wholly-owned or joint venture. While MNEs establish foreign subsidiaries throughout the world (including developing economies), SMEs from advanced countries tend to concentrate their investments in other industrialized nations, typically in host countries that are either adjacent to or in close proximity to SME home economies, as in the case of joint ventures between U.S. and Canadian firms. From his own survey of U.S. SMEs, Buckley concluded that invest abroad for essentially the same reasons market-seeking, resource-seeking and cost-efficiency reasons that motivate MNEs.

Lu and Beamish (Lu and Beamish 2001) investigated the impact of export activities, foreign direct investment, and cross-border alliances upon the financial performance of 164 Japanese SMEs (less than 500 workers) between 1989 and 1996. All of the enterprises in this sample engaged in export to some extent, while more than half (95) reported having initiated one or more FDI projects during the period for which data was collected. The researchers found that the initial impact of FDI was a decline in profitability, but that over time (and with additional resource transfers); foreign direct investment had a positive contribution to enterprise profitability. Oddly, Lu and Beamish found that exporting (figured as a percentage of total sales) had a *negative* impact upon enterprise financial performance over the temporal period encompassed in the study. The researchers argued that this unexpected result may have been an artifact the inordinate strength of the yen in the early 1990s. After adjusting for the impact of unfavorable exchange rates, Lu and Beamish found that higher export intensity was positively associated with firm profitability. Interviews with SME CEOs underscored the importance of alliances with partners that have local knowledge of overseas markets for the commercial success of both exports and FDI projects. They found that having an alliance with a firm in the host/target market country was a far more successful approach to gaining critical local knowledge than was alliances among Japanese SMEs or alliances with firms from third country that had acquired some knowledge of host/target market environments (Lu and Beamish 2001).

As Turpin (Turpin 2002) has argued, SMEs are believed to perform a crucial role in the diffusion of technology and know-how within their home societies. These spill-over effects are said to take place through a variety of channels, including the dissemination of technology and related skills developed by the SMEs themselves, the unbundling of technologies embodied in capital goods imports, and in-house training of employees through either formal programs or through on-the-job, “learning by doing” modalities.

The presence, extent, and impact of these technology diffusion processes are exceedingly difficult to document and gauge. We do know that MNEs conduct the bulk of their formal R&D activities within their home economies; according to U.S. Office of Technology Assessment (United States. Congress. Office of Technology Assessment. 1994), 87 percent of the all R&D expenditures by U.S. MNEs are attributable to work conducted in the United States. When U.S. multinationals establish R&D facilities abroad, they tend to concentrate upon customizing products for local markets or meeting foreign government local content import requirements (United States. Congress. Office of Technology Assessment. 1994, p. 76). As Eden, Levitas and Martinez (Eden, Levitas et al. 1997), the bulk of all direct technology transfers from U.S. nationals to foreign economies occur in-house, that is, to their wholly-owned subsidiaries

Blomstrom and Sjöholm (Blomstrom and Sjöholm 1999) investigated whether technology spill-overs from MNEs increase when they utilize local partners (in this study, one or more Indonesian SMEs). Although Blomstrom and Sjöholm were able to determine that intra-industries spill-overs do exist among Indonesian enterprises and that they have a positive impact upon Indonesian manufacturing performance, they found no firm evidence of direct technology transfer spill-overs from MNEs through local Indonesian partners into the Indonesian economy. The only spill-over effect that these researchers were able to observe was that joint ventures between U.S. MNEs and Indonesian firms exerted competitive pressure on other Indonesian enterprise to increase their production efficiency by restructuring and/or increased purchase of advanced capital goods from abroad.

Based on UNCTAD data, Buckley (Buckley 1997) found that small and medium-sized multinational corporations do transfer technology to their overseas subsidiaries (as is the dominant pattern for large MNEs). More commonly than is the case for MNEs, multinational SMEs convey technology and know how to joint ventures with local partners in host economies. The most important forms of technology transfer, Buckley noted from his own survey of small and medium-sized U.S. transnational enterprises, are on-the-job training and transfer of machinery/parts that embody new technologies. Expenditures on the formal training of local work forces by small and medium-sized multinational corporations were exceedingly low. On the basis of his analysis, Buckley concluded that SMEs will not, in the aggregate, be major suppliers or conduits for the diffusion of technology in the global economy, but that they may play key niche roles.

In their study of Singapore SME suppliers to foreign transnational corporations, Chew and Yeung (Chew and Yeung 2001) argued that the flow of technological innovation is actually bi-directional. From the results of a postal survey with 41 Singapore SMEs that serve as suppliers to MNEs and interviews with a subset of 9 of their CEOs, Chew and Yeung presented evidence of reverse knowledge transfer, that is, Singapore firms conveyed critical information about local technical specifications, standards, management style and culture to their MNE partners abroad. Moreover, several of Chew and Yeung's informants stated that their enterprises engaged in the modification of product designs to enhance marketability in the East Asian region. Rather than being dependent upon MNE customers, Chew and Yeung asserted that SMEs engage in a joint development role with large multinational corporations, which enhances the competitive performance of the latter in overseas markets.

What we find, then, is that a significant proportion of SMEs are undergoing internationalization through the inauguration or expansion of export and (to a much lesser extent) foreign direct investment activities. There is a strong linkage between SME innovation capacity, on the one hand, and SME export propensity/intensity, on the other. Although a few SMEs are able to compete independently abroad by pursuing focused niche strategies targeted at lucrative markets, many more utilize their local networks connections to overcome the risks associated with participation in foreign markets. SMEs may also extend their penetration into foreign markets through alliances with local partners, replicating the networking model that they rely upon within their own economies. Some SMEs have established production operations abroad; these are almost invariably joint ventures with local partners rather than wholly-owned subsidiaries. It is extraordinarily difficult to document the cross-border technology diffusion role attributed to SMEs. Small and medium-sized businesses do transfer technology via licensing agreement to firms abroad, but the role of SME multinationals in technological diffusion to host countries appears to be modest, at best.

2.2.3 Flexibility, Information Technology, Collective Learning and Social Capital

Most scholars would concur with Chen and Hambrick (Chen and Huang 2004) that competitive actions and responses differ by enterprise size, and that SMEs rely upon their superior flexibility and speed to initiate and/or counteract competitive challenges. Thus, for example, based upon a statistical analysis of business formations/closures in U.S. manufacturing industries covering the period 1977 through 1987, Dean, et al. (Dean, Brown et al. 1998) wrote that, “the results suggest

that small businesses are adept at pursuing strategies built upon the strengths of speed, flexibility, and niche-filling capabilities” (p. 724). They then added that, “the possession of these traits is often accepted as a given, but empirical research in this area is extremely limited” (Dean, Brown et al. 1998, p. 724).

The evidence that Dean and his colleagues drew upon in arriving at this finding is, however, inferential. It is highly plausible that SMEs are capable of greater flexibility than their larger rivals. Their owners have closer knowledge of enterprise capabilities than do top executives at large firms; their organizational structures are flatter than those of their larger rivals; in at least some instance, SMEs appear to have organizational cultures that support collective learning rather than top-down control. Although the researcher has not encountered any empirical studies dedicated to the use of flexible manufacturing systems by SMEs, both Gupta and Cawthorn (Gupta and Cawthorn 1996) and Levy and Powell (1998) have asserted that a high proportion of U.S. and Western European SMEs have adopted production systems that allow them to efficiently produce small batch runs and customize their offerings to meet variable consumer preferences. At bottom, both strategic and technical flexibility is inordinately difficult to measure.

Advances in information technology, most notably the Internet, have greatly lowered barriers to long-distancing marketing and environmental scanning that had previously put SMEs at a competitive disadvantage relative to larger enterprises. Recently, some empirical studies have been focused on SME adoption of information technology and its capacity to magnify the purported flexibility advantages of small and medium-sized enterprises.

Levy and Powell (Levy and Powell 1998) conducted a set of in-depth case studies at four manufacturing SMEs located in the West Midlands region of the United Kingdom that had recently made major investments in information technology. They noted in passing that two of these firms continued to work with obsolete machinery (dating back to World War II), and that neither of these enterprises planned modernize their production systems due to the costs entailed in purchasing computer-assisted capital goods. All of the enterprises in the study used their IT systems to enhance stock management and to increase the rapidity with which they filled orders, yet none of them had, “realized the potential of connecting this data to overall strategies and competitive analysis” (Levy and Powell 1998, p. 188). More specifically, none of the four concerns used their IT capabilities to identify or attract new customers; instead, they tended to use their systems to meet the demands of their existing customers for speed in order delivery and for quality control certification. Levy and Powell concluded that these, “case studies indicate that SMEs do not readily confirm to the received wisdom that they are particularly flexible or adaptable” (Levy and Powell 1998, p. 192). Rather than moving rapidly to capture the competitive advantages latent within IT usage, they acted cautiously. They added to their information systems incrementally, and this, in turn, resulted in their accumulation of a number of incompatible systems that were difficult to network.

A similar impression of managerial hesitance emerges from Sadowski, Maitland and van Dongen (Sadowski, Maitland et al. 2002) exploratory study of the strategic use of the Internet by 264 Dutch manufacturing and service SMEs. After noting that the availability of the Internet makes possible new strategic opportunities with customers and business partners, Sadowski and his colleagues reported that of the 264 enterprises in their sample, most (198) had an on-site

connection to the Internet, but only 94 had established their own websites. Moreover, of those 94, only 39 enterprises had developed the capacity to sell products/services on-line. "Whereas it is established that Internet usage provides strategic advantages," Sadowski, et al. remarked, "only a small fraction of SMEs (in their study) intend to draw on these gains" (Sadowski, Maitland et al. 2002, p. 89). Instead, they too had adopted a wait-and-see stance, allowing their larger rivals to gain strategic advantages during the interim.

The twelve entrepreneur/owners of textile industry SMEs textile located in Italy's Prato region with whom Piscitellio and Sgobbi (Piscitellio and Sgobbi 2004) spoke made considerably greater use of the e-commerce capabilities of the Internet. In contrast to the participants in the British and Dutch studies summarized directly above, Piscitellio and Sgobbi (Piscitellio and Sgobbi 2004) informants were far more enthusiastic about the capacity of the Internet to extend the scope of their marketing activities and to induce collective learning in their respective workforces. Nevertheless, the subjects in this study used the Internet primarily as an alternative marketing channel, to solicit sales agents in Italy and in foreign markets, and to take orders for customized goods. They continued to rely upon face-to-face contact with local suppliers, and they were extremely averse to integrating their operations with overseas joint venture partners who lacked the tacit knowledge base that these entrepreneurs valued. While there were variations in the extent to which subjects had embraced e-business, the researchers disclosed their, "conviction... that isolated actions will not foster significant collective learning and growth, possible compromising competitiveness in the long run" (Piscitellio and Sgobbi 2004, p. 345). In lieu of direct measures of enterprise flexibility, these studies of IT adoption by West European SMEs certainly challenge the widespread notion that small- and medium-sized enterprises move rapidly to capitalize on competitive strategic opportunities and challenges.

As with flexibility, the claim that SMEs enjoy greater collective learning than their larger counterparts is intuitively appealing, but difficult to test. In one of the few studies undertaken in this topical domain, Chaston, Badger and Sadler-Smith (Chaston, Badger et al. 2001) surveyed 179 U.K. manufacturing SMEs (10 to 50 workers) to determine whether entrepreneurial firms used higher-order (double loop) learning to a greater extent than non-entrepreneurial firms. Chaston, et al. distinguished between entrepreneurial and non-entrepreneurial enterprises on the basis of scorecard ratings from CEO responses to items on their respective firms' innovation, risk-taking, and proactive behavior records. On that basis, 92 enterprises were classified by the researchers as being entrepreneurial, and the remaining 87 as being non-entrepreneurial. They then defined "lower-order" or "single-loop" learning as the capacity to apply existing knowledge and experience as the basis for improving the efficiency of current operations in contradistinction to "high-order" or "double-loop" learning as the capacity to exploit new knowledge to evolve new practices, perspectives and operational frameworks. The study's results indicated that entrepreneurial enterprises engaged in and benefited from "higher order" learning and that this learning took place on a collective (enterprise-wide) basis. This speaks to both discovery and creation mechanisms of entrepreneurship and innovation as factors in double loop learning.

Finally, the assertion that SMEs contribute to the "common good" through civic engagement and the development of "social capital" has not been tested extensively (Curran, Rutherford et al. 2000). In a study of 400 owners of service and manufacturing SMEs located in five British cities, Curran and Blackburn (1994) found that 40 percent did not belong to any local associations. Indeed, these researchers highlighted their subjects' "fortress enterprise mentality," featuring "an

extreme reluctance to engage in any behavior which might lead to dependence on others or even to be seen as showing a need for others” (p. 172). Using a similar study design, Curran, Rutherford, and Blackburn (Curran, Rutherford et al. 2000) reported that SME owners were not, as a whole, deeply engaged in community affairs or local economic initiatives. By contrast, Joseph (Joseph 2000) reported that British SMEs played a vital role in local economic development and were, on the whole, positive examples of civic engagement behavior.

More recently, Spence and Schmidpeter (Spence and Schmidpeter 2003) compared the level of civic engagement and social capital development activities among British and German SME owner-managers. Their study drew together information gathered from interviews and observations at 30 food manufacturing, marketing services and garages located in West London and Munich which they illustrated in six ethnographic in-depth case studies. The German SME owners were far more likely than their British counterparts to belong to both local trade associations and civic improvement bodies. The researchers explained this difference by referring to the high degree of liberalism and individualism in British culture as opposed to the democratic social welfare norms prevalent in Germany.

Across sectors, the owners of businesses that drew their workforces from the local community (notably the food processing SMEs) displayed a higher degree of civic engagement than those whose workers lived in suburban communities (notably the marketing SMEs) within both the British and German groups. Nevertheless, a majority of both British and German SME owners engaged in at least some civic activities, including many that did not involve a business pay-off. The chief constraint on deeper engagement cited by the study participants was lack of available free time. Spence and Schmidpeter (Spence and Schmidpeter 2003) concluded that: “SME owner-managers are quite capable of being motivated (to engage in civic activities) by social and ethical reasons” (p. 106). The results of Spence and Schmidpeter's 2003 study suggest that cultural norms, the extent to which SMEs draw their labor from local markets and individual personality variables exert significant influences upon their variable levels of civic engagement.

Although we can justifiably assume that SMEs are more flexible than their larger rivals and that flexibility represents a competitive advantage for the former, the studies surveyed in this section suggest that the capital and human resources limitations they typically display constrain their capacity to leverage that flexibility. The handful of empirical investigations into the topic of IT adoption by small firms that have been published to date suggest that SME owner-managers may be reluctant to alter their reliance on face-to-face exchanges with external entities in their existing networks/production chains. This may be part of the reason that geographically bounded SMEs retain a high level speed in their innovation processes. At the same time, more innovative SMEs do generate higher-order collective learning effects, and while the extent of the degree to which they are embedded within local communities varies substantially, a considerable proportion of small and medium-sized enterprise are deeply engaged in the development of social capital outside of organizational boundaries. As will be seen in later chapters, as the pitfalls of globalization impact SMEs, local or regional SME networks that take advantage of local stakeholder synergies may find more sustainable success and opportunities to innovate because of the speedy nature of feedback loops in such networks. The importance and synergies of network formation and operations have not gone unnoticed by researchers who propose a focus on studying the interdependencies between business and society as a method to better understand the transition to more sustainable enterprise. Loorbach, et.al., presents a variety of

supporting evidence supporting the idea that “sustainability issues are too complex and interconnected to be solved by individual firms” (Loorbach, Whiteman et al. 2010). Loorback et al build on Gunderson and Holling’s findings (Gunderson and Holling 2002) that the interconnections and activities of networks and systems provide opportunities to build sustainable economies. This research implies that the workings of sustainability can be best understood only through the study and understanding of the behavior of firms within functioning networks of TBL interconnected stakeholders, which must include business, governments, and NGOs.

There is evidence that small, responsive and self-sufficient networks, linked together (initially locally or regionally and eventually, even globally) may produce enterprises that “think globally and act locally” through using effects first learned from understanding local boundaries. It is important therefore, to consider, albeit briefly, the perceived advantages that small firms gain when working in local economies to determine how local networks might be replicated and linked within a global context, to retain their local efficiencies and self sufficiency while exporting intellectual capital and created capacities.

2.3 Conditions that Could Support Long-term Value Creation in SME Networks

Since the action research cases presented in Chapters 5 through 7 of this thesis highlight the network structure in which SMEs work and how the networks contribute to value creation, an introduction to some aspects of network science and theory are needed to explain how the differences in network size, scope, and structure, influence SME behaviors and their successes and failures..

This section discusses concepts related to analyzing stakeholder networks and network behaviors as a tool in strategy planning. These findings show that network functions are as important as the products and services the companies provide. Consequently, understanding whether a SME’s value lags behind the network’s value (that is, the SME does not produce equitable value for other members in the network) or whether a SME can produce greater value by entering or creating a new network are important strategic considerations (Spence and Schmidpeter 2003; Wheeler, Mckague et al. 2005).

2.3.1 Introduction

Michael Schuman (Shuman 2006), a leading proponent of prioritizing local economic development and self-sufficiency above globalization,¹⁰ summarizes eight trends which support the growth of SMEs in local markets in the USA. If these trends are indicative of the advantages of small firms working in local or regional networks, then as communication within global networks becomes more efficient, SMEs should be able to recreate similar conditions in global as well as in local markets.

Presently, however, Shuman (Greenwald and Kahn 2005) focuses only on local networks as the primary environment for SMEs with the following trends:

¹⁰ Shuman’s work is in my opinion builds on the work of Schumacher (1973, *Small is Beautiful: Economics as if People Mattered*) and follows his ideas of “right sized” and “right livelihood” technologies and business for markets and economies.

1. *Inefficiencies of global-scale production*: “Managers perform more effectively when they know their markets intimately, master one or two products (services) and dominate their market niche” (p. 76).
2. *Inefficiencies of global distribution*: “Whenever the cost of production is low relative to distribution, there are economies of smaller scale that can be gained by linking local producers directly with nearby consumers (p. 76).
3. *Rising energy prices*: “Price hikes (energy) will make local production for local consumption relatively cheap. Oil price hikes will (make) suburban sprawl unaffordable. The rising cost of energy will lead to more aggressive conservation.” (pp. 78-79)
4. *Personalized services*: “In 1960 US consumers spent four of every ten personal consumption dollars on services, the rest on goods. In 1980, 48 percent of our consumer dollars went for services, in 1990, 55 percent; and in 2003, 59 percent. Few services can be mechanized or delivered from afar over the Internet. Have you ever gotten a massage over the World Wide Web? (p. 82).
5. *The growing irrelevance of location*: “The most competitive communities in the US will be the smartest, not the largest. Size does not limit a community in the skills it can develop, the knowledge it can retain, or the technology it can acquire.” Regional agglomeration affects are important in non-information intensive manufacturing. “Place” confers certain natural advantages (differentiation) allowing smart SMEs to spin specialized goods and services from natural endowments. (pp. 84-87)
6. *Workforce effectiveness*: “Three criteria that define what college graduates are looking for in a job are: a job that fits with their skills, professional development opportunities, and company reputation and ethics. All of these give small business an edge.” (pp. 88-89)
7. *Kosher public policy*: “The subsidization of large business is one of the dirty secrets of globalization. The Cato Institute estimates that the federal government annually gives MNEs \$87 billion per year. The World Resources Institute calculates that the annual federal subsidy to cars and trucks may be as much as \$300 billion per year.” There is much to indicate that the government cannot afford to continue these subsidies. (pp. 88-89)
8. *The decline of the dollar*: “A nose dive by the dollar will affect many sectors of the (US) economy in complicated ways. Exports will rise. Foreign tourism will flock to the new affordable American destinations. Foreign investors will buy up US assets. But most importantly for our communities, the price of imported goods, including many of those sold by large MNE chains, will rise. This will be new impetus for import substitution and local production.” (pp. 90-91)

Shuman’s (Shuman 2006) perspective is based on his experience as the founder of a national SME network (see BALLE website¹¹). BALLE’s purpose is to address the inefficiencies and lack of sustainability of globalization, which in their view is inefficient and producing negative economic effects on local economies by proving the sustainability of being “local.” BALLE encourages local business network formation to enhance local communities, by viewing such creation as providing sustainable effects.

¹¹ <http://www.livingeconomies.org/>

Shuman argues that his eight trends represent forces that provide competitive advantages for SME's production and delivery of goods and services in local and regional markets in the US. He further states that supporting local networks creates positive synergistic economic effects and that these results are more in alignment with sustainable development than those produced from either multi-national enterprises (MNE) or from "ad hoc" (see below) global networks. He believes that the demonstrated value created by SMEs in local economies reinforces the idea of local networks as the ideal medium for SMEs due to short connections and rapid feedback loops, which promote rapid innovation and improved entrepreneurship. These ideas are supported by Loorbach and Whiteman (2010) who introduced the idea that not only are the business relationships important for innovation and value creation, but the broader context of societal systems and the power structures that exude influence beyond the marketplace must be considered when sustainability is introduced (Loorbach, Whiteman et al. 2010). The question remains to be answered as to what scope of influence can be exerted on or by SMEs "beyond local" and what does local really mean in the context of sustainable business networks?

Schumacher, of course, also discussed the concept of appropriate size and technology creating efficiency and vitality in the 1970's (Schumacher 1973; Schumacher 1977). He described the competitive advantages of smaller firms filling needs in markets, where multi-national enterprises and advanced technologies are overkill. He called this appropriate technology or appropriate scaling (Schumacher 1973). He agreed that a firm's innovation, speed to market, and ability to respond quickly on intentional strategy, provides small firms advantages over competitors which may be too large to focus specifically on customer's needs in local, highly technical, or regional (non-global), opportunities and whose ecological and social footprints are simply too large to be efficient. Good examples of successful specialization even in large networks are small private restaurants that continue to thrive even when national and global chains are the low cost producers and have national advertising (Shuman 2006).

The discussions that follow in this section tend to reinforce the idea that synergistic effects from local networks improve efficiencies and enhanced resilience in participating SMEs. Such findings support the idea of *intentional* network architecture based on right-sized, intentional interconnections and consciously recognized common value due to interdependences. In this view, "appropriate" size can be described as a competitive advantage because it allows one to take advantage of local network synergies, rapid feedback and reaction to such feedback. Intentionally "small" or intentionally "aligned" can be a deliberate strategy designed to leverage the advantages of SMEs' ability to focus and act swiftly to respond to challenges within a local sphere of influence or network.

Used in engineering, ecology, network analysis, and systems theory in particular, the concept of "resilience" refers to the system's capacity to rebound from a perturbation. It can be assessed in a variety of different ways most of which rely on an underlying *structural* understanding of the factors crucial to system rebound, such as: number and diversity of alternate paths, degree of redundancy, and system rigidity and dominating momentum. Folk, Carpenter, et al (Folke, Carpenter et al. 2002), for example, relate resilience to the magnitude of shock a system can absorb and remain viable, which they see as a function of the system's capacity for "self-organization," and the degree to which the system can continue to build capacity for learning and adaption. Therefore, *intentionally* designing for resilience means designing an organization that

reacts rapidly and sensibly to at least an reasonably expected array of circumstances within a local or regional environment.(Sutcliffe, Weick et al. 2005)

Gunderson and Holling (Gunderson and Holling 2002) use the concept of resilience as the basis of their vision of “Panarchy”, a nested dynamic, adaptive, cyclical systems model of the world and all its subsystems, derived from the Greek god Pan connoting dualistic, chaotic change (panic) on one hand and the creative forces of nature on the other. Panarchy allows for incorporation of Schumpeter’s “creative destruction” forces within the growth models of capitalism alongside slower ecosystem and even influences of policy on systems behavior. The ideas of resilient systems and Panarchical behavior patterns provide new direction for designing enterprises with intentionality. This is described in Figure 2.1.

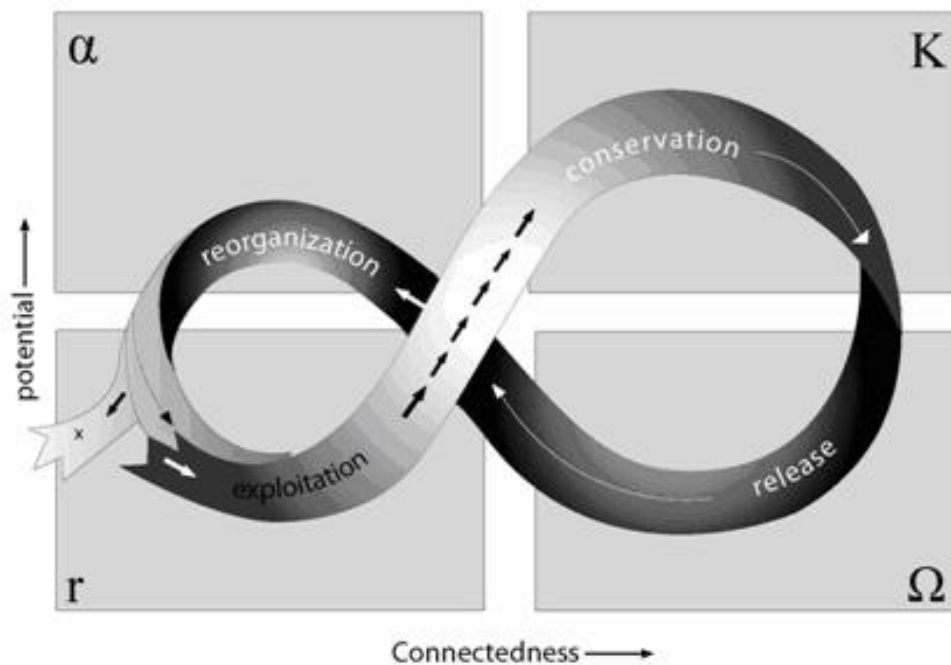


Figure 2-1 A Representation of the Flow among Four Ecosystem Functions (r, K, Ω, α)

The arrows show the speed of the flow in the cycle: short, closely spaced arrows indicate a slowly changing situation while longer arrows indicate a rapidly changing situation. The cycle reflects changes in two properties: (1) Y axis= the potential that is inherent in the accumulated resources of biomass and nutrients; (2) X axis = the degree of connectedness among controlling variables. Low connectedness is associated with diffuse elements loosely connected to each other, whose behavior is dominated by outward relations and affected by outside variability. High connectedness is associated with aggregated elements whose behavior is dominated by inward relations among elements of the aggregates, relations that control or mediate the influence of external variability. The exit from the cycle indicated at the left of the figure suggests, in a stylized way, the stage where the potential can leak away and where a flip into a less productive and organized system is most likely (Gunderson and Holling, 2002, p. 34).

In business lexicon, entrepreneurial SMEs begin at the flux boundary between the α and r regions by either forming or reforming strategies that make them successful. As they become successful as a result, they accumulate assets and market share as they move toward the K region, also forming strong bonds with stakeholders that can deter competitors from entering markets. Firms in the r region are adapting to external variables and firms in the K region are controlling the variables. As the K phase matures, there are incentives to increase efficiency in controlling variables, so much so that they become “brittle” leaving them unable to invest or

perhaps even see opportunities outside their dominate area. (The Burlington Chemicals Case discussed later is a good example of this characteristic). It is in the K phase where companies are subject to disruption (Schumpeter's destruction). "Accumulated resources are released from their bounds (customers move from an incumbent product or service to a new upstart) and restructuring of successful but deteriorating firms begin" (Gunderson and Holling, 2002, p. 47). This could be where new divisions are formed, CEOs are fired, and what was once a predictable market and customer behavior become chaotic as the firms enter the α region for the cycle to begin to reorganize again.

Therefore, out of chaos comes opportunity. Firms organize to fulfill the opportunity: collecting assets, market share and technology along the way. There develops great expertise as customers, market share and technology increases, but as the marketplace is dynamic, such expertise can become old and less efficient, which opens the door for upstarts to enter. Firms successful in producing stability and order ignore these mosquitoes until the pain is too late. These upstarts create chaos...and so it goes.

The importance of these models is the emphasis and importance placed on the attributes of dynamic adaption and connections and the recognition that resilience can produce deserts as well as productive sustainable forests. (Gunderson and Holling, 2002)

Such "intentional network designs" strategies have the potential to provide high value creation in chosen markets because they optimize the SME network to local or niche conditions, recognizing the phase with the large cycles in which they reside. Optimizations will include diversity in stakeholder sensibilities and leverage interconnections between them, and the speed of SMEs to act within the system. The economic collapse of 2008 due to banking and insurance companies being "too big to fail" fully demonstrates the disadvantages of organizational designs that were too large to manage and lost focus on economic changes. These banks are good examples of K phase organizations. (Gunderson and Holling 2002)

There is evidence that also shows that SMEs that do not incorporate some management practices that include sustainability to build diversity, have the potential to behave in a similar brittle fashion with negative effects on value creation, therefore, before examining the conditions needed to support value-creation in SMEs it is useful to first consider the negative potential as well.

2.3.2 Ad Hoc Networks: Why SME Impacts are *Not* Always Positive

Despite the many positive roles that certain SME networks play, there are also important reasons to be concerned about the negative social, economic and environmental impacts of K phase SMEs, especially by those that are highly mono-focused (Moore and Manring 2009) on low price and short-term profit, and/or which isolate diverse stakeholders who have a long term stake in the global commons. A good example could be a textile dyeing mill that discharges toxics into a river, which impacts the reproduction of the fish living there, and in turn impacts the livelihood of fishermen downstream. If the fishermen are not involved in policy setting which regulates the behaviors of their textile neighbors, they are isolated stakeholders of a common resource.

Manring and this author (Manring and Moore 2004; Manring and Moore 2009) have specifically noted the dangers of rapidly forming and disbanding, mono-focused, but highly efficient SME networks that have many disengaged external stakeholders, and named them "ad hoc" networks

describing their formation and activities. Ad hoc networks may intentionally form to fill a single need that may be short term or long term, and the network may only remain intact as long as it is beneficial toward this single need. This means that the SME ramps quickly into a K phase organization. This provides opportunities for ad hoc members to focus on a single goal, withholding the costs of consideration of the broader spectrum of stakeholders. Ad hoc networks are often inconsiderate of systemic impacts because they only need to survive long enough to fulfill their single objective and therefore are disengaged from policy or behavioral norms.

In the US, for example, Wal-Mart contracts out its store cleaning needs to ad hoc SMEs as a way to lower costs and avoid legal restrictions and consideration of other stakeholders, such as regular employees. Workers for these ad hoc cleaning contractors were often paid sub-minimum wages and benefits, and when the contractors were caught behaving illegally, they simply went out of business and Wal-Mart was shielded from the damages.

Many of these new ad hoc, global networks intentionally address the needs within the global marketplace, by building highly focused and efficient networks over broader geographies or markets that are focused on a single efficient deliverable. Such networks may expand to compete with MNEs (Friedman 2005). This is a SME behavior that is not as well described by Shuman because this self assembled, mono-focused, ad hoc SME network structure is in its infancy. Only by studying the Internet and the effects of mobile phone networks, can such behaviors be modeled and better understood (Dorogovtsev and Mendes 2003).

In today's disruptive, technology driven global markets, many SME ad hoc networks may have a more negative impact than a structurally-integrated MNE (Aldrich 1999) in part because such networks can appear and disappear so rapidly that society cannot identify and regulate them fast enough to hold them accountable for their intentional actions and unintended consequences. In short, these types of uncaring, unaccountable, short-term, mono-focus businesses have the potential to be very dangerous because, as former CEO of Interface Corporation, Ray Anderson puts it, they can be "as bad as the law allows" (Anderson 1998).

Potential threats to the advancement of sustainable enterprise emerge from networks that lack feedback from a diversity of stakeholders. Shuman states emphatically that this cannot happen with local SME networks because of the SMEs accountability to local stakeholders in a very diverse way. They cannot physically escape scrutiny from any local stakeholder that cares to observe. Global, mono-focused, highly efficient (but increasingly brittle) networks are different from these locally bounded networks because of the short the distance between nodes, the higher levels of interdependencies, and the immediate observation space discussed by Watts (Watts and Strogatz 1998).

Therefore, if sustainable SMEs and their networks are to survive as viable business constructs, they must have a value proposition beyond a short-term, ad hoc, mono-focused efficiency. While an ad hoc structure may fit the needs of organizing the diversity of services and goods available from an expanding SME population to fulfill the short term goals of global supply chains for efficient production, its behaviors should be aligned with the needs of the global commons with a target of building long-term value and resilient markets (Gunderson and Holling 2002). Otherwise, this highly efficient structure may serve a short-term need and then may disappear before policy can be developed to include the global commons as a stakeholder in the process.

NGO and third-party certification of processes are evolving as the *de facto* policy makers in such situations (Nalinakumari and MacLean 2005).

2.3.3 Bounded and Random Networks: Feedback Loops and Synergistic Effects

Since SME behaviors are not always positive in terms of sustainable development, the question arises as to what kinds of conditions and network effects lead some SME networks to successfully produce broad, long-term value, while others do not. The literature provides examples of at least some of the necessary characteristics, but before exploring these we must first introduce some terminology.

One of the most important factors influencing SME's successes appears to be enhanced value creation via network effects.¹² The contrast between the potential benefits of SMEs and the negative Ad Hoc example presented in the previous section, offers the opportunity to evaluate the conditions that produce these alternatives in terms of two proposed forms of SME networks: *bounded networks* and *random networks*.

Figure 2.2 Network A depicts a *bounded network* — also called a “normalized networks of coupled dynamic systems” — visualized here as a ring lattice due to interdependent boundaries with multiple connections to neighbors. Figure 2.2 Network B depicts a random network, one with less interdependency and more exclusion¹³ (Strogatz 2001; Watts 2003).

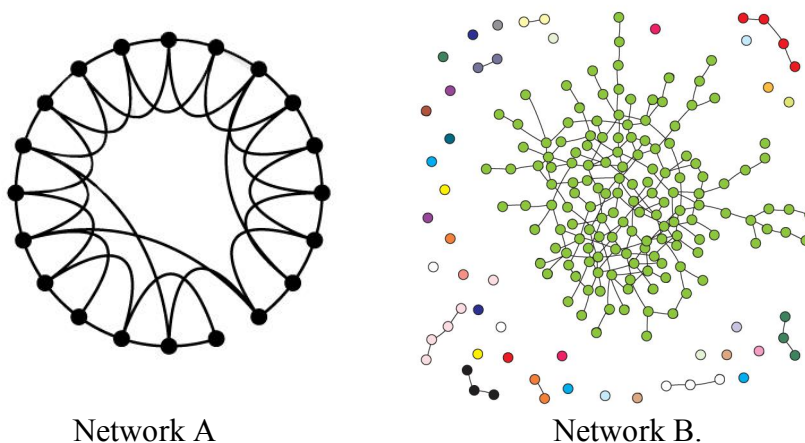


Figure 2-2 Bounded and Random Non-inclusive Networks

Network A represents a bounded network in which all stakeholders are interrelated and none are excluded. Network B represents a more random non-inclusive network, where some stakeholders are excluded and do not interact or affect the network in any way.

¹² The notion of “network effects” or “network externalities,” as the tendency for products or services to become more valuable as more people use them, finds mathematical expression in Metcalfe’s law. Named for Ethernet inventor Bob Metcalfe, this notion states that the value of a communications network rises in proportion to the square of the number of people who use it. The near monopoly of Microsoft Office is a good example of this kind of network effect.

¹³ Random networks can be scaled (bounded) due to multiple stakeholder interdependencies, or scale free, without connections and diversification of stakeholders.

Note that all stakeholders in Network A are interdependent and interrelated by normalized connections and bounded by various factors. One could envision this as a tax district or a watershed or a county or state boundary. The stakeholders would be ideally connected diversely through TBL commons and markets and most importantly, these connections would change in importance depending on circumstance. These dynamic circumstances creates boundaries and bounded conditions fitting with the behaviors described by Gunderson and Holling (Gunderson and Holling 2002). The adaptive systems model described in the second chapter of *Panarchy* (Gunderson and Holling 2002) describes the role of dynamic connections between network stakeholders as various cycles of exploitation, conservation, release and reorganization occur. These dynamic connections are described as “loose ties” by (Granovetter 1984) and the metaphor is strengthened by Loorback et al (Loorbach, Whiteman et al. 2010) and described as “small world” clusters by Watts (Watts and Strogatz 1998).

It is important to observe, however, that these connections produce common boundaries created by the dynamic connections to all stakeholders, be they weak or strong. It can be further envisioned that when connections are no longer possible or the connections become less dynamic due to the phase of development within a certain system or network, then a stakeholder may drift away, no longer active within the membership that bounds the network. (Folke, Carpenter et al. 2002)

One could also describe networked interdependencies, i.e., boundaries created through connections, like the walls of a handball court. Any feedback (balls) served, can interact with the walls, but always bounce back into the game. This can be described as “percussive effects” which also rather nicely describe the speed and the energy with which an idea or issue can resonate with a network. The closer to the boundary and the greater the vigor with which an idea is pressed through the network, the more vigorous and speedy the re-percussion or feedback from the boundary. Because local networks are dynamic and efficient, the more feedback that bounces among SME member firms as feedback loops, the more the value of this feedback multiplies among the stakeholders (Kelly 1998). Highly efficient feedback loops also offer great opportunities for network synchronization (Strogatz 2003) and synergistic cluster effects to develop within such networks, but diversity among stakeholders that avoids blind efficiency and increases resilience due to reduction in unintended consequences, may be a first order benefit.

The literature also provides indications that the relatively short distance between members in SME networks and their tendency to focus within the network, enables rapid feedback from multiple sources due to the acknowledged boundaries and the ability to feedback from a diversity of engaged stakeholders. In such environments SME success and failure depends heavily on their ability to provide enhanced value to their stakeholders (network members) via development and implementation of an intentional sustainability strategy, however, the stakeholders also have rapid influence over the SME due to the speed and proximity of stakeholders in closely knit networks.

Note the random Network B (Figure 2.2) directly links some stakeholders just as in Network A, but it also isolates others. This isolation leads to a lack of diversity in connections with stakeholders and, therefore, does not create beneficial feedback boundaries of commonality. Stakeholders become isolated and do not form repercussive learning cycles. The loss of this interchange between diverse stakeholders can produce hyper-efficiency and over alignment and a

lack of resilience (Gunderson and Holling 2002). The isolated stakeholders are not deemed for some reason, to be valuable contributors, or they are disenfranchised for some reason to the goals and stakeholder of this network. Therefore, they become isolated and their inputs are lost from the network. Just as in studies performed on highly resilience ecosystems have demonstrated, it can be very dangerous to allow stakeholder isolation as there may be weak ties with value to the network that are not readily apparent (Granovetter 1984; Capra 2002; Folke, Carpenter et al. 2002). This verifies the concepts of the high value of inclusion and the management skills necessary to learn in a diversified environment (Hart and Milstein 2003).

Network B, is different. It may be a highly efficient network for a specific task, short-term, because it eliminates some “less efficient” stakeholder connections thereby eliminating the overhead time and management of diverse stakeholders. However, it is also a brittle network, which may have limited longevity due to lacking the ability to learn and anticipate disruptions simply because of the isolation of valuable stakeholders and a lack of diversity of stakeholders (Gunderson and Holling 2002). This lack of diversity in connections that leads to great efficiencies also produces a lack of resilience within the network to withstand changes due to unintended consequences. For example, if the transition to electric automobiles occurs, the highly efficient chain of petrol filling stations will be out of business, unless their strategy includes providing charging services for electric autos.

It is possible that deliberately seeking a strategy to include disenfranchised or uninterested stakeholders could create the opportunities for connections even in hyper efficient networks. The could allow for the evolution of broader connection that would reduce hyper-efficiency, thereby reducing the possibilities of disruption. Regardless of whether stakeholders are linked together intentionally or via random Small World connections, adding connections that increase percussive dynamics should produce self-sufficiency via networking of local stakeholders while adding diversity among stakeholders. Going back to Hart’s stakeholder diagram in Figure 1.1 the inclusion of social and ecological commons as dynamic stakeholder to Network B, could greatly improve the number of diverse connections and reduce isolations in this network. This would make Network B more bounded, dynamic and inclusive, thereby, making it more resilient. Need citation here

Boundaries induced by policies that encourage stakeholder *inclusion* produce powerful repercussive effects in feedback loops. If policy is used to force inclusion of excluded stakeholders into network involvement, then policy assumes a role that can produce sustainability effects. This is documented in this author’s paper on policy effects on the US Textile industry (Ausley and Moore 2004). During the 1980’s, new regulatory reform, policy decisions emerged that forced textile companies to measure the aquatic toxicity of wastewaters discharged into NC rivers. This pressure induced a virtuous cycle that eventually spawned new process and chemistry designs, which cost-effectively reduced aquatic toxicity impacts on the surface waters of NC. In this case, policy induced changes in stakeholder behaviors producing more sustainable textile dyeing processes and reducing the load of toxic chemicals on publically owned waste treatment facilities. However Ostrum (Ostrom 1990; Ostrom 2005) and Holling (Gunderson and Holling 2002) warn that policy is not the most efficient, nor the most viable means of producing dynamic sustainable development. The most efficient mechanisms are for the stakeholders themselves to produce dynamic innovations within the opportunity created

by the policy and indeed this is shown by Gunderson and Holling as an important part of the Panarchy model (Gunderson and Holling 2002).

A network environment that is bounded by dynamic activities of stakeholders within an active policy environment (Network A) also produces a barrier to entry for competitors outside the network who for political or other reasons cannot dynamically interact: outsiders may have additional difficulty connecting because they must prove both their value contribution and interdependency with other network stakeholders. Such effects, however, may be a two-edged sword, limiting those on the inside from benefits gained from outside interaction. Thus, bounded networks also face the issue of “groupthink,” which ignores forces and voices outside the network and, hence, may lead to stagnation (Diamond 2005).

2.3.4 Responsive Local Networks: Values, Communication and Small World Effects

In short, one characteristic of successful SME networks is that they are “bounded.” De Geus (DeGeus 1997), for example, described four attributes that may be used to characterize successful companies and SME networks:

- There is awareness of the identity and a sense of community (value of boundaries)
- There is sensitivity to the world around them (not isolated by boundaries).
- There is tolerance of new ideas (ideas get into the network and are considered).
- There is conservatism in financing (financing stays within the network’s boundaries)

In this view, “local” SME networks become successful because of an environment that produces rapid feedback loops (bounded), and which have synergies and connection (weak and strong) producing resilience and perhaps providing SMEs an environment of increasing innovation, efficiency and resilience (Hart and Simanis 2008) (Folke, Carpenter et al. 2002). For SMEs, such advantageous contexts historically are to be found in the dynamic environment of local and niche markets where connections and stocks and flows are diverse and the value propositions are equally diverse and influential.

For example, Shuman’s (Shuman 2006) contribution to the discussion of SME networks is the idea that local economies are networks bounded by: market geography; local concerns; mores (language, etc.); a diversity of behaviors; and rapid feedback from interconnected stakeholders. Within those local economies (networks), there is a highly structured, highly efficient, dynamic based on interdependency. This interdependency creates great value in many ways as dialogue and idea exchange between stakeholders is almost immediate.

Additional benefits may also include the actual formation of boundaries created by this interdependency. These boundaries can be thought of as walls or fences constructed of values and concerns of the local network. If an idea or topic can be considered as a ball, thrown against this wall, it bounces back, influenced by the values and concerns of the stakeholders. Standing close to the wall, inside of the network, the ball comes back quickly, influenced by the stakeholders. Throwing a ball at the wall from a long distance means the ball of ideas will return much more slowly with other forces (gravity, rocks, etc) influencing its path.

Sarasvathy (Sarasvathy 2001) reinforces the idea of the power of rapid communication and feedback loops for small entrepreneurial firms, implying that the power of effective communication is at the event horizon of innovation:

...And when destinations are unclear and there are no pre-existing goals, causal road maps are less useful than effectual exchanges of information between all stakeholders involved in the journey (p. 262).

The literature review on the global impact of SMEs broadly supports Sarasvathy and Shuman's findings. The numbers of SMEs continue to increase globally, and the reason appears to be increased opportunities caused by global growth (Ács 1996), particularly the addition of millions to the consumer class as economic development occurs in Asia. This idea of global growth causing a "rising development tide floating all boats," is also supported by Friedman (Friedman 2005) and Hart (Hart 2005) and importantly Sen (Sen 2000) who described a flattening of markets and the opportunities at the base of the economic pyramid.

The idea of dynamic boundaries as a significant network characteristic due to interconnections is a highly valuable metaphor that is not new. The value of walls and fences as boundaries between neighbors is discussed in Robert Frost's poem *Mending Walls*, in the line, "Good fences make good neighbors" (Frost 1949):

The understanding that "good fences make good neighbors," that is, that men can use their own knowledge in the pursuit of their own ends without colliding with each other only if clear boundaries can be drawn between their respective domains of free action, is the basis on which all known civilization has grown. Property, in the wide sense in which it is used to include not only material things, but (as John Locke defined it) the "life, liberty and estates" of every individual is the only solution men have yet discovered to the problem of reconciling individual freedom with the absence of conflict. Law, liberty, and property are an inseparable trinity. There can be no law in the sense of universal rules of conduct which does not determine boundaries of the domains of freedom by laying down rules that enable each to ascertain where he is free to act (p. 107).

For local economies and the SMEs working in them, allowing networks to form boundaries based on interconnectivity, interdependency, and self-sufficient value creation for the members, forms the necessary dynamic network connections, the "fences" reinforcing interdependency. This concentration of value creation due to barriers and the energy created within the network produces valuable network effects for all stakeholders within the network. This arrangement is known to create a more creative internal environment, which may create very valuable goods and services that may be sought after from less connected stakeholders perhaps known as export customers.

A great example is the high quality of Bordeaux wines. In this case, the appellation of Bordeaux sets standards for the quality of the wine that can be produced within the "fences" of the region. All wine makers must adhere to such rules. This value-creating arrangement creates a network of stakeholders that have a common interest in keeping the quality high and product unique. In other words, the fences and boundaries imposed within the region are what allow Bordeaux wines to be exported as being unique and special. Such fences have also created clustering synergies and a knowledge base within the region that keep the product unique and of high

quality. There is a high level of dynamic communication within region, but these conversations stay within the region.

Certain characteristics of networks, such as “Long Tail” effects (Anderson 2006) and “Small-World” synergies (Strogatz and Watts 1998) also improve efficiency through rapid communication and learning arising from alignment of broad sensibilities and values among stakeholders and not readily apparent connections between stakeholders. In the case of SME networks, Long Tail effects come from crowd sourcing or the use of diverse stakeholders to gather opinion and information that, without the internet or some social media, would be impossible to collect.¹⁴ Long Tail effects support Hart’s (Hart 2005) development of dialogue and business with as large a diversity of stakeholders as possible as catalysts for innovation and value creation, even from obscure viewpoints, but obscure viewpoints that get heard.

The idea of “small worlds” existing within broader networks also speaks to dialogue and diversity. When one has a large number of stakeholders in dialogue, for example all of Apple iPhone users, the use of networked communications allows people to make a connection because of that common trait, even if those people have no other contact with each other except by owning an iPhone.¹⁵ Networked communications allows people who, for example, have an Apple iPhone to connect with people who have an iPhone and own a Blue-tick hound dog. The subset of people owning iPhones and Blue-tick hound dogs can now create enough synergy rapidly enough to perhaps get this breed of hunting dog into the Westminster Dog Show!

Small World synergies or the dynamic and even random appearing connections – weak connections- between stakeholders help catalyze an SME network’s ability to rapidly understand and integrate (learn) from network and individual successes and failures using a variety of expected (regular) and unexpected (random) connections to associated network members. Hence, the intervention used in all three case studies in this dissertation looked through all existing stakeholders and even sought new potential stakeholders of these companies in an effort to find some links of interest or common value that would form sub-networks of stakeholders. For example, in the case of TS Designs (Eric Henry), the company has a growing Small World of connected stakeholders who are interested in local cotton and apparel production. This Small World within TSD’s larger world of stakeholders formed spontaneously around these products or the idea of them and because TSD was working within a market network that had “sustainability driven” sensibilities, these connections could form rapidly. Along the same lines, the multi-dimensional TBL feedback loops emerging from the diverse stakeholders and Small World synergies (Strogatz and Watts 1998) may also help SMEs differentiate themselves from competitors inside the network (which can be very competitive environments).

Local economic networks can be efficient and resilient for very long periods when not disrupted by outside forces, but they remain so only within the effective boundaries of their interdependencies of the network of engaged stakeholders and if efficient communication, Small World effects, and a broad bandwidth for all communications is maintained (Strogatz 2003). It is important to note that, when network stability is maintained by excluding (through policy) new stakeholders from joining a network, this introduces brittleness and a hyper-efficiency produced by groupthink. Therefore, isolation may not be desirable in an interconnected world.

¹⁴ For more on Long Tail effects see: http://en.wikipedia.org/wiki/Long_Tail

¹⁵ For more on Small World effects see: http://en.wikipedia.org/wiki/Small-world_network

Conversely, recent challenges with contamination of global food supplies and toys from China indicate that random, global scale or scale-free networks that are focused on the single definition of lowest cost as *the* measure of success are not rapidly self correcting due to their lack of boundaries and multi-dimensional value propositions. Size and distance between nodes also makes it difficult to police or for a single stakeholder to enforce or to provide feedback via appropriate, enforceable policies. Certainly, the incident of the Sanlu Group's contamination of baby formula with melamine indicates a complete lack of connection to immediate stakeholders and resulted in the failure of the Sanlu Group and its managers.¹⁶

Consequently, the greatest challenge facing global networks with a mono-focus on efficiency as their primary value definition lies in the *lack* of importance of longevity and the global commons in their definition of success. This is the common resource conundrum described by Ostrom (Ostrom 1990). To continue with our fence or boundary metaphor, the Sanlu Group acted like an unbounded, ad hoc network. The fence that would normally have made a good neighbor policy and stakeholder scrutiny by creating rapid, integrated, network feedback for the health and safety of society's children, did not exist, even with the direct customer who is normally the most important stakeholder in business networks. Therefore, policy creation and policy enforcement disappeared or became impossible when whole classes of stakeholders were ignored (Barboza 2007).

One well recognized problem is that limited "bandwidth"¹⁷ within global communications and market information systems currently limits effectiveness of communication among interconnected and interdependent stakeholders and, in turn, fails to provide adequate feedback loops. However, as the bandwidth continues to broaden, it may become efficient enough to create a "conscience" boundary of the global commons just as local networks are bounded by local social and ecological realities today.

Still, the broader sustainability movement's slogan, "think globally, act locally," speaks to one of the fundamental concerns facing globalization of markets, economies, and, consequently, of global networks of SMEs: whether or not global networks can ever be as responsive and efficient as local networks in meeting stakeholder needs, including providing an efficient environment for innovation, supporting a healthy, sustainable, global social and environmental commons (Harden 1968), and producing local and global economic, social and environmental prosperity. This slogan emphasizes that the global commons should not be forgotten, even as action can only occur within the local sphere. There is great hope, however, that these common resource challenges can be met and the global commons can become a dynamic and manageable boundary for enterprise.

2.2.5 Cooperation and Synergy within Networks

Value creation in SMEs also appears to be enhanced by a proper combination of dynamic cooperation, synergy and resilience. For example, cooperative networks are famous for producing *synergy*, the well-documented phenomenon that effective teams tend to produce

¹⁶ See <http://www.nytimes.com/2008/09/12/world/asia/12iht-13milk.16094054.html> -and- http://en.wikipedia.org/wiki/Sanlu_Group

¹⁷ A measure of data flow rate in digital networks is typically in bits per second. In this case, the term means the speed and the dimensionality of data flow.

overall better results than individuals working separately toward the same goal (Manring and Moore 2004). Healthy networks are also *resilient*, the ability to adapt and rebound rapidly from unexpected events.

Often described using the metaphors of vitality, abundance, and prosperity, the phenomena of synergy and resilience are summarized in the slogan: “small and connected = strength and speed” (Goerner 1999). This is reinforced by Gunderson and Holling who describe the Panarchy cycles in terms of functions, connections and boundaries that are sometimes rapid and sometimes very slow. Increasing evidence suggests that SMEs’ short-term success in a global marketplace over other organizational forms such as large multinational enterprises (MNE) is due to the greater speed with which such networks move and the lack of encumbering organizational overhead require to manage assets. Perhaps it is best to consider that larger organizations tie up many assets with direct connections that once formed, cannot be easily disconnected. For example, if a large firm builds a building and hires 1000 people, it cannot readily move. There are many ties that bind. Also, when such strong ties bind assets, people capacity or capital, these are assets or connections that are not free to form new connections. An analogy here is that when single, a person is free to make many sexual connections. Once a marriage is formed, this freedom to connect is limited by many factors, legal, financial, moral, etc.

Consequently, one characteristic all SMEs have in common is that they are competitive due to innovation that creates value and therefore, leaves the firm free to create a customer (Drucker 1954), which is one of the most important functions of any enterprise.

Axelrod (Axelrod 1984) described the value of cooperation within network stakeholders via game theory. He also describes this inclusive stakeholder value creation philosophically as moving beyond a zero sum game of winners and losers. This is presented in Figure 2.2, Network B, which depicts one group as connected winners, and others, who are disconnected and isolated members, are depicted as “losers.”

The antithesis of the zero sum game is an infinite game where everyone is impacted directly due to expansion or contraction of opportunities (Gomes-Casseres 1997; Hampden-Turner and Trompenaars 1997; Strogatz 2003; Sullivan 2004). One can visualize this in Figure 2.2: Network A. In Network A, expansion of opportunities might continue as the boundaries expand or become limiting, due to a loss of interconnection and lessening opportunities for all stakeholders if, for example, one group dominates the opportunity of the commons (Harden 1968).

In an infinite game scenario, if the network’s success produces increased opportunities for all stakeholders, then the network expands or replicates to fulfill these opportunities. Hence, expanding the size or abundance (opportunities) within a network must also be accompanied with expanding opportunities for a wide variety of stakeholders as bounded by the recognition of: the value of interdependency; the security of self sufficiency; and the number and types of connections. When such conditions are met, they increase the value for all.

The antithesis of this expanding opportunity situation occurs when the network’s sustainability is lost because its connections become too random or one or more nodes become too large and efficient to maintain a broader vision of an interconnected commons. Such networks eventually collapse due to brittleness or complacency caused by the loss or isolation of stakeholders who

can no longer contribute in any fashion (Harden 1968). All communications with the now isolated stakeholders is cut off and all benefits from them are lost.

2.3.5 Agglomeration

Hansen (Berra, Platti et al. 1995) describes geographical value creation through the mechanism of *agglomeration* within regional Italian textile manufacturers. These textile firms' successes were based on an intentional strategy of providing goods and services only within that geographical bounded textile district where rapid communications and logistical systems existed to support a specialized niche and provided broad value for all members. It was found that none of the network members had significant business advantages outside of this network. Network success produced individual SME success as a reinforced dynamic.

Such highly interdependent, but self-sufficient networks of SMEs that contain both regular and diverse (apparently unrelated) connections, and are bounded by commonality of vision or purpose are often very effective. Such networks often develop synergistic rather than strictly additive performance. Such capability formations are described as agglomeration effects, which may be geographical, ethical, or technical in nature.

Agglomeration effects may occur because SME network boundaries — as stakeholder nodes within a highly connected network are bounded by interconnectivity on many issues — may increase the rate of cooperation and synchronization within the network. Increased cooperation within networks of SMEs is also due to the nature of the complex relationship between the owners of SMEs and their firms. Rapid cooperation not only increases their SME's value, but also simultaneously increases the value of every other network member that enjoys in the expansion and increased value for the owners of the firms that are members of the network.

2.3.6 Local SME Networks and Global Markets

Although business networking opportunities were not his primary focus, network theorist, Duncan Watts (Watts 2003) also describes how the evolution of structural synergies of network clustering produces networks capable of being vital, efficient, resilient, and connected as they grow. As Watts states:

Individuals, therefore, have severe limitations imposed on what they can deduce about the world based on what they can observe. A well-known aphorism contends that all politics is local, but really we should say that all experience is local — we only know what we know, and the rest of the world by definition, lies beyond our radar screen. In social networks, the only information we have access to and, therefore, the only data we can use to make assessments of the world, lies in our local neighborhood — our friends and acquaintances. If most of our friends know each other— our neighborhood is highly clustered — and everyone else's neighborhood is likewise clustered, then we tend to assume that not all these clusters can be connected. But they can be, and that is why the small-world phenomenon is so counterintuitive; it is a global phenomenon, yet individuals are capable of only local measurement. (Watts 2003, pp. 82-83)

Watts implies that it is possible to recreate the synergies of Shuman's smaller local networks within broader global markets, if such networks can approach the functionality of local communications. Perhaps such small-scale synergies can occur in densely communicating global

markets through unexpected, even random connections between/among stakeholders. Watts explored this concept by examining existing networks and behaviors and describing the Small World clustering and loose ties and network re-creation mechanisms.

The question remains concerning whether or not “ties that bind” can be developed enough to enable long distance networks to develop network feedback loops that function as if they were in small, local networks. If the continued development enabled such connection then such Small World effects might also create highly effective and sustainable global SME networks. This could allow local networks to function as efficient, local clusters with random or intentional connections to the global economy.

However, in the opinion of this thesis author, the functionality of local network communication is not easily accomplished over global distances due to the lack of adequate communication pipelines with *the ability to accept feedback from a wide diversity of stakeholders*. While such feedback is more readily produced within local economic networks, it remains very difficult to recreate in networks or clusters of networks separated by global cultural and geographical distances.¹⁸ This is of course the basis for all common resource challenges relating to the Tragedy of the Commons behavior archetype (Ostrom 1990). Today, it is also physically difficult to recreate the nuances and influences of “local” communication via the bandwidth of current email, telephony and social networking technologies.

So, instead of producing brittle global networks that are efficient, but ignore diverse stakeholders, perhaps the preferred architecture may be local clusters of networks connected in a flexibly evolving manner that efficiently achieve goals, while maintaining local connections and boundaries. Perhaps resurrecting or reinventing the idea of the cooperative may be a good design to study using the Panarchy model as a design for the boundaries and structure of cooperative loops (Gunderson and Holling 2002).

Shuman (Shuman 2006) similarly addresses the value-add of local SME networks on local economies, but does not delve deeply into the increasing influence of global SME networks on global innovation mechanisms. He does not address the possible structures of linked local economies within the global “meta” communication networks.

This thesis author believes however that Shuman’s strong support of “local” over global could be tempered within the context of local self-sufficiency, which is then expanded to address global opportunity (Roome 2001). For example, let’s say that my local SME network produces a particular kind of ham in NC. We decide that we like this ham to have a low fat content, so the network engages and over a period of years we breed a pig that has low fat content, and a feeding regime that produces a color and taste that we like. The people here in our local network like it very much and a local purchaser from Denny’s (a large fast food chain) decides that this is just the ham he wants to serve in the restaurant nationwide.

The first priority of the local network should be to the local consumers (self-sufficiency), which Shuman would say is important because of the multiplier effects of local economies. The price

¹⁸ There was a recent commercial played on US television for a mouthwash that showed a physical kiss as the first “instant message.” No matter how much electronic communication bandwidth is achieved electronically, there is no kiss like a real kiss and communication of the message within a kiss remains outside the possibility of long distance communication.

set is fair by the market based on all the local stakeholder benefits to breed the pig, grow the pig, feed the pig, process the meat, cure the ham, distribute local and package, etc within the boundaries and limits of the network. Rather than greatly increase and also compromising the quality of this special product by engaging in higher volumes for Denny's, it may be more valuable to recreate the conditions of the local net work in various regions through out the country to maintain all the synergies of the original network. To simply scale production to meet volumes and compromise on any of the stakeholder dynamics within the original network reduces resilience, increases brittleness and will reduce the value of this product by becoming volume and price driven. This valuable network that has produced this wonderful product would become a commodity.

This approach to supporting local self-sufficiency while expanding to address global opportunity agrees with the concept of sustainable global economic development described by Stuart Hart and his concepts of sustainable economic development through networks of SMEs in developing economies. Hart and his colleagues at Cornell University describe this as the Base of the Economic Pyramid Development Protocol¹⁹ (Hart 2005).

BOP is *not* about moving goods produced in developed regions to BOP markets — Nike tried this with their World shoe and others have tried it and failed. Instead, BOP means developing entrepreneurial infrastructure by using clean technologies as an impetus to develop enterprise infrastructure that is scaled to the market. This is a very “Schumacherian” concept (Schumacher 1973; Schumacher 1977) in which high technology can be used, but must be scaled to fit its BOP application. Practitioners of the BOP Protocol first live within these local communities and assess needs and market capabilities *before* trying to fit in new clean-tech opportunities. This protocol, therefore, is less a matter of introducing a product, and more a process of creating a market maintained by the people living in it.

2.2.8 Using Natural Networks to Understand and Measure Healthy Development

Most of the literature on SME network effects that this author found was based on computer simulations or theoretical mathematics, not on recent advances in understanding real-life networks, such as ecosystems and living organisms. There is, however, an emerging science and expanding literature pertaining to natural networks that advances our ability to describe and understand how such real-life networks behave and evolve. For example, natural networks often exhibit the phenomenon of “subsidiarity,” a form of distributed empowerment and intelligence in which decisions and actions are made at the lowest possible levels. Understanding how subsidiarity works in nature helps expand our understanding of “learning organizations” in business (Senge 1990).

Of greater import to the emerging themes of intentional enterprise network development, the science of resiliency has enabled Ulanowicz, et al. (Goerner, Lietaer et al. 2009) to develop quantitative measure of durable health for natural systems based on long-standing data on how *network structure* affects the system's long-term health. Goerner, et al. (Goerner, Lietaer et al. 2009) has extended these concepts and measures to business networks as well building on the ideas and scholarship referenced through *Panarchy* (Gunderson and Holling 2002). The result is a concrete description of what constitutes healthy structure or, more to the point, *healthy*

¹⁹ See http://en.wikipedia.org/wiki/Center_for_Sustainable_Global_Enterprise

development that leads directly to a precise, measurable understanding of Quantitative Economic Development (QED).

QED's assessment of sustainable development grows out of energy flow's natural connection to network structure. Ecologists, for example, have long known that an ecosystem's ability to maintain its own vitality over long periods (that is, its "sustainability"), depends largely on the layout and magnitudes of the trophic pathways by which energy, information and resources are circulated. (Goerner, Lietaer et al. 2009)

This work suggests that the hidden critical issue in maintaining long term systemic health and vitality lies in the system's ability to strike a balance between the equally crucial but opposing properties of resilience and efficiency. These two properties are in opposition, with more of one automatically meaning less of the other, because both are functions of the level of diversity and connectivity in the system. More diversity means greater the resilience and the less the efficiency; less diversity means more streamlining, more efficiency and less resilience. Balance is crucial because too much or too little of either characteristic leads to calamity: too much streamlining (efficiency) leads to brittleness and too much diversity (resilience) leads to stagnation. Gunderson and Holling perhaps further this idea by expression envisioning that resilience is a relative feature that cycles waxes and wanes at different speeds based on the dynamics of a system at any given time. (Gunderson and Holling 2002)

The long-term maintenance of (network) vitality appears to rest heavily on two structure-related attributes: 1) *efficiency*: the network's capacity to perform in a sufficiently organized and efficient manner as to maintain its integrity over time; and, 2) *resilience*: its reserve of flexible fall-back positions and diversity of actions that can be used to meet the exigencies of novel disturbances and the novelty needed for on-going development and evolution.

These two crucial factors of resilience and efficiency are complementary because they are inversely related to the levels of diversity and connectivity found in the network. For example, a well-woven multiplicity of connections and diversity plays a positive role in resilience because additional options help the system rebound from the loss or disruption of one or more pathways or nodes. Yet, flow systems also require efficient end-to-end circulation of products in order to properly catalyze crucial processes at all levels of the whole. Redundant pathways and excess diversity hinder such throughput efficiency, leading to stagnation that erodes vitality by dissipating weak throughput via various inefficient sectors. Consequently, greater efficiency means less resilience and, conversely, greater resilience means less efficiency because the streamlining that augments efficiency also reduces diversity/connectivity.

This inherent push-pull trade-off explains why, after a certain point, increasing a system's efficiency makes it more brittle even as it grows bigger and more directed. Conversely, while increasing diversity and connectivity makes the system technically more resilient, beyond a certain point the loss of efficiency also makes it more stagnant. The upshot is that systems become *unsustainable* whenever they have either too much or too little diversity/connectivity (or too much or too little efficiency).

Since resilience and efficiency are both necessary, but pull in opposite directions, nature tends to favor those systems that achieve an optimal mix of the two. Furthermore, a system's balance of efficiency and resilience can be calculated via its configuration of diversity and connectivity. This allows the system's sustainability to be captured in a single metric that establishes its place in the continuum from brittle (insufficiently diverse) to stagnant (insufficiently efficient).

Consequently, in our previous paper (Goerner, Lietaer et al. 2009), we argued that flow-network sustainability can reasonably be defined as *the optimal balance of efficiency and resilience* as determined by nature²⁰ and measured by system structure. (Goerner, Lietaer et al. 2009)

Goerner's (Goerner, Lietaer et al. 2009) most useful visualization tool (see Figure 2.3) indicates where an organization might lie on a continuum from stagnation (due to excessive small-scale diversity) to brittleness (due to excessive large-scale efficiency, streamlining and size). Optimal health lies in a "Window of Vitality" region located in between, slightly skewed to the resilience/diversity side.

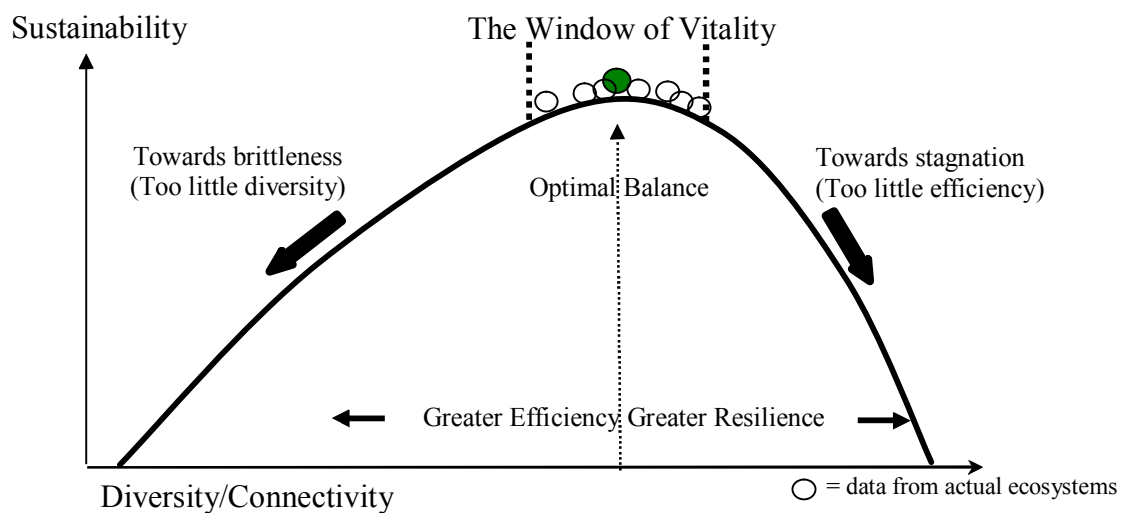


Figure 2-3 Measuring Optimal Efficiency and Resilience in Networks

(Goerner, Lietaer et al. 2009) *If the network is too efficient (focused on a single objective to the exclusion of all others), the lack of diversity will make the network susceptible to collapse if the objective changes. Intentionally adding a Sustainability Lens, tends to add resilience, and diversity; consequently it helps balance an enterprise's stakeholder network (Hart 2005, Capra 2002).*

This economic network model suggests that:

- Long-term economic vitality rests upon the health of multi-scale business networks and human capital that make up the "real" economy.

²⁰ Presumably, the balance found in nature also reflects underlying physical laws of structural stability and optimal flow, such as those seen in power laws and fractal development.

- Big and small players are equally necessary and, as in natural ecosystems, health rests on a proper balance in the number and diversity of both big and small players and sufficient density of connections, especially at the lower levels and these actors may move at different speeds.
- Exaggerated emphasis on efficiency and large size leads to brittleness because excessive elimination of connections and diversity also reduces flexibility, fallback positions and the ability to rebound.
- Conversely, networks that have too many connections and too much diversity are prone to stagnation because they lack sufficient directedness and cross scale efficiency and the ability to form new connections.
- Health lies in the balance between these two extremes.

Goerner's work, together with the systems concepts described by Gunderson, Holling and others (Gunderson and Holling 2002), provides a quantitative foundation for intentional network development. Connections between stakeholders and other stakeholder networks can be mapped, stocks and flows of information and money measured, and a visualization of these networks' efficiency and resilience provides information on where investments were made that were not diverse enough and those, which were too diverse.

Goerner, et al. (Goerner, Lietaer et al. 2009) as well as Gunderson and Holling (Gunderson and Holling 2002) show that networks that isolate stakeholders and focus on a single-minded efficiency become "brittle" with extreme streamlined efficiency and large size/capacity in one node eroding the grassroots network and leading toward collapse. Adding stakeholders in dimensions that deflect and balance this single-mindedness, may reduce efficiency, but it increases the resilience or sustainability of the network, by reducing unintended consequences that result from such isolation and exclusion. For SMEs, this may mean engaging with or even adding stakeholders within the network that have been ignored in the past.

This empirical explanation of why both extremes — hyper efficiency/capacity and excessive diversity/smallness — lead to economic instability also provides new clarity on several pressing economic conundrums. QED, for example, explains exactly why "too big to fail" actually means "too big to be viable." In fact, the same excessive size, efficiency and capacity that leads to monopolistic dominance by a small number of organizations, also erodes the small-scale economic root system, and pushes the economic system as a whole towards brittleness and potential collapse (i.e., "un-sustainability").

Similarly, understanding the balance needed between large-scale and small-scale organizations, also creates a new view of the current political battles being fought over local SME networks versus global MNEs. Currently, the battle between small, responsive, local economic networks and the massive global economy is usually cast as "protectionism" on the one hand, versus "free trade" on the other. Here, MNE-favoring economists warn of the consequences for any local economies that artificially impede global trade, while those concerned with local economies decry the impact of globalization on local enterprises, environments and communities.

What most people don't know is that, over the last 30 years, neoliberal²¹ economists and politicians have pushed a radical free-trade agenda — focused on deregulation, privatization, and rolling back labor, environmental and anti-trust protections as well as taxes on the rich — that radically favors MNEs over SMEs. Consequently, just as QED predicts, neoliberal policies such as NAFTA and WTO “structural adjustments” have led to: massive, large-scale concentration; serious erosion of SME networks and businesses, particularly in the developed world; “jobless growth,”²² and increasing global economic instability.

Consequently, while the combination of regulations, protections, taxes and other policies needed to strike a balance between large and small is complicated and hence controversial, QED provides a clear theoretical basis for why the current, black-and-white neoliberal vision of the unerring benefit of totally unfettered giants is a recipe for disaster for every sector of the economy, large, small and middle. The loss of US jobs in the name of the “efficiency” of outsourcing to low cost labor sites and the massive consolidation leading to excessive size of banks and of MNEs over the last 30 years exemplify how this exaggerated emphasis led to widespread brittleness and the erosion of economic root system.

2.3.7 Connecting Network Concepts to the Tragedy of the Commons

As we've seen, SMEs exhibit two fairly distinct patterns of organizational behavior in the global economy based on the boundaries, stakeholders, and size and scope of the networks to which those SMEs belong:

The first pattern is the specialized SME that intentionally focuses on smaller niches and markets and relies on interdependence and interconnections of these small networks to provide rapid feedback and value. In such networks, expanding the size or abundance (opportunities) within a network must also be accompanied with expanding opportunities for a wide variety of stakeholders as bounded by the recognition of the value of interdependency and the security of self sufficiency. This type of local network adds value to the SME and the SME produces value for the network.

Within a highly interconnected, self sufficient, interdependent network with formal, informal, regular and random connections, and where growth is dependent on expanding opportunities and connections for as many stakeholders as possible, there may also be opportunity for greater or more effective *democracy*. Similarly, the economic pattern described earlier as *free enterprise rightly understood* might arise from a network where all nodes could be linked and bounded equally by an environmental and social commons, which could be envisioned as the ultimate boundary of natural and social capital.

The second pattern of SME behavior results in formation of much larger, more random, less bounded, ad hoc networks, which are focused on competing in global markets, and which, by

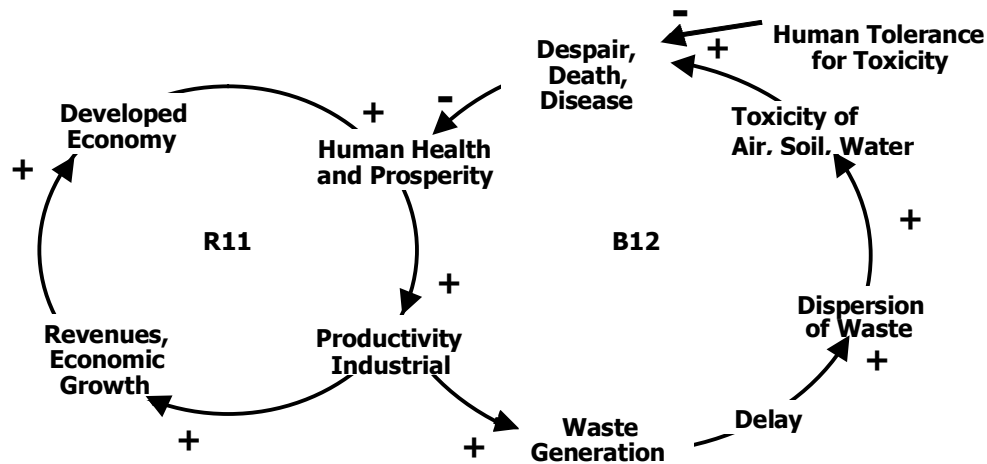
²¹ Rising to global dominance under Ronald Reagan and Margaret Thatcher in 1980, neoliberalism is both an economic and political philosophy that holds that the economic malaise (particularly that of the 1970s) is the result of too much government intervention in the free market. Also known as the Chicago School or simply the “Washington Consensus”, neoliberalism is now the dominant theory of both US political parties and major global institutions such as the WTO, IMF and World Bank. See <http://en.wikipedia.org/wiki/Neoliberalism>

²² Jobless growth refers to an increase in GDP (overall volume of monetary flow) accompanied by a decrease in the number and quality of jobs. In flow-system terms, jobless growth indicates monetary flow is concentrated in small circles of flow at the upper levels of the economy, and is not reaching the grassroots or even middle-levels of the system.

definition, cannot be as tightly interconnected (Manring and Moore 2009). This second type of SME behavior attempts to take advantage of the inefficiencies caused by the inertia and incumbent friction of large centralized organizations, and uses networking in their supply chains to provide the goods and services with greater efficiency (Hart and Simanis 2008). It also uses its size and monetary power to push for policies that further support continued escalation of size. Goerner, et al. (Goerner, Lietaer et al. 2009) show that this excessive support for the large-scale organizations leads to the kind of economic brittleness seen in the global crisis that began in 2007.

Furthermore, because isolated stakeholders lack the connections and interdependencies of more bounded networks, the larger, less interdependent networks cannot provide the vision and feedback loops that ensure the proper sustainability valuation or even a definition of the “commons”²³ beyond a short-term profit motive (Moore 2009). In such networks, inadequate policy-making and stakeholder disconnection and isolation may allow SMEs to avoid or just ignore their effects on the commons for a short period of time. This discounting of the commons may continue until whole systems — that stakeholders often did not even know existed or were being used by others — collapse (unintended consequences). This is of course the “Tragedy of the Commons” (Harden 1968). Figure 2.4 describes the archetypal behavior of this “Tragedy of the Commons” or “Limits to Success” viewed in the context of network behavior.

Limits to Success and the Sustainability Challenge



Copyright 1999, Seed Systems, Inc

Figure 2-4 Archetype Behaviors “Limiting Success”

The behaviors (above), described by Seed Systems, Inc. in the context of sustainability, are based on Senge’s archetype behaviors “limiting success” (Senge 1994). While growth reinforces economic development and many positive outcomes result (R11), unintended consequences produce balancing effects (B12) thereby limiting growth. Reducing unintended consequences can create additional efficiencies and speeds sustainable development. Unintended consequences are reduced when environmental and social stakeholders are fully connected and feedback is rapid.

²³ The role of NGOs and voluntary third party social and environmental management accreditations appear to be increasing to fill this void.

By contrasting the opportunities available with a single focus on maximizing only financial returns versus those available when maximizing financial, environmental and social responsibility simultaneously, Hart (Hart 1997) helps envision why opportunities increase as a result of using a TBL strategy (see Figure 2.4). In this view, incorporating the Sustainability Lens not only helps the environment, but also increases opportunities by expanding the number of possible stakeholder nodes and connections within the network (Wilber 1996; Hart 1997; Capra 2002; Hart and Milstein 2003; Sullivan 2004; Hart 2005). Forming new connections also increases the interdependencies of all members of the network(s). Ostrom, who recently received the Nobel Prize for Economics for her works on resolving common resource challenges and involving enterprises, also demonstrated that the more financial, environmental and social networks expand and create opportunities, the greater the number of stakeholders that are involved connect and benefit (Ostrom 1990). In *Panarchy*, this is also made quite clear (Gunderson and Holling 2002) through five points required for constructive changes in enterprise behaviors to promote resilient, sustainable development:

- Identify and reduce destructive constraints and inhibitions on change, such as perverse subsidies
- Protect and preserve the accumulated experience on which change will be based
- Stimulate innovation in a variety of safe-t-fail experiments probe possible directions, in a way that is low in costs for people's careers and organization's budgets.
- Encourage new foundations for renewal that build and sustain the capacity of people, economies, and nature for dealing with change.
- Encourage new foundations to consolidate and expand understanding of change.

Consequently, when the idea of markets is examined through the Sustainability Lens, some important factors begin to emerge. When a market is an integral part of a community or local network, thanks to interconnections and interdependencies, it is possible to quickly identify and isolate behaviors that damage the commons. If there is a company that pays low wages, pollutes the local river and engages in other unacceptable behaviors, the feedback loops are short and the company is set upon by its neighbors. The company either quickly resolves the issues or is put out of the network because no one will do business with them, because they are damaging the common good. In this way sustainability is defined as conserving the ability of a community to adapt to change by retaining the resources to survive and thrive when disruptions occur. This happens effectively when the dynamic TBL connections form the glue that builds dynamic resilience and abundance in markets.

In contrast, global networks are often isolated from stakeholder diversity and single-mindedly focused on a short-term measure of efficiency. Because of the "observation limits" described by Watts (Watts 2003) and the "delays in system loops" described by Senge (Senge 1990), it is much less likely that damage to the environmental or social commons that occurs half a world away from one node will be reported and quickly impact network behaviors.

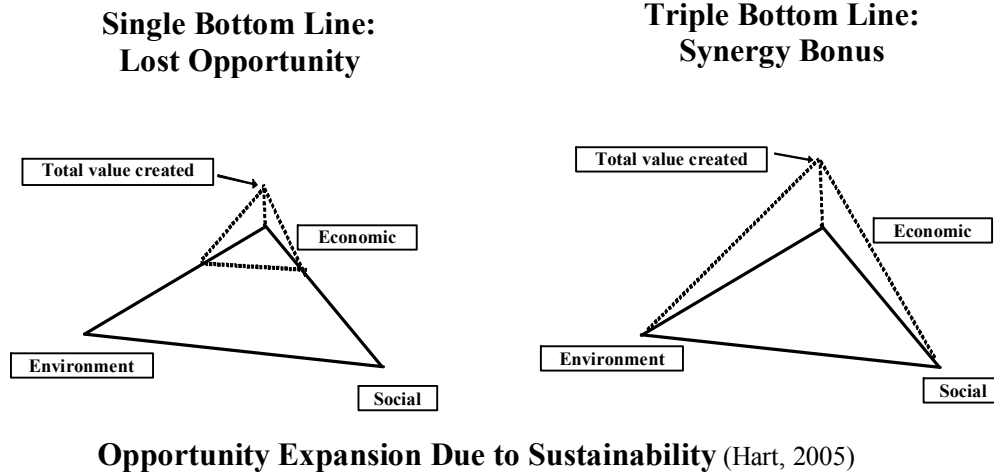


Figure 2-5 Opportunity Expansion Due to Sustainability

According to Hart (Hart 2005), the number of stakeholders available to a firm that embraces the total diversity of stakeholders in a market increases the total opportunities. A good example is: “What is the value of one fax machine in comparison with its value when 10,000 fax machines are networked together. Another analogy is from the Allman Brother’s Song, “Wolf a Howlin’,” “Its hard to live your life in color when all you see is black and white” (Alman 1995).

At the same time, one of the conundrums of managing SME network behavior is “whether to” or “how” to retain the innovative forces of capitalism by allowing successful members to achieve a higher “quid pro quo” for their innovations and higher efficiency without taking undue advantage of the commons or any other stakeholder’s opportunities. This thesis author proposes that one mechanism to allow higher rewards for higher producers without creating a “tragedy of the commons,” might be through formation of Small World networks that can achieve certain short-term goals *without* isolating stakeholders in the process, and while evolving naturally in an interconnected and ad hoc manner. While the specifics of this process remain unclear, the truism of “think globally, act locally,” must play a role in such dynamics.

Adding Corporate Social Responsibility (CSR) and Corporate Environmental Responsibility (CER) to the mission and boundary conditions of a network can also help reduce the unintended consequences and facilitate the balancing loop influences caused by social inequity and environmental impacts. By reducing unintended consequences and inequitable quid pro quo at the expense of the commons, and by inclusion of diverse stakeholder connections and more equitable quid pro quo for common resources, the benefits of development are encouraged to expand more freely with a lower probability of collapse (Adams 1997; Brown 2003).

SMEs and their networks are adapting to CSR and CER mandates using third part certifications and audits and using their consequent enhanced credibility to gain market acceptance, but this is not as an efficient mechanism as the interconnected feedback loops found in local or regional networks.²⁴ As SMEs adopt CSR and CER, they also become more resilient (sustainable) by

²⁴Beginning in late 2008, Chinese factories began complaining to major retail brands such as GAP that a huge percentage of their manager’s time was being spent on handling a never ending stream of third party auditing teams performing CSR and environmental compliance audits. In a meeting in San Francisco, California at the GAP corporate headquarters, in early 2009, it

adding TBL opportunities and new stakeholders, instead of decreasing both via destruction or consumption of common resources. This increases the value of both the SMEs and the networks to which they belong (Adams 1997; Hampden-Turner and Trompenaars 1997; Wheeler, Mckague et al. 2005).

Large global firms have “seen the light” that an environmental “tragedy of the commons” (Harden 1968), the resulting requiem scenario (Senge 2004) and poverty would not provide the best conditions for business. They also recognize that there is the potential of adding billions more customers and workers if economic development can occur sustainably (Hart 2005). With meta-communications and globalization of trade, small firms now also have the ability to achieve the market breadth, once only available to large firms. This literature review indicates the mechanism of this development will be achieved through networking.

However, it is important to acknowledge that long distance, more ad hoc SME networks have behaviors and structures that are also dangerously different even from a multi national corporation’s (Aldrich 1999). Being focused on short term, single-dimensional goals, ad hoc SME networks may be more efficient cost-wise but have fewer direct connections to the communities and societies in which they work. These broad and in some cases global networks are currently struggling with the discrepancies between local, regional and international policies and regulation. Adoption of CSR and CER with a global perspective help can eliminate these discrepancies and provide networked SMEs a real opportunity to outperform traditional, global corporate organizations in all dimensions (Wheeler, Mckague et al. 2005). Since delays in feedback can be insidious to society and to the environment, the more efficient global communications systems become, the more difficult it will become for global, ad hoc, SME networks to avoid feedback from damages to the environmental or the social commons. Consequently, as feedback delays decrease, the adoption of CSR and CER (and voluntary, NGO- and third-party certifications of them) is becoming increasingly important (Hawken 2007).

2.4 Summary

This chapter examined the realities and the science of networking on strategic development among SMEs. Becoming aware of the differences in structured, rational, bounded networks and less rational, more random, ad hoc networks should be an important part of any strategic planning process. Network mapping is a tool that can aid SME’s leaders in visualizing and analyzing their firm’s stakeholder network and help it to create understanding and focus on new opportunities both for present value creation and for future value creation for them as they invest in sustainable strategies.

The conclusion from this exploration of network behavior is that creation of viable networks can increase the opportunities, value and the market breadth of individual SMEs. However, care must be taken to ensure diversity and interdependence, or the networks may become brittle, lack resilience and will be too narrowly defined to survive and thrive. It is also quite important to remember that network boundaries and behaviors are dynamic. These are not static structures and should not ever be judged as such.

was reported that as much as four days per week were spent with auditors by Chinese firms manufacturing shoes and textiles for US brands.

While the works reviewed in this chapter lent support to the thesis that small and medium-sized enterprises are performing increasingly critical roles within their respective national economies and the world at-large, it is acutely evident that the empirical study of SMEs is in its infancy, even within developed economies. To begin to study SMEs through a sustainability lens as envisioned by Hart, Holling, Goerner and the many other scholars, publishing in critical journals, is even more critical.

At the same time, it appears that the driving force behind the rising importance of SMEs is their *capacity for product and process innovation, which, in turn, depends upon their ability to benefit from knowledge spill-overs grounded in network collaboration and synergies*. This capacity will undoubtedly gain strength as ongoing globalization processes enable SMEs to draw upon world-wide information flows while building complementary tacit knowledge through contacts with network members. There are fundamental economic, market and social definitions, however, that must be realigned if SMEs or nested networks of SMEs are to emerge as a possible answers to the conundrum of “local vs. global”.

The evolving role of global sustainable development is likely to accelerate this trend by expanding the number of stakeholders and SMEs. SMEs have not yet realized their full potential as exporters, sources of direct investment, and of cross-border technology transfer. Nevertheless, we can reasonably posit that the same network resources that they enjoy within their local, regional or national economies could facilitate their internationalization and, hence, increase their function as conduits for technological diffusion that provide a welcome alternative to the tight control that MNEs have exercised on the dissemination of technical advances. The rise of small firms such as GOOGLE to become giants is a clear indication of how powerful SMEs can be as an incubator of innovation.

As this occurs, SMEs will build upon their ties with the local communities, going beyond their robust job creation function to build social/human capital for the common good. It is this dependence on interrelationships and interdependence that should accelerate and increase the positive role of the SME, not only in the global economy, but in a sustainable global economy. However, the links between doing well economically and doing “good” for the global social and environmental commons must be forged.

Unfortunately, since the largest man-made network, the internet, has only been studied since the 1980’s, the science of man-made networking is in its infancy. However, our understanding of natural systems and how they have survived and thrived through many changes is increasing. How will this emerging understanding of network mechanics and architecture influence the formation of such networks? Can networks of SMEs be held accountable for their behaviors by society more efficiently than MNEs? These remain vital questions, which only can be answered by a more complete understanding of the reasons SMEs choose to become more sustainable enterprises.

3 Frameworks and Tools for Developing a Sustainable Enterprise Strategy

This chapter addresses the need for a formal planning process that incorporates network analysis as a part of integrating sustainability into the traditional planning frameworks for SMEs. It proposes an expanded strategic planning process based on: 1) an integration of Stuart Hart, Montalvo and Bob Willard's distinct approaches to sustainable value-creation for SMEs; 2) network analyses and mapping used to focus Intentional Network Development; and the use of the Sustainability Lens for strategic differentiation and value enhancement.

It is clear to this thesis author that Montalvo (Montalvo 2002), Hart (Hart 2005), Hawken (Hawken 1993), and Willard (Willard 2002) among many others are correct: the most important link that can be forged to accelerate formation of sustainable enterprise is for "more sustainable" enterprises to be *more successful by creating greater value for their stakeholders*, than their "less sustainable" competitors. Hence, this chapter investigates the frameworks of Hart, Montalvo, and Willard in depth because their approaches: 1) engage the concerns of owners and stakeholders, 2) produce strategies for growth and organizational capabilities for learning; and 3) create financial incentives for growth. These frameworks, together with a growing global sensibility that non-sustainable behavior by any individual or organization is unethical and dangerous, may begin to produce a firm path towards sustainable enterprise for SMEs.

3.1 Introduction

This thesis author believes that global brand-values may decline due to greater dissemination of information and access to markets and information (Surowiecki 2004; Surowiecki 2004), and bounded yet flexible, SME networks of interdependent stakeholders may come to out perform integrated MNEs, particularly in TBL dimensions. The fact that interdependency and recognition of the value of sustainability for such networks is being demanded by various constituencies globally (Hawken 2007) helps to explain the rapid increases of SMEs globally.

Such SME networks, of course, have a fundamentally different organizational structure than a MNE conglomerate. MNEs rely on the value created by centralized brand value, quality assurance and market breadth, which lead to higher returns on investment on research and development investments to compete (Acs 1988). These assets are funded by channelling profits back to a central location, the home office, rather than by distributing all profits equitably among network stakeholders. An MNE, therefore, could be shown as a network where all nodes are connected to a central point, the central administration. In contrast, nodes in an SME network will act more independently than any division of a single larger firm because the organizational and financial bonds across the SME network are not as strong or as formal as those in an MNE. These bonds have been described in detail (Watts and Strogatz 1998; Strogatz 2003; Buchanan 2002), as have the values, potential behavior, and structure of networked SMEs (Manring and Moore 2004)

Similarly, MNE's "home office" functions help maintain a higher level of stakeholder interdependency, however, funding these administrative functions by reducing the efficiencies of financing can be an impediment to improved value creation in rapidly changing markets. Since networks lack the overhead for funding the central office functions, networks as organizational

structures, may aid in promoting innovation by reducing organizational barriers to creative destruction change mechanisms (Schumpeter 1942), and may also shorten innovation cycles (Surowiecki 2002).

In this way, individual SMEs behaving as nodes in a network can bring agglomerated intellectual capital and assets to global markets in a manner similar to MNEs, but without the organizational friction caused by the necessary support of central administration and goals.

The ability of a SME to rapidly integrate with others to create opportunity and to “creatively destroy” (Christensen and Overdorf 2000) or discard less favorable nodes in favor of better opportunities, is a unique benefit of SME networks that are not burdened with incumbent “corporate overheads and interests” (Manring and Moore 2009). In times of rapid market change and short innovation cycles, this ability to discard the old and reinvest in new innovation often gives SME networks a major efficiency asset over more centralized MNE structures. The characteristic for rapid change and decision making reinforces the need for greater diversity in stakeholders and creation of effective boundaries if sustainability is to be a strategic factor. This can be accomplished via local networks to control hyper-efficiency and ad hoc tendencies, i.e., the emergence of brittle networks.

One of the realizations growing out of this thesis research is that developing an strategic process for intentionally cultivating diversity within SME stakeholder networks can aid small firms in developing successful strategies in a “hot, flat, and crowded” global marketplace (Friedman 2008). This research suggests that the opportunities arising from network synergies tend to increase the quality of innovation without reducing speed, and, thus, ensure greater sustainability and long term financial stability for the adopting SMEs. Efficient value creation, as part of local business networks (Blackford 2003), has always been the strength of the SME maintained by quick response, rapid communication and multidimensional value creation.

SMEs will continue to succeed through innovation and differentiation mechanisms in local and regional environments, and are held swiftly accountable by local and regional stakeholders for what they do well and what they do wrong. These standards will be different region to region. For this reason, standardizing an approach to incorporating sustainable strategies into SME operations and practices will be a challenge.

The challenge to the emergence of effective and sustainable SME networks lies in development of planning strategies that utilize the synergies of SMEs to produce competitive, resilient, diverse, bounded, interdependent and responsive enterprises. This means that SMEs must be intentional towards TBL visions and measurements of success and embrace this as enthusiastically as their recognized customer focus.

3.2 Strategic Use of the Sustainability Lens and Intentional Network Creation

As the literature review in Chapter 2 showed, network factors, from stocks-and-flow connections among stakeholders to synergies founded in agglomerations of industries, intellectual assets and network structures, all appear to be very important in SME successes. The Sustainability Lens described in Chapter 1 provides an additional dimension in strategic planning with the potential

to help SMEs expand these network effects further through formation of previously ignored stock and flow connections that can provide new and exciting perspectives (Hart 1997).

Due to their small size and influence, smaller firms have been traditionally perceived as “limited” by their ability to leverage R & D and capital investments across broad markets. In contrast, intentional network formation using potent new communication technologies help open new markets and level the playing fields for SMEs (Acs 1990). The necessary process of merging “clean and green” technologies with emerging economies also provides great opportunities for SMEs to take new green technologies into new markets, such as the Base of the Economic Pyramid (Audretsch 2002; Manring and Moore 2004; Manring and Moore 2009).

When the Sustainability Lens is used to produce strategic value and applied to strategic policy development within SMEs, the role of Intentional Network Selection in SMEs becomes one of understanding the structures, interconnections and interdependences of the network options. This understanding can produce present-value in existing operations, and can project and develop value for the future. This analysis is a key feature of the systems developed to integrate and produce such differentiation.

Greater opportunities also emerge for SMEs by:

- Acknowledging that a paradigm shift in *global* environments -- financial, social and environmental -- occurred near the end of the 20th century;
- Adding this perspective as a normal part of the strategy planning process; and
- Forming new connections and relationships with heretofore ignored stakeholders within existing networks, or through the formation of new connections, stakeholders and/or networks.

As discussed within the literature review, the key to modifying SME behavior through the Sustainability Lens rests on understanding how SMEs networks form and evolve, and how they behave to create improved and more competitive value in a variety of market environments.

- The literature clearly indicates that there must be enhanced value creation for any SME to invest in TBL behaviors and to form new networks based on a sustainability strategy (Montalvo 2002; Willard 2002; Hart 2005; Alvarez and Barney 2007).
- A successful lens should be inclusive of as many of the firm’s stakeholders as possible; it should “fit” within a normalized business-planning framework; and it should lead to increased value for the firm.
- A better understanding of how SME networks form, and how the changing structure and boundaries of their networks influence behaviors when sustainability is introduced as a strategic consideration, must be coupled with the development of a formal strategic planning process for the SMEs.
- A clear and normalized process for inclusion of a Sustainability Lens as a fundamental building block within strategic planning should reduce conflicts and promote mutuality between internal and external stakeholders of the SME, by integrating and empowering stakeholder groups that have diverse objectives (Hawken 2007).

Such a lens should create positive learning loops and a “systems thinking” approach to strategies that reinforce the positive aspects of adoption of sustainable strategies through avoidance of unintended consequences and archetypal behaviors that limit success (Senge 1990; Wolstenholme 2003).

While the connections and intentions can and should be based on ethical principles, business strategy and actions should be grounded in sound management concepts as well. New planning approaches should include the ideas from leading sustainable strategists and organizational behaviorists, focusing strategy sharply on a new sustainable vision for success.

These new sustainability-based approaches must be introduced within a normalized business planning process, with the final results being expanded value creation that includes profits and economic success as well as value creation in environmental and social spaces. Any new planning process, and the ideas behind it, must be rational, realistic and backed by practical examples of success. The process must be normalized enough to be accepted by businessmen, i.e., the owners and managers of the SMEs and their shareholders and lenders.

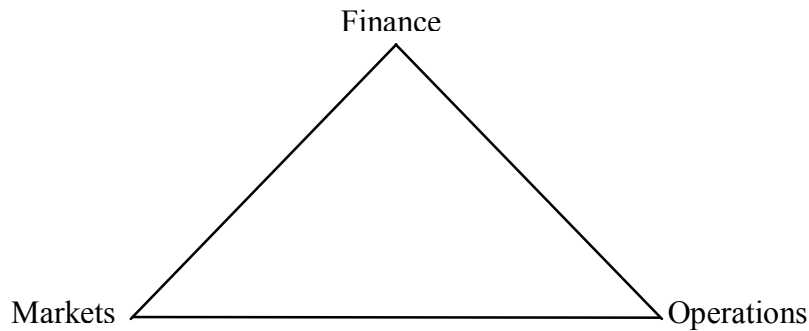
Strategies developed incorporating a Sustainability Lens should be judged as “worthy” or “unworthy” investments through a vetting process that includes rigorous ethical and financial analyses of results by shareholders, lenders, investors, governments and consumers. This vetting process should link and balance financial performance through the Sustainability Lens by equal weighting of social and environmental performance with financial results.

3.3 The Sustainability Lens and the Sustainability Triangle

If strategy is used to preserve and enhance distinctiveness, then strategic planning is a systematic, intentional route towards distinction and improvements in enterprise performance. Typically, most strategic plans include financial projections, sales and marketing projections, a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats), a Research and Development assessment, and an operational analysis. These different forces produce the organizational tension that is the creative force behind strategic planning. See Figure 3.1.

Senge (Senge 1994) described strategic planning as taking the “tensions” outlined in Figure 3.1 and focusing them by defining the “Present State” of the firm. He then asks the organization, through the planning process, to stretch and describe a desired “Future State.” He went further in asking planners to envision the degree of tension between the Present state and the Future state as a rubber band. The further an organization must reach to obtain the desired Future state, the more tension the organization will experience. Try to stretch too far and the rubber band will break; not stretching far enough puts no tension on the organization and thus, produces little tension that induces change.

This thesis author suggests adding a Sustainability Lens (Robert, Schmidt-Bleek et al. 2001) (Hoffman 2000) component and analysis to this Present-state/Future-state, organizational planning matrix. By this process, the company leaders are acknowledging the increasing opportunities from the changing conditions of the global markets and environment, primarily by increasing efficiency and taking advantage of increasingly networked populations of consumers. Figure 3.2 (adapted from Hart 1997) incorporates the Tension Triangle from Bradford (see Figure 3.1) with the ideals of sustainability.



The Tension Triangle Represents the Realities Every

Figure 3-1 The Tension Triangle: Markets, Finance and Operations

Bradford describes strategic planning as producing possible maps towards success by adjusting the tensions of the demands on a business of markets, operations and finances. By increasing the tensions that must be resolved to include environmental and society as equally important stakeholders, adding the Sustainability Lens to Figure 3.1 places this entire triangle as the economic leg of the TBL. (From (Bradford and Bradford 1990).

The Sustainability Triangle

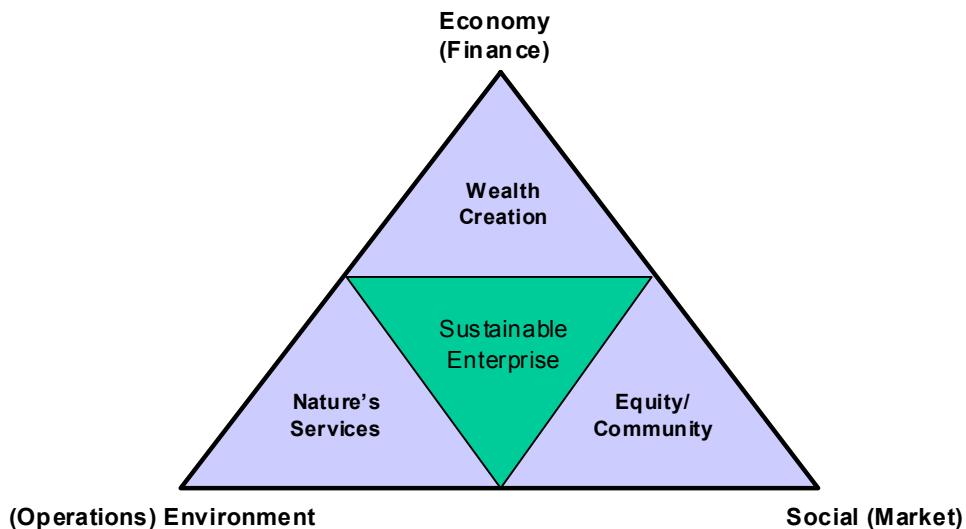


Figure 3.2 The Sustainability Triangle

Modification of Figure 3.1 to include broader stakeholder issues demonstrates the fusion of the company's operational tensions within the context of the insights form applying a Sustainability Lens to it. Adapted from (Hart 1997 and Bradford and Bradford 1990).

The addition of environmental and social considerations in addition to profitability as an integrated objective for enterprise strategy dramatically increases the number of stakeholders, the number of connections between stakeholders, and variables that must be considered and managed, i.e. complexity. Conscious understanding of network effects (Watts 2003) and Panarchical cycles (Gunderson and Holling 2002), provides the link between intentional network analysis and the strategic planning process (Watts 2003; Sutcliffe, Weick et al. 2005).

Understanding and then controlling the complexity formed by the addition of social and environmental stakeholders should produce network synergies and benefits for customers and produce value for firms engaged in such activities within the network.

3.4 The Importance of an SME Strategic Planning Process

Network analyses that integrate large numbers of stakeholders to include environmental and social considerations in balance with both short and long term economic returns must be directed into a business planning process for SMEs to fully realize the benefits of a sustainability-based business strategy.

In most large firms, especially those that utilize public markets for financing, strategic planning is an ongoing process. Yet, though it is a part of prudent management and is a fiduciary responsibility, SMEs have not usually been known to fully embrace formal strategic planning processes (Perry 2001).

Many leaders of small businesses see the concept of strategic planning as ineffectual, in part because the world changes so rapidly, and also because of the lack of connection between strategic planning and prosperity. This thesis author, however, argues that there is a difference between taking quick tactical actions that are not aligned due to a lack of coherent strategy, and developing a strategic plan for being effective, innovative, and creating long-term value. The following quote from Michael Porter goes directly to the heart of why strategy development is so important to building value within enterprises (Porter 1996):

The myriad activities that go into creating, producing, selling, and delivering a product or service are the basic units of competitive advantage. *Operational effectiveness* means performing these activities better—that is, faster, or with fewer inputs and defects — than rivals.

Companies can reap enormous advantages from operational effectiveness, as Japanese firms demonstrated in the 1970s and 1980s with such practices as total quality management and continuous improvement. But from a competitive standpoint, the problem with operational effectiveness is that best practices are easily emulated. As all competitors in an industry adopt them, the *productivity frontier* — the maximum value a company can deliver at a given cost, the best available technology, skills, and management techniques — shifts outward, lowering costs and improving value at the same time. Such competition produces absolute improvement in operational effectiveness, but relative improvement for no one. And, the more benchmarking that companies do, the more *competitive convergence* there is — that is, the more indistinguishable companies are from one another.

Strategic positioning attempts to achieve sustainable competitive advantage by preserving what is distinctive about a company. It means performing different activities from rivals, or performing similar activities in different ways.

Whether the firm is large or small, strategy is intentionally used to position the company: to enhance and develop a plan of actions to maximize competitive advantage from what is distinctive or unique about a particular firm. The firm can be a low cost provider, such as Wal-

Mart, or be a highly differentiated pharmaceutical manufacturer like Amgen. However, if they are successful enterprises, they have clarified:

1. Why they are successful;
2. The networks in which they wish to operate;
3. The assets they have to work with;
4. That plans are necessary to ensure continued success.

The value propositions for these firms of SMEs in the global economy are as diverse as the world markets. Some use geography and size to be low cost producers (generally regional) and others are highly specialized, unique producers of goods and services whose markets can span the globe. Since planning behaviors in smaller firms remain a bit of a mystery, any tacit strategy or formal process for developing a guiding strategy these SMEs might have is generally unknown (Acs and Audretsch 1987).

A fully articulated intent for the strategy development process in SME firms is less defined than in large MNEs (Hansen 1992). In many cases, especially during the start-up phases, many SMEs seem to have almost an instinctive or informal reactionary development of strategy (Chell and Baines 2000) based on a highly iterative planning behavior with very short cycles of evaluation (feedback). This appears to be a successful development process, and is, in fact, one of the recognized efficiencies of smaller firms (Shane 2000). Small size, rapid feedback, and rapid changes in behavior make SMEs nimble, quick to change, and efficient in such environments, but a lack of strategic focus can produce a management sense of being busy, without achieving necessary objectives (Barnett and McKendrick 2004).

Regardless of which theory of entrepreneurship or business development one favors (Shane 2000), the role of planning for small firms, even in the highly disruptive or entrepreneurial environment of globalization, is to provide focus on developing and increasing value (Shane and Venkataraman 2000). SME business plans conceived in highly uncertain, entrepreneurial settings will be less rigid and less formal; sometimes appearing as only simple, broad, strategic guides. In this dynamic environment, optimization and sharply defined goals are replaced with an approach, which acknowledges that each opportunity and the resulting strategy to address it may be unique. Planning in this setting will suggest the general direction an SME is likely to head, but the plans will be fluid as they are subject to numerous fundamental changes due to the fluidity in markets. Indeed, in a start-up situation, it would not be uncommon for successive business plans to form in rapidly changing environments, to have little in common with each other (Buehler and Griffin 1994). As the discovery process and the resultant formation process unfold, the companies may be forced to redefine their potential customers. They might also have to redefine the industry or market within which they are operating, their core technologies, and the opportunities they are looking to exploit (Bhide 1992; Bhide 1999; Christensen, Anthony et al. 2004). In other words, they are joining or developing networks and changes in stakeholder connections as they develop an ongoing value proposition.

These numerous and fundamental changes of direction by SMEs do not imply that SMEs are necessarily “poor planners,” nor does it imply that their planning process is broken. Instead, SME behavior reflects the lack of information SMEs have about the business opportunities they will ultimately exploit. SMEs generally do not have the resources and confidence to be as

assured as larger firms with their planning abilities. Moreover, SMEs are comfortable with flexible decision-making that is adaptive to the changes required from new information and knowledge that is created through the enactment process (Garud and Kotha 1994). Under conditions of high uncertainty, the features of flexibility, adaptability (Weick 1979; March 1991) and absorptive capacity are more valuable than detailed strategic, financial, and market analyses (Mintzberg 1994; Bhide 1999).

However, in start-up situations, even entrepreneurial SMEs, while requiring great flexibility, still need some fundamental direction on the financial, ethical, and innovation approaches the SME is going to take, and the networks in which it intends to participate (Audretsch 1991). It is this intentional process of network analysis that is new in terms of traditional approaches to SME's strategic planning.

Such network analysis planning is even more fundamental to strategy development, if the conditions of rapid population growth, ecological decline, materials scarcity, and expanding economic competition, described in the introduction of this thesis, are assumed to be valid. Adding these assumptions to the reality of the immediate business situation in which SMEs must operate, requires the intentional addition of a Sustainability Lens, within a planning process; this addition should result in better analyses and decision making (Montalvo 2002).

Perry's research (Perry 2001) on the value of formal, written, business plans for SMEs found that firms with greater than five employees that used a formal planning process were more successful. As he says, "if your small business employs five or more people, you should consider engaging in planning activities... because doing so may enhance your chances of survival and success" (pp. 202-203). Perry defined a basic planning process as answering the following questions:

1. Does your business prepare a written sales forecast?
2. Does your business prepare a written forecast of cash requirements for at least 12 months into the future?
3. Does your business prepare a written staffing forecast?
4. Does your business prepare a written pro forma capital expenditure forecast?
5. Does your business analyze its competition and prepare a written identification of strategies and measurable goals, which extend three or more years into the future?

Question 5 gets to the basics of how emerging environmental and social conditions can be integrated into SME planning. Answering the first four questions within Perry's simple planning template produces important tactical operational information. An emphasis on sustainability can also help the firm to produce important new efficiencies that will affect sales, cash needs, staffing, and capital expenditures.

It is very important that sustainability, as an intentional strategy, provides a positive influence on present value as well as on future value (Willard 2002). Indeed, the author will show that the sustainable strategic frameworks chosen as tools in the proposed planning approach must provide for enhanced present value creation, internal and external to the SME, in addition to future value creation via innovation and networking (Christensen and Raynor 2003).

3.4.1 Planning for Value Creation

SME networks must also be resilient and responsive to needs for rapid change. To reiterate, the world population is increasing and social unrest, technology shifts, economic cycles, natural disasters, etc., can disrupt markets. Since competition for resources is fierce and resources are becoming scarce, improved efficiency and more resiliency is increasingly important for small firms.

The focus of strategy development for SMEs must assume that as the rate of global economic development and competition for all forms of capital increase, the value of understanding and then utilizing network complexity, in all its forms, also increases. The importance of creation of strategy that embraces dynamic resilience should not be forgotten. This is the where understanding where a particular network or market resides within its broad cycle of stakeholders becomes a key tool for success (Sutcliffe, Weick et al. 2005).

By definition, using a Sustainability Lens *includes* previously excluded, external stakeholder needs and provides an expanded, value definition beyond simply producing at the lowest cost. The new value definition must include including the integration of the global network's social, environmental and economic values if it is to remain dynamic and flexible enough to avoid becoming over conservative and ripe for outside disruption (Gunderson and Holling 2002; Hart 2005).

The process of intentionally developing the firm's value definition or formal *value* proposition is critical to the final outcome of any strategic planning process. As the first step in strategic development, this process leads to a coherent vision for the organization that is firmly grounded within a set of values and that leads towards a fully aligned mission and goals. This step is extremely important in the appreciation of strategic planning because it powerfully influences the firm's vision of the networks it chooses to join, the priorities of its actions, etc.

For SMEs, value creation evolves most clearly from understanding and responding to the needs and desires of their stakeholders and managers. As the primary basis for strategy and enterprise mission development, a defined value proposition should directly influence the products and services that an enterprise brings to the market. The inclusion of a Sustainability Lens can help catalyze a strategic emphasis on value creation while also helping the company become a differentiated producer by achieving a "truer" efficiency (Brown 2003).

Figures 3.3 depict concepts that can be used to support the development of value definitions from a perspective based on the current situation facing SMEs as explained in the first two chapters of this thesis.

Figure 3.3 presents one approach to broadly defining strategic intent. These ideas, based on a synthesis of ideas from:(Porter 1996; Hawken 1993; Capra, Pauli et al. 1995; Wilber 1996; and Sullivan 2004) rests on the premise that the world is a very complex and highly interconnected place and that the "value" in its broadest sense is increased by cooperation and expanding network opportunities for as many stakeholders as possible. The idea is to create as many winners as possible and minimize or eliminate creating losers. This can be further described as moving from a finite game to an infinite game philosophy (Hampden-Turner and Trompenaars 1997).

There is a need to define “value” in order to achieve a vision that helps the firm differentiate itself via its actions. Value is defined by the costs or the price paid for the goods or services or investments and the benefits realized as a result. The greater the perception by the customer that complexity is controlled by a company’s goods and services due to the benefits they provide, even if they are intangible or not adequately accounted for, the less dominant selling price become in the buying consideration for the customer.

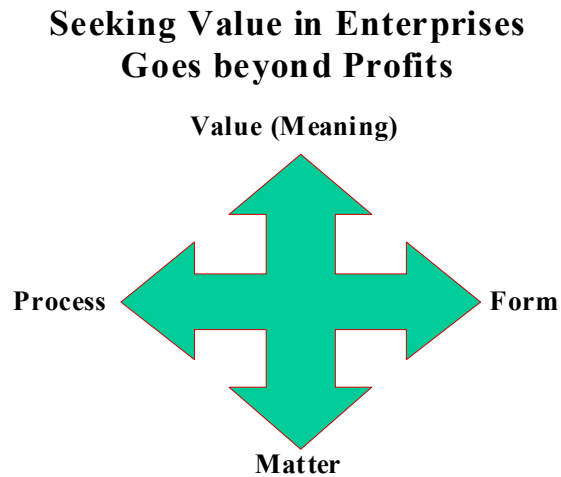


Figure 3-3 Seeking Value in Enterprises Beyond Profits

A synthesis of the works of (Capra 2002 and Wilber 1996), this figure presents an integrated view of stakeholder’s value in the context of all inputs and outputs of a business. This holistic approach broadens the idea of value to include all aspects of an organization’s influence. The figure is to help corporate leaders better understand the business’ processes — the materials it uses, its products and organizational forms — as the perceived interfaces between a business and the world towards defining value for the firm. (Meaning) is created and sustained by Organizational (Form) and Communication (Process). Organizational Culture generates Value. Organizational artifacts (products and services) communicate meaning to society. (Adapted from Capra 1982).

If the value proposition for a business’s goods and services is highly differentiated by the tangible value of the product or service, or even perhaps by the characteristics of the enterprise, then, it is possible to build a strategy based around these characteristics. For the purposes of this thesis, the suggested differentiation is focused on developing an organizational TBL philosophy and strategies that provides a wide bandwidth of benefits across economic, ecological and social spectrums. How can adoption of TBL strategies increase the value of products in the marketplace?

Many US consumers define economic value by the price one pays for goods or services. The value is determined by the complexity that is controlled by the product or service verses other products in the market. When there is the perception that the product is a commodity,²⁵ and there lots of competitors, no discernable quality differences, then selling price is the differentiating attribute for selling this product or service. If a company produces commodity goods and services then, the strategic emphasis must be on lowering costs. If cost savings are done to the

²⁵ Meaning, a good or service whose wide availability typically leads to smaller profit margins and diminishes the importance of factors (as brand name) other than price.

detriment of any environmental or social stakeholders (commons), then the value may only be short term and artificial (Brown 2003) creating a market advantage that is brittle and short-lived. Conversely, if the dominant strategy for value creation is to control as much complexity as possible within a product or service, then costs, as a single value determinate, become less dominant. A strategy devised to differentiate an enterprise by controlling complexity for all its stakeholders, intentionally controls as many important variables for customers as they are willing to pay for. This broader value spectrum creates demand for the product or service, which in turn produces organizational distinction in the eyes of the market, that is, it increases value of the company as well.

For example, the following companies have used or are trying to adapt sustainability as a point of differentiation:²⁶

- IKEA- has a focus on value pricing, functional Scandinavian design and sustainability. There is an emphasis on a value proposition that focuses primarily on design, sustainability and then price. The history of IKEA has shown that design and sustainability are points of high differentiation.
- Wal-Mart- has always been focused on selling commodity products at the lowest possible price but has recently begun to focus on sustainability to attract customers with higher incomes and a greener sensibility and to lower operating costs.
- Whole Foods, Inc. – a grocery store focused on local, sustainable, organic food products. Its prices are very high in comparison to Wal-Mart or other grocery chains and has completely differentiated itself from other chains by not offering commodity products

In short, working with the complexities of sustainable development should enhance the value propositions for firms seeking greater efficiencies and lower costs as well as for firms seeking to differentiate themselves through provision of specialty products and services. This can lead to creation of abundance and expansion of opportunity and creation of more dynamic and resilient systems (Gunderson and Holling 2002) (Adams 1997; Hampden-Turner and Trompenaars 1997).

3.4.2 Seeking Cooperation for Improved Efficiency by Embracing Complexity

Using game theory, Axelrod found that in complex systems, mutual advantages can be obtained through cooperation (Axelrod 1984). (Watts 2003) and (Strogatz 2003) define this phenomenon in terms of network behaviors, including synchronization.

Cooperation, as a strategy, has been described as moving from a finite game of lowest costs and profits for a few, towards an abundant infinite game creating value for as many as possible (Hampden-Turner and Trompenaars 1997). This is accomplished through intentionally engaging the market and the world as a very complex place and seeking abundance through efficient cooperation for a multiplicity of stakeholders and customers. This complexity includes environmental and social considerations that were mostly ignored during the industrial revolution as there were no apparent limits to growth (Meadows 1972). Infinite game behavior,

²⁶ The conclusions on the value propositions for these firms were reached by consensus in a General Studies Class taught by the thesis author at Elon University in 2007. The student's presented case studies of firms where they were asked to rank the primary value proposition of firms from literature and advertising research, seeking points of differentiation.

therefore, it is in contrast to controlling only one dimension (costs), which is frequently obtained through an isolationists' disregard for the global commons (Harden 1968; Costanza, Graumlich et al. 2007). Value creation in firms by attempting to benefit from the complexity created by "sustainability" can result from an intentional strategy of creating current abundance for as many stakeholders as possible, without discounting future value; this should be possible if society ensures that resources are available for future generations. Creating abundance for all expands the opportunities for all (Hampden-Turner and Trompenaars 1997; Sullivan 2004). If such complexity is to be addressed by small business, then business planning that addresses this additional complexity becomes even more necessary; such functions are usually not present in SME's planning templates (Bradford and Bradford 1990).

To address the challenge of inadequate SME planning in any form, simple systematic approaches to strategic planning, tailored specifically towards SMEs, have been developed. One such approach was produced by The Center for Simplified Strategic Planning (CSSP) in Vero Beach Florida, USA. This plan is marketed through workshops presented by the Michigan State University (Bradford and Bradford 1990)²⁷. This plan contains the templates and procedures for developing a "traditional" strategic plan for SMEs that answers Perry's (Perry 2001) basic inquiries for strategic plans, but it does not include a lens for taking into account the "Hot, Flat, and Crowded" conditions of the 21st century. The stakeholder definitions used are too internal and too narrow in this thesis author's opinion. The emphasis is on a simplified, highly structured approach centered on present value financial performance. However, the CSSP plan offers plenty of flexibility within their method to integrate a Sustainability Lens that includes tools such as network mapping and analysis, a present value, future value matrix and ROI calculations for investments.

3.4.3 Creating a Strategic Planning Process for Building Sustainable SMEs: Incorporating the Sustainability Lens and Hart, Montalvo and Willard's Frameworks

Today, there is no Sustainability Lens in Bradford's or any published "simplified" strategy development framework that is truly appropriate for SMEs. This section's objective is to provide frameworks for such a strategic planning module.

As the following paraphrase of Bradford (Bradford and Bradford 1990) indicates, he defines strategy in much the same way as Porter (Porter 1996):

"Strategy," Bradford believes, is the leadership's sense of vision to the overall course and direction of any endeavor or enterprise, be it war, government, a profit-seeking business, a non-profit organization, sports, one's personal or one's family life.

The term "strategic planning" refers to a coordinated and systematic process for developing a plan for the overall course and direction of the endeavor or enterprise for the purpose of optimizing future potential. For a profit-making business, this will involve questions as to "what shall we sell," "to whom shall we sell it" and "how shall we beat or avoid competition?" It may well involve other questions, such as; ownership and capital structure. The central purpose of this process is to assure that the course and

²⁷ See <http://www.cssp.com/>

direction is, sound and appropriate and to assure that the limited resources of the enterprise (time and capital) are sharply focused in support of that course and direction. (Bradford and Bradford 1990, pp. 1-23)

Note that Bradford does not mention external stakeholders beyond customers, no mention of the environmental or social commons, and no mention of sustainability. Therefore, the logical next step for incorporation of sustainable strategies into a formal planning process for SMEs is to condense the work of some of the leading practitioners of sustainable enterprise into a systematic, but also simplified approach, and to then incorporate them into a process, does not ignore the environment and society.

This thesis author moves beyond Bradford's framework (Bradford and Bradford 1990) with the ideas of three practitioners found to have developed appropriate tools for SME's sustainable strategic planning: Stuart Hart of Cornell University, Montalvo of Erasmus University, and Bob Willard, author and consultant.

3.4.4 Hart's Strategic Planning Framework

Stuart Hart of Cornell University's Johnson School of Management has developed a strategic planning framework that maps sustainable investments, actions and value creation within a shareholder value matrix (Hart 2005). Beginning in the mid 1990's, Hart's history of publications provides evidence that current economic development practices are not efficient or resilient enough to address the needs of the developed economies of the west [see (Hart 1997; Hart and Prahalad 2002; Hart and Milstein 2003; Hart 2005; Hart and Simanis 2008)]. He concludes that, if development practices are not changed, today's current best practices will certainly be unable to meet the needs of an additional three billion people by the end of the 21st century.

Hart further believes that enterprises can adapt to provide the necessary goods and services by discovering competitive advantages by using a Sustainability Lens to redefine "value" and "success." However, Hart also believes that there must be a new intentional strategic approach to discover such advantages. Hart describes a strategic framework that enables an enterprise to map the value proposition for various sustainable activities. This mapping tool can be useful for SME's leaders to place sustainable efforts into each of the four different quadrants of Hart's "Sustainable Value Model." This shareholder value matrix details opportunities for enterprises in four ways:

1. Present value-internal to the enterprise;
2. Present-value from external factors by increasing stakeholder awareness and value;
3. Future-value internal to the organization by clean technology innovation;
4. Future-value external to the organization by finding new customers and fulfilling needs of people not yet in the global economy in a significant way.

Figure 3.4 provides a graphic presentation of Hart's framework, which can be used to help SMEs to place their efforts in the context of present value and future value to their organizations and to further identify if the value will come from factors internal to the organization's operations or from external stakeholders.

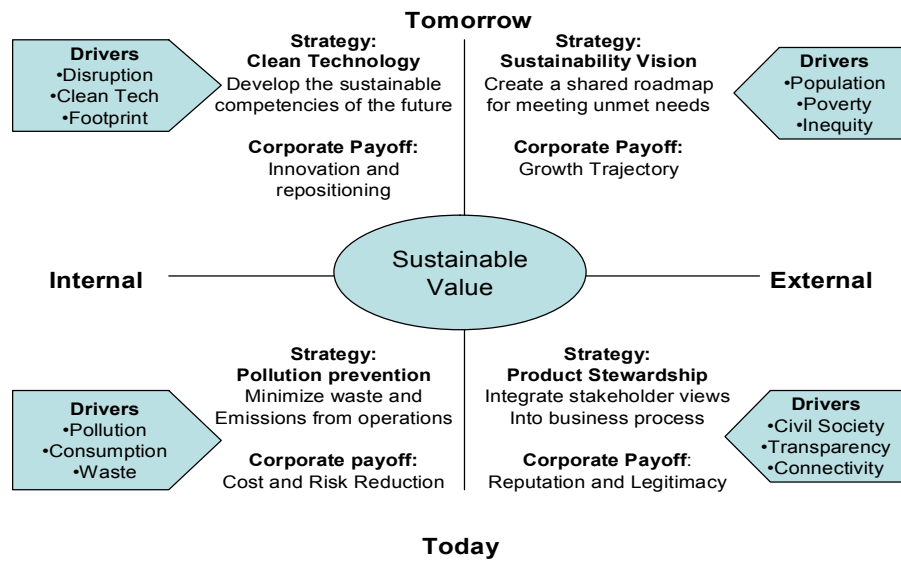


Figure 3-4 Hart’s Matrix for Creating Sustainable Value

Using this matrix as a tool, investments in sustainable value creation can be mapped, which can be further utilized to quantify returns on financial investments in these activities. The matrix can be used without a Sustainability Lens to map investments within a traditional operations and R&D context. For example: construction of a new plant would be listed under internal investments- today and if the plant were planned with an eye towards sustainability, it would also reduce pollution and be highly energy efficient. (Hart 2005)

Some additional clarification of the mapping within quadrants may be helpful:

- The bottom left quadrant is for actions that will produce present-value internally for the firm. Examples could include pollution prevention activities, or eco-efficiency programs that reduce internal costs.
- The bottom right quadrant is for activities that produce value external to the firm such as product stewardship, building the image and value of the enterprise brands, enhancing image to attract the brightest employees and customers.
- The top left quadrant is for activities that produce internal future value by development of clean technologies, new forms of commerce, or new green business segments.
- The top right quadrant is for activities that produce future value through strategies designed to make customers out of the poor, who are unable to be customers today.

The novelty of Hart’s sustainable value tool is that it produces a good map of how pollution prevention, eco-efficiency, stakeholder engagement, etc., can help firms to produce present value and future value. When proposed activities are placed into this matrix, not only can the value be defined and quantified within the planning budget templates or pro forma financial projections, the various operational groups within the company can be challenged/rewarded for present value returns and for additional value towards R&D. This matrix can also be used with issues of sustainability and as a primary lens for future strategy development.

Using this matrix, the actions of a firm can be measured and categorized to develop and implement a clearer vision of where and how a firm’s efforts can help them to build TBL values for their company in the short and long-term future. For example:

- A Pollution prevention and eco-efficiency program can help the company to reduce present operating costs.
- A community outreach program can enhance the company’s reputation and ability to attract and to retain top talent today and tomorrow.
- An improved future value development can result if a company’s R&D is focused on developing a radical cleaner technology that could replace a dirtier technology.

Continuous Improvement vs. Creative Destruction

<u>Strategies for Greening</u>	<u>Strategies for Beyond Greening</u>
<p>Focus on Existing:</p> <ul style="list-style-type: none"> products processes suppliers customers shareholders <p>Characteristics</p> <ul style="list-style-type: none"> Incremental Continuous Improvement Rationalizes Industry <p style="text-align: center;">EVOLUTION</p>	<p>Focus on Emerging:</p> <ul style="list-style-type: none"> technologies markets partners customers shareholders <p>Characteristics</p> <ul style="list-style-type: none"> Discontinuous Creative Destruction Restructures Industry <p style="text-align: center;">REVOLUTION</p>

Figure 3-5 Continuous Improvement vs. Creative Destruction

Figure 3.5 places strategies for sustainable changes into an existing or evolutionary mechanism or a revolutionary or emerging track. Creative destruction mechanisms may seem too discontinuous and may require a jettisoning of existing or incumbent activities and structures in order to succeed. While revolutionary approaches often involve organizational pain, they may nevertheless be the correct strategy in many emerging situations. (Based on Hart’s 2004 SEA presentation.)

Hart makes another significant contribution with his value driven approaches that may be obvious to practitioners, but could benefit from additional discussion. The contribution is the use of the Hart-Milstein matrix to discover strategic opportunities for sustainable strategies that can help company leaders implement Schumpeterian “destruction” effects.²⁸ Hart builds on the work of Christensen (Christensen 1997; Christensen and Overdorf 2000; Christensen and Raynor 2003; Christensen, Anthony et al. 2004) who popularized the Schumpeterian ideas of capitalism

²⁸ In *The Process of Creative Destruction*, Joseph A. Schumpeter (1942) says in "The opening up of new markets and the organizational development from the craft shop and factory to such concerns as US Steel illustrate the process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one... [The process] must be seen in its role in the perennial gale of creative destruction; it cannot be understood on the hypothesis that there is a perennial lull."

as a destructive, revolutionary economic force. Putting “creative destruction” into the terms of the Hart-Milstein matrix offers sustainability as not only a concept for incremental improvements, but also as a source of innovation that can displace or disrupt present technologies and services.

Not only can incremental improvements such as eco-efficiency be achieved through an emphasis on sustainability, but opportunities also exist within green technology development — especially by seeking customers on the base of the economic pyramid, the top half of the matrix — to disrupt less sustainable and inefficient practices and structures, and to create new value that was heretofore, unforeseen (Hart and Simanis 2008). In this way the Hart-Milstein matrix provides a new strategic lens for strategic sustainable development. Figure 3.5, derived from Hart’s 2004 SEA presentation, categorizes innovation strategies as existing (evolutionary) and emerging (revolutionary).

3.4.5 Montalvo: Assessing Capacity to Adopt a Sustainability Strategy

Once a strategic path has been envisioned there remains the task of evaluating whether or not the organization has the physical, fiscal, and intellectual will plus assets to adopt the sustainability strategy, and whether they are working in a policy environment that encourages or discourages such changes. While Senge’s visioning process and Hart’s matrix provide tools to anticipate value creation, a SME must have the assets and attributes necessary to convert such visions into actions. It is the equivalent of having a vision to build a dam: there needs to be stones and mortar to physically build the structure; there must be engineers available to build the structure; there must be the will to build the structure; and it must be legal to build the structure. Without all of these attributes being present, no dam will be built. There must also certainly be the finances to support all of the above.

For projects envisioned using a Sustainability Lens, this means that a new organizational cultural paradigm is necessary along with new organizational skill set assessments.

Montalvo (Montalvo 2002) developed a methodology to organize and understand the behavioral attributes, core competencies, and assets of an enterprise. His research can be used to help SME leaders evaluate their firm’s willingness to change and to adopt sustainable strategies. Producing value from sustainable change requires unique organizational assets and a supportive and encouraging policy environment. Montalvo’s great contribution is discovering which organizational behaviors, capabilities and attributes engender change towards cleaner production and sustainability.

In his book, *Environmental Policy and Technological Innovation*, Montalvo (Montalvo 2002) built upon the work of Ajzen (Ajzen and Fishbein 1980; Ajzen 1988) by modelling and quantifying attributes and determinates that influence behavior of enterprises located in the Northern border region of Mexico. His findings, derived from a survey of more than 50 companies, show in summary that:

Firms, currently and in the long term, are not willing to develop clean technologies. This suggests, states Montalvo, that “it is not possible to reconcile” conflicting interests between profits and broader societal goals, “if the current social and technological

conditions that determine the firms' willingness to change remain at the status quo," in this region of Mexico. (pp. 189-198)

His book also examines the reasons why the firms would not adopt business strategies that "include radical preventative measures to eliminate residuals and waste, such as changing product designs and manufacturing processes that aim at the ideal recycling and zero emissions factory." He found that there were three factors, alone or in combination that sparked the willingness to develop clean technologies.

- **Attitudes** towards sustainable changes (cleaner production) were affected by whether or not the changes: (a) presented good opportunities with low capital risk; (b) and the perception (positive or negative) of sustainable behaviors as a permanent solution to environmental pollution (liability and costs).
- **Perceived social pressures** concerned the internalization of social norms that encourage the development of clean sustainable technologies arising from market pressures, and/or community or regulatory agencies.
- **Perceived control over the behavior** regarded the perceived technological and organizational capabilities to innovate.

It is impossible to move beyond the visioning step in the strategic planning process without a method to assess whether or not the organization has the assets, attributes and core competencies necessary to act on the vision. Montalvo's maps of organization's attributes and how they influence each other are key tools to help predict organizational capabilities and behaviors within a defined change process (see Figure 3.6).

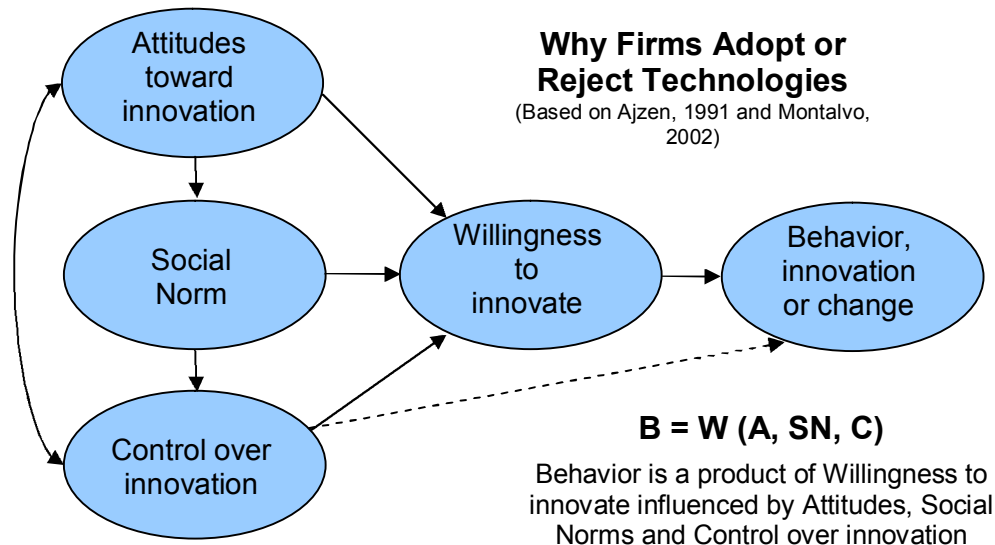


Figure 3-6 Montalvo's Assessment of Core Competencies

Montalvo's (2002, p. 49) process of assessment of core competencies and attributes of organizations forecast if companies will readily adopt or reject change. His framework depends on an inventory and analysis of attitudes, social norms in which the firm operates, and whether or not the firm has assets to succeed in the change processes.

Montalvo's framework examines the fiscal, physical and mental assets of a firm in order to determine if the firm's leadership is capable of using technologies or organizational strategies to produce productive change. His idea is that a firm must have the "will" to change, before innovation can occur. His approach by inventorying and mapping these assets allows a strategic planning group to answer the question: "OK, we know what strategy seems to provide a reasonable path forward, but do we as a company have the assets, competencies and ultimately the will necessary to walk the path?"

3.4.6 Willard's Case for TBL Benefits

In many ways, Montalvo's methods and findings reinforces Hart's assumptions about linking enterprise efficiency and competitiveness to rates of change. Both researchers agree that without a clear link between sustainable behaviors and value creation as economic success, there is little incentive for enterprises to seek to become more sustainable.

Together, these two frameworks provide tools for envisioning present and future value strategies for enterprises and provide an assessment technique for the organizational capabilities and asset identification for implementing their new strategies. What remains to be done by the SMEs, is for them to realize the middle management tools necessary to communicate, implement, and link actions so that successful implementation of the strategy can be achieved.

This brings this thesis author to the practical tools of Bob Willard, author of *The Sustainability Advantage: Seven Business Case Benefits of a Triple Bottom Line* (Willard 2002) and *The Sustainability Wave: Building Boardroom Buy In* (Willard 2005). In his first book, Willard, an ex IBM executive and lead instructor at the Sustainable Enterprise Academy, described the seven present value benefits that any business can receive from making investments in sustainable development as follows:

- Easier hiring of the best talent;
- Higher retention of top talent;
- Increased employee productivity;
- Reduced expense for manufacturing;
- Reduced expenses at commercial sites;
- Increased revenues/market share;
- Reduced risk, easier financing.

As Willard says, "The first three areas (hiring, retention, productivity) are about people benefits. The next two (reduced expense at manufacturing and commercial sites) are about environmental benefits for the planet. Combined with the last two benefit areas (increased revenues and lower risk), all contribute to profits. People, planet and profits — an integrated win/win/win case" (Willard 2002, p. 21).

Willard developed the business case and financial analysis for each of the seven bottom line benefits of integration of sustainability into business practices. This is demonstrated by producing practical spreadsheet models for a theoretical company. He applied a conservation ROI model to his economic assumptions and indicated significant present value returns,

primarily from sources that are located in the bottom half of the Hart Sustainable Value Model. Figure 3.7 provides a visualization of the assets to be managed within Willard's framework.



Figure 3-7 Willard's Three-legged Stool

This figure describes Willard's definition of stocks of capital that are necessary to manage and predict within a strategic planning and management system that incorporates a Sustainability Lens (Willard 2002). His "three-legged stool" for building financial models and projections are complimented with spreadsheet models, which can be found at his website and in his publications.

For SME leaders to be able to find financing for strategic planning and strategy implementation there must be templates for practical financial analysis that predicts financial performance from sustainable investments. Banks are very interested in present value and short-term economic returns on credit invested, and therefore, Willard's spreadsheet tools are extremely practical and useful. The financial tools developed by Willard can be used to predict potential financial returns from practical applications of sustainable enterprise. This information is critical for building the value proposition for investments in sustainable strategies. Willard supports his financial models with examples from his books (Willard 2002; Willard 2005) and has other valuable tools on his website.²⁹

Willard's approach to benchmarking the perceived benefits of strategies incorporating sustainability and then measuring progress within a practical spreadsheet format, is a very sound bridge between strategy formation, implementation and action plans. Such practical templates are very important in producing usable business plans that require involvement of financial institutions because this toolset is understandable to lending institutions and investment banks.

When used together, these three frameworks can help SME leaders to create a systematic approach to developing a strategic planning process that integrates a Sustainability Lens. Hart's strategic framework helps SME leader to map their value creation from internal operations of the firm and the value created by expanding relationships with stakeholders. This value can also be mapped for producing present value for the SME and to map potential future value via the paths

²⁹ See <http://www.sustainabilityadvantage.com/>

of “Creation” and “Discovery” innovation theories (Alvarez and Barney 2007). Once the initial ideas for the strategic path are mapped in Hart’s Matrix, Montalvo’s methods for inventorying a SME’s internal assets and capabilities, and external norms and conditions, provide an indication if the SME’s expertise and capabilities are likely to ensure success and where the pitfalls might be.

The final tool in the proposed toolkit is Willard’s practical financial and management spreadsheet models, which make it possible to develop proforma financial projections of the likely impacts of a SME’s strategy that includes TBL value systems.

3.5 Summary

The integration of these three approaches can help SME’s strategic planners to answer the following questions:

- How can our firm position itself to take advantage of the coming opportunities and threats from higher demands on the natural environment, greater competition for resources and the globalization of markets?
- Does our organization have the capabilities and the will to take advantage of these opportunities?
- How can our organization measure its returns versus its investments towards becoming sustainable?

This brings us full circle to the integration of these three planning approaches into a formal strategic planning process. Because of increasing waves of uncertainty and creative destruction forces within technology and markets, formal strategic planning is increasingly important for SMEs. This thesis author selected these three scientists’ approaches because they are simplified enough for SME use in incorporating sustainability into their strategic development processes.

It is clear that incorporation of sustainability into SME’s strategic planning has the potential to help them to achieve the following positive benefits:

1. It broadens and randomizes heretofore stakeholder connections which may provide synergy.
2. It supports awareness raising and analysis of networks in which the firm operates.
3. It supports organizations to catalogue and assess their organizational and financial assets. It helps them to align them with anticipated needs in a world of growing populations, rapid development, and ever more limited resources.
4. It helps them to establish financial projections and benchmarks to be incorporated in concrete financial reports that can be used to measure costs and value creation.
5. It broadens what are considered opportunities and helps SME’s leaders to identify future risks and to implement ways to avoid or to reduce those risks.

4 The Action Research Methodology: Introduction and Background for the Case Studies

This chapter describes, step-by-step, the action research methodology developed to insert a Sustainability Lens into the strategy planning process for SMEs. This strategic planning process is based on a cycle of iterative visioning, planning, acting and learning processes designed to produce a new vision and positive financial, environmental, and social returns on investments for the small firms that adopt it. As background, this chapter also provides a short discussion of the basic concepts used in “action research.”

The action research cases presented in Chapters 6-8 are based on previous work by Kendrick (Kendrick 2009) and Czarniawska (Czarniawska-Joerges 1998). They center on developing a planning process designed to lead to the application of successful and useful Sustainability Lenses. These lenses then became the intentional approaches for small firms seeking to build long-term sustainable value.

- The broad goals of these case studies was to use *action research* concepts to teach the SMEs the value of applying sustainability principles, and to assist them in producing a strategic development process that is a logical, normative, and that embraces and implements the TBL concepts.
- The process was designed to help to move the owners of the SMEs from a personal realization of the business case for sustainable enterprise to an enterprise-wide strategic planning and implementation process that measured and involved the entire organization and added a diversity of previously ignored internal and external stakeholders. The process should be ongoing and iterated within the routine business planning cycle to ensure that it becomes a part of the culture of the organization. In other words, meeting Porter’s definition of “strategy planning” (Porter 1991).

Figure 4.1 shows a flowchart of the newly developed process used in the action research projects for this thesis. The process’ objective is to build trust with the owners; convert this trust into a strategic planning process; and then to follow-up with appropriate actions that can be changed, analyzed for effectiveness, and iterated as needed:

- *The Conversion Realization*: The process begins with the education of the owners of SMEs and their managers. This results in a personal transformation and the creation of a Sustainability Lens appropriate to this SME. Building trust is the key to the conversion of the owners/entrepreneurs and their key managers.
- *Strategic Planning* helps translate vision into values. The strategic planning process should both analyze the SME stakeholder networks and provide insights into why and how the network effects described in the literature review are important.

After this network analysis is complete, the strategic planning process then uses this information to improve value-creation in the adopting SME, while expanding the scope and transforming the path of SME strategy. This translation of information into action defines strategic planning (Porter 1991).

- *Action:* This step's goal is to help the SME's leadership make and manage the actions their firms identified in translating the vision of sustainable enterprise into concrete actions. This may include evolutionary or creative destruction plus innovation.
- *Data Produced and Analyzed:* In this step, the leadership acquires and analyses the data produced from the activities (results)

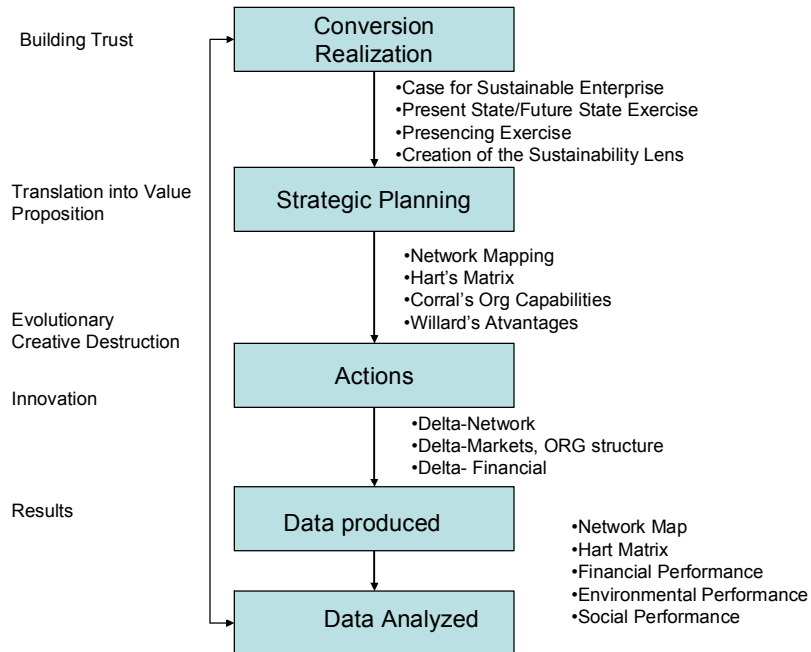


Figure 4-1 Action Research Flow Chart

This figure shows the proposed action research flow chart for incorporating the Sustainability Lens into strategy planning process for SMEs. The steps in the process are: building trust with the SME's owners and managers; making sure they link to the idea of the TBL; deciding on a change mechanism (evolutionary or revolutionary); measuring the results of the innovation; and change in iteration. (Based on Argyris, Putnam et al. 1985)

4.1 Action Research as a Vehicle for Inserting a Sustainability Lens in SMEs

This thesis author inserted his particular bias towards embracing the concepts of sustainability into the strategies and production activities of each firm in order to discover if the adoption of sustainable strategies and practices could help them to develop vision and the path toward the future that were not previously visible to the owners of these firms.

A systematic approach to this process was first developed as a result of the author's experience as the Vice President and then CEO of Burlington Chemical Company. He then applied this new approach within the two additional firms. There are several points that are important to remember about this process:

- It was this thesis author's intention as an action researcher, to help the management/owners of the three companies to develop a Sustainability Lens and to help them to integrate it into their planning activities and actions of the firm's studied;

- Action research was the only available method that would allow for the introduction of these ideas and approaches to the management/owners of the companies that would result in quick actions, data development, reflection, and iteration of the process as a learning cycle;
- In the role of action researcher, this thesis author also accepted the role of change agent, introducing the concepts of sustainable enterprise into these firms, not to induce philanthropy or ethical sensibilities as the primary driver of the process, but to catalyze the development of increased value creation and financial success for the organizations that were failing within their incumbent models;
- This thesis author's intention was to test if a Sustainability Lens could aid these firms in discovery and implementation of a new way of progressing towards success, as their incumbent businesses neared failure.
- The essential piece of the conversion process within all three case studies was bringing the owners of these firms to the realization that embracing sustainability would create greater opportunities than their current vision. It was critical from the very beginning of the conversations and educational process that the owners understand that this was a "hard" business decision that would yield them many returns, including economic ones.

As an action researcher, this thesis author posed the concept of sustainability as a viable path towards increasing value and growth for these firms that without the development of some sort of new lens, had no viable path forward. The reality for these firms was that their old paths were blocked and they needed a new map to maneuver around the obstacles and to move forward. The firm's leaders/owners needed to see this as an ongoing process and not a finite project and to view this as an opportunity to adopt and utilize the new paradigm of sustainable business.

This process of linking personal and business visions for the future, resulting in a vision that includes a Sustainability Lens, evolved from the author's experiences at the Sustainable Enterprise Academy (SEA), where this thesis author was an active participant from 2000-2006 (SEA 2007). The SEA is an executive training program where executives of large firms are introduced to the possibilities of sustainability as a new business paradigm. Many of the recently acknowledged concepts, such as GE's "Eco-imagination," Canadian investments in wind power, and emerging "Clean Tech" Venture capital funds were catalyzed during these sessions (Wheeler, Zohar et al. 2005).

Changing the companies' vision by adding a Sustainability Lens inclusive of new environmental, community, and social stakeholders offered new opportunities due to expansion of stakeholder networks. This Sustainability Lens was presented to the client firms as a means of discovering value from new or existing markets and customers through a mechanism of controlling increasing complexities from a world that was becoming *Hot, Flat, and Crowded* (Friedman 2008). Understanding and acting on such complexities expanded business possibilities beyond the limited vision of internal cost reductions and should bring a new vision and produce pathways for growth that were not visible to competitive firms that remained narrowly focused on short-term profits (Hart 2005).

4.2 Action Research Methods

Action Research or Action Science is, first and foremost, the concurrent achievement of change (action) and understanding (research). It is a family of methodologies that are designed to assist researchers to actively work to bring about changes and to analyze the outcomes of such changes, simultaneously. This is much different than the passive or objective observer role taken in many empirical research projects.

In action research, the researcher actively promotes an agenda that s/he believes will broadly improve the targeted organizations. The researcher is an active promoter of the desired outcome.

In the cases examined for this thesis, this author acted as the principle action researcher/consultant for two firms, and was a Vice President and eventually CEO of the third. In these cases, therefore, the personal and professional involvement and commitment were high on all levels.

Dr. Chris Argyris, one of the fathers of modern action research, is the author of *Action Science* (Argyris, Putnam et al. 1985), and the website <http://www.actionscience.com/>. He describes “action science” in this manner:

Action science is a strategy for designing situations that foster effective stewardship of any type of organization. It is a framework for learning how to be more effective in groups. It aims to help individuals, groups, and organizations to develop a readiness and ability to change to meet the needs of an often changing environment.

To help individuals in groups to learn how to overcome barriers to organizational change, action science does not simply focus on improving the participants' problem-solving or decision-making skills. It also does not look only at making incremental changes (e.g., identifying opportunities; finding, correcting, reducing, or eliminating threats) in the external environment. Without eschewing these concerns, action science focuses on looking inward, learning new frameworks, and establishing new routines.

A critical issue in action science is whether a problem is considered routine/trivial vs. non-routine/difficult. The difference is not always clear. Nevertheless, action science focuses on identifying and resolving the difficult, complex, real-life problems that are critical to organizations and society. This includes the formidable challenges of leadership, innovation, informed participation, and reducing prejudice. These bewildering problems often emerge and become more significant as group participants try to formulate and carry out new plans and evaluate their work together (Argyris 2009).

Action research is a process that is cyclic, participative, qualitative and reflective. The design of this particular action research initiative was to positively influence the financial success of three SMEs, to build value in their community and local environment, and to benefit the stakeholders of the global commons. This is, in essence, the emerging concept of “sustainable enterprise” described via the axiom of “Think Globally, Act Locally.” (Hart 1997)

It is important to note that action research addresses “non-routine/difficult” problems by finding routes to action by maximizing a highly collaborative style of double-loop learning, described by Argyris (Argyris 2009) as “Model II.”

Model II's main characteristic is double-loop learning, a productive reasoning process that involves minimal interpersonal defensiveness. Wide gaps exist between espoused theories and theories-in-use and action science is designed to help participants minimize these gaps.

Model II is the domain of usable knowledge. It has high standards for questioning goals and testing the validity of claims.

Productive reasoning relies on the idea of probabilistic causality, the claim that "A will probably cause B." Probabilistic causality allows for the richness and uniqueness of concrete situations. It recognizes the inherent gap that exists between stored knowledge and the knowledge required to act effectively, the continual need to change the status quo.

Participants who reason productively recognize that any innovation is likely to be inadequate and, therefore, needs monitoring. They reliably repeat effective actions, making outcomes of initiatives known publicly. They specify the action strategies and skills required to produce the desired consequences and the conditions necessary to maintain them. Since action is testable, problem-solving contributes to basic theory and theory gets integrated into practice.

What are some more of the characteristics of these effective groups? Effective groups resolve difficult problems by taking innovative action relatively soon. As the participants question each other's underlying programs or the credibility of their ideas they maintain high levels of interpersonal openness. They accept that while openness is potentially or actually embarrassing, threatening, or frustrating, openness is necessary to increase trust and individuality in their group. Individual participants may deny the difficulties involved in carrying out their challenging plans but the members freely challenge, test, and correct the claims. By possessing high levels of action science skills, their minimally defensive interpersonal and group relations enable the group members to innovate and respond productively.

Action Research, as a process, suggests that it is not enough only to identify the challenges and problems that face organizations. Identification of challenges must be aligned to organizational actions to address the challenge. Especially in this emerging realm of sustainability, it is paramount to recognize that the realignment of any organization is a journey and not a finite project. The continuous iteration of the planning, acting, and learning cycle is important to build "double loop learning" into the DNA of the organization.³⁰

Action research can be defined within the context of this thesis as the deliberate use of any kind of plan, act, description and review cycle, for inquiry into action within a field of practice (Argyris, Putnam et al. 1985). Action research is based on the researcher having a specific agenda (bias) for the project, and being intentionally transparent about this agenda and the

³⁰ Using Gregory Bateson's concepts of first and second order learning, Argyris and Schön (1987) distinguish between single-loop and double-loop learning. In single-loop learning, individuals, groups or organizations modify their actions according to the difference between expected and obtained outcomes. In double-loop learning, the entities (individuals, groups or organization) question the values, assumptions and policies that led to the actions in the first place; if they are able to view and modify those, then second-order or double-loop learning has taken place. In this way, double loop learning examines and modifies the context for single-loop learning.

outcome s/he promotes. Specifically, Action Research has four steps (loops) that differentiates this research from other types of inquiry (Tripp 2003):

1. Develop a strategic plan from visioning;
2. Act on the strategic plan;
3. Create data from actions;
4. Analyze and reflect on the data;
5. Re-plan the strategy and begin the cycle again.

This can be restated as “planning,” “acting,” “observing,” “reflecting” and “doing it again,” over and over, applying what was learned from one loop into subsequent loops. Early cycles are used to build onto later cycles. This cyclical approach builds rigor into the systems and adds learning loops to the process (Argyris, Putnam et al. 1985).

A definite plan is necessary to gather the data depending on: the types of firms involved, the skill set of the researcher, and the anticipated audience for the cases that result from the studies. Langley (Langley 1999) describes seven strategies that allow for choices based on the organizational literature. “In my analysis I also look at the relative data needs of each approach both in terms of depth (process detail) and breadth (number of cases)...finally I show how each strategy tends to favour different types of process understanding (senses). Some are more oriented toward the meaning of process for the people involved, whereas some are more concerned with prediction. (p. 969)”

The data gathering plan, therefore, must be based on many factors:

- The nature of SMEs and the characteristics of the CEOs and their managers,
- The personal nature of the work for the researcher and the SMEs,
- The lack of formal strategy planning processes in two of the three companies,
- The emphasis on process and high availability of experiential and qualitative detail,
- The long embedded period with company (3+ years),
- The desire to provide general frameworks and suggested approaches from a few cases rather than quantitative data from many,

A narrative strategy was chosen to hopefully produce a synthesis of approaches that SMEs could use to bring about adaptive, sustainable changes.

In summary then, action research is the process wherein a researcher or consultant inserts his or her biases into the decision making process of an organization to guide the actions of the organization. In this thesis, the focus is on three small to medium sized enterprises, whose basic markets have been disrupted by commoditization³¹ or globalization.³²

³¹ Commoditization means to lessen the importance of a diversity of benefits within a product or service and increasing the importance of commonality to focus only on the cost or price of a thing.

³² Globalization means the diminution or elimination of state-enforced restrictions on exchanges across borders and the increasingly integrated and complex global system of production and exchange that has emerged as a result.

4.3 Evolving Concepts for a Sustainability Lens: Embracing Diversity

Figure 4.2, from Hart (Hart 2005), graphically depicts the anticipated limits and expansion of opportunities for enterprises, when additional engagement of previously unconsidered stakeholder occurs. The figure suggests that an expansion of vision inclusive of environmental and social responsibility may provide opportunities leading to new strategies and markets for the adopting firms and that these opportunities are beyond simple economic returns. This assumption can be considered within both the “discovery and creation” theories of entrepreneurship and innovation (Alvarez and Barney 2007). In the context of the network discussions presented Chapter 2 there should also be opportunities for gains in resilience stability, and efficiency to be found in such diversity (Goerner, Dyck et al. 2008).

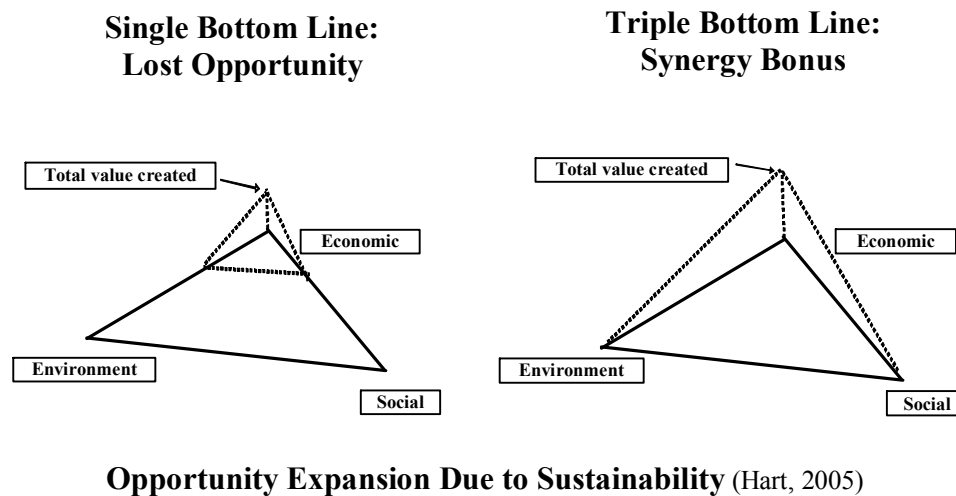


Figure 4-2 Opportunity Expansion Due to Sustainability

When an enterprise seeks only value creation and opportunity from economic returns, the “opportunity space” is limited. When stakeholders are added to include environmental and social stakeholders (stakeholders of the global commons) the opportunities for enterprises increases. This concept is in agreement with Hampden-Turner (Hampden-Turner and Trompenaars 1997) who describes such expansion of opportunities as “expanding the playing field for everyone.” (Hart 2005)

Hart’s concepts are not unique nor have they been developed in isolation. Many others also describe organizational benefits realized from expansion in the scope of visioning, including cooperation among diverse stakeholders (Capra 1982; Axelrod 1984; Adams 1997; Hampden-Turner and Trompenaars 1997; Anderson 1998; Goerner 1999; Capra 2002).

For example, in *The Art of Possibility*, Zanders (Zander and Zander 2000) described the importance of metaphors and eschewing limits: “We perceive only the sensations we are programmed to receive, and our awareness is further restricted by the fact that we recognize only those for which we have mental maps or categories” (p. 10). This implies that new ideas must surely come from outside current mental models and maps and this implies the need for inclusion of atypical influences.

Also, Hampden-Turner (Hampden-Turner and Trompenaars 1997) provides a broader insight that is directed at the value of inclusion and broad expansion in business success: “There is

another source of improvement (other than individual Darwinist survivors), the evolution and improvement of the Game (marketplace) itself. It is technologies and whole industries, which survive, informed by human heads and hearts. The game (marketplace) is not a static institution, but improves and co-evolves with its players. Better games “infinitely improving” are what transform an economy and lead to fast growth (p. 23).”

These ideas imply that expansion of a firm’s stakeholders equals more opportunities for everyone by expanding the opportunity-space rather than focusing on a single dimensional return for relatively few shareholders. This concept is very much in alignment with the discussion in Chapter 3 on the value of networks and networking for SMEs.

Interestingly the incumbent common vision and mission for all three case study firms was the converse of expansive inclusion. In all three case studies, the SMEs initially had a myopic focus on commoditization and reducing internal costs to become low cost producers.

Such myopia was induced by the furor of globalization in the post NAFTA and WTO realities. During the period of 1990-2007, all three firms were forced to creatively destroy (Metcalf 1998; Cowen 2002) their current realities to respond radically to the deterioration of their incumbent markets and enterprises in order to avoid collapse.

This was the situation of entry for these action research projects. This thesis author presented the company owners a vision and methodology to help them to increase their opportunities to expand and broaden their stakeholders, thereby increasing possibilities for their firms to find and follow new, more successful pathways. This in turn, created network opportunities and innovative problem-solving skills that helped them rebuild their companies based upon sustainability value propositions and networks.

As an action research project, the changes advocated in each firm by the author rested on the idea that sustainability could create new opportunities and visions for the firm that could only be discovered by adding a Sustainability Lens to the planning process.

The recent article by Loorbach (Loorbach, Whiteman et al. 2010) describes the process of sustainable strategy development as “Transitional Management” which is focused on the management of specific patterns of structural system change from one equilibrium to another.” (p. 136). This is the expansion of the goals and strategy of the firm to embrace the larger world as required by TBL. Transitional management has three levels:

Strategic, which begins with educational dialogues and formulation of new paradigms to achieve the designed changes; Tactical, where internal and external stakeholders begin to form networks of action, identifies barriers and firm’s begin their internal restructuring to merge organizational capabilities to opportunities; and Operational, where experiments and projects are begun, entrepreneurship is engaged, and lessons are reintegrated into the next cycle.

It is interesting to note that at the beginning of the this research the formalization of Transition Management had not been realized, however the process that ultimately evolved from these cases had the characteristics and form as described in the these three levels.

Therefore, the approach that evolved was to begin an education and dialogue process that would expand the set of stakeholders for each company. This would lead into strategy and a tactical action plan to induce sustainable changes for the company and would produce market and operational changes that would allow each company to thrive.

4.4 Beginning the Educational Process

The first step in creating a SME vision and strategy that included sustainability was development of an educational process to induce a meaningful “conversion or realization” experience for the owners and boards of these firms. This experience had to be both enlightening and positive for the owners, boards and key managers.

This process was designed to include a series of presentations linking the idea that sustainability was as important to the success of the owner’s businesses as it was in their personal lives. These companies were chosen because their owners had a personal environmental and social ethic, so they would not be in fundamental opposition to the very idea of their being value in environmental and social stewardship. The design of this educational approach was to help these leaders realize an essential strategic restructuring of their company’s vision that sought alignment and reinforcement, rather than isolation, from sustainability.

This linking process was an intentional part of this designed approach, whereby the author-action researcher, encouraged the SMEs owners and their stakeholder teams to think about, develop plans for, and to implement changes. The goal was to help their SME to implement sustainability as an integral theme of their new business philosophy and strategy. This intentional approach of persuading the test subject to a particular point of view is a key difference between empirical and action approaches to research. (Argyris, Putnam et al. 1985)

The literature was clear that, to achieve the utilization of a Sustainability Lens within the visioning process for these SMEs, new strategies must begin with active leadership and buy-in from the entrepreneurs-owners of these firms (Drucker 1954; Drucker 1985; Bradford and Bradford 1990; Anderson 1998; Davidson 2000; Freel 2000; Joseph 2000; Chaston, Badger et al. 2001; Capra 2002; Czarniawska-Joerges and Hernes 2005). After buy-in from the owners, the upper-middle management of their companies must also be convinced to endorse and then be empowered to apply these concepts in managing the companies, and they needed to do so because sustainability links their personal goals and greater success for their companies without any ethical conflicts. These crucial endorsements were the catalysts for the next step, the process of envisioning, which led them to develop new visions and strategies for ensuring their collective futures. This transformation process energized the owners’ leadership, exciting them to get involved in the development of “*new sustainable visions*,” and the strategies to achieve them.

The empowerment of the owners and the middle managers to revitalize their firms based upon the concepts and reality of sustainability as crucial elements, *even for our small firms*, was accomplished via a series of formal and informal training presentations and discussions. These activities helped create a personal and business relationship among the researcher, owners and managers. The goal for these dialogues was to convince the SME leadership that “we” (people, planet and profit) are all inter-dependant upon each other, as members of an interrelated ecological, economic, and social world, and that by understanding and building upon these interdependencies, new business opportunities would emerge and/or be discovered by them as

they moved forward. Sustainability thus becomes the map and the compass for these pioneers, helping these firms to innovate within a new paradigm. A very useful presentation this idea is shown in Figure 4.3, which is adopted from the idea of an interrelated common's by Harden (Harden 1968).

**Business Health Is Dependent Upon,
and in Turn Affects,
Both Social & Biosphere Health**

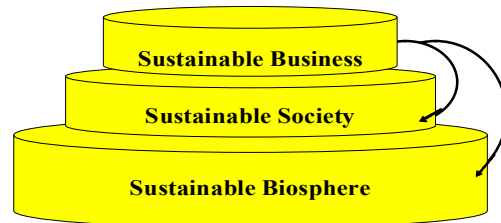


Figure 4-3 Business Health Depends on Social and Biosphere Health

This figure shows explains why global citizens must all use the global “common” resources. Therefore, business, society, and the environment are all dependent on each other. Take one away and all are destroyed. (Harden 1968)

The formal envisioning process and the strategies that emerged formed a clear relationship between working with the changing realities of the social and ecological commons, and increasing the long-term economic strength and financial stability for their respective firms.

The transformation *or realization step* of this action research process involved education of the owners of the SMEs and key managers by the action researcher, on the evolving opportunities and challenges that are emerging as a result of mankind’s abuse of the global environmental and social commons (Harden 1968; Hawken 1993; Anderson 1998; Hawken, Lovins et al. 1999). Because successful examples can be useful for effecting awareness rising and for increasing motivation for change, by 2002, the thesis author had several published examples from the visions and experiences of various leaders in the American corporate world, who have achieved advantages for their firms by using a Sustainability Lens. Illustrative examples included:

- Ray Anderson’s experience as CEO of Interface Corporation (Anderson 1998) and his conversion to the ideals of “sustainable enterprise.” His experiences are self-described as a “spear in the chest,” a metaphor of his great shame for having become a successful businessman through the rape of the planet, and the resultant realization of the opportunities that an enlightened path forward provides.
- Paul Gilding (Gilding 2005), past CEO of Green Peace, also produced a scenario of great verisimilitude in his document “Scream, Crash, Boom,” where the opportunities for sustainable enterprises are forecast.
- Gary Hirshberg’s *Stirring It UP* is the narrative of how one of the US’s most famous yogurt firms grew rapidly due to environmental and social initiatives (Hirshberg 2008).

Since 2002 the number of examples of successful integration of sustainability into successful business strategy has increased dramatically. When the search term “sustainability” was used on

Amazon.com's book search in December of 2009, over 50,000 books and media publications were presented for sale. The popular press is rife with examples that connect how doing well in the social and environmental arenas connect to financial success. A survey of popular US magazines in 2007, performed by a group of undergraduate students at Elon University indicated that, by 2002, there were a reasonable number of firms advertising that they were creating competitive value through "greening" of some sort and this had increased significantly by 2005. An even more fascinating bit of information is that this advertising theme of sustainability as a business strategy did not seem to exist in popular publications prior to 2000.

A flowchart of this intentional education and "conversion" process, adapted from the successes of the Sustainable Enterprise Academy,³³ is shown in Figure 4.4. (A list of resources used in the Realization process is given in PowerPoint Slides in the dissertation website.)

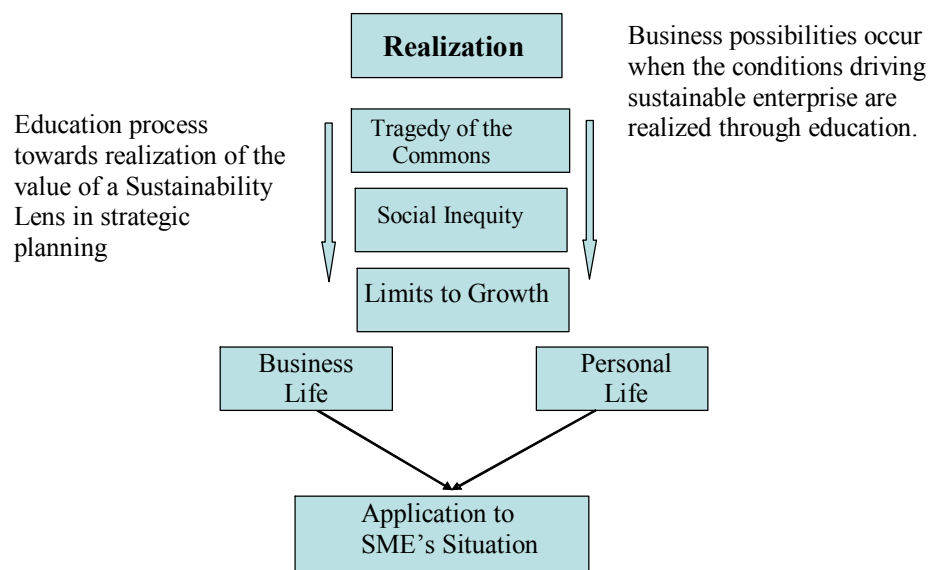


Figure 4-4 The Intentional Education and Conversion Process

The education of owners and managers of SME included presentations of the concepts of "the tragedy of the commons," the rise of civil society, documentation of the limits to growth, and a process of integration of this human, personal sensibility into the business sensibility. The hoped for result was that the owners and managers of the SMEs would see a "better way of going" where personal and business ethics and activities were in alignment.

The first formal sessions with these firm's managers were spent in dynamic educational interactions. The objective was to inspire a realization that ignoring the tragedies of the social and environmental commons is seriously threatening the survival of their children and their firms. These tragic results are due to the old style industrial revolution models of economic development and this type of development is totally lacking the strategic consideration of sustainability or network expansion. Once this tragedy has been realized personally, this realization demands a reinvention of business. A reintegration of personal values into what had been normally isolated business considerations was discussed in detail. By adopting a new Sustainability Lens for expanding their personal vision to include sustainability, new visions and

³³ The Sustainable Enterprise Academy (SEA) is an executive educational devised by the Schulich School of Business. See <http://www.schulich.yorku.ca/ssb-extra/sea.nsf>

opportunities became mandatory for enterprise, if an enlightened individual was to work within the marketplace. This idea of alignment, while so simple in concept, is extremely difficult to discuss with “hard-nosed” business people until a firm alignment with increased economic returns is presented. The goal is to create the business case for sustainable development. The PowerPoint presentations used in this education process can be found in Appendix 1 (attached separately from the dissertation).

As mentioned before, in the case studies developed for this dissertation, the leaders of all three SMEs had environmental and ethical sensibilities that made them open to these more, holistic sustainability concepts and approaches. The owners all had a strong sense of community that included a prudent environmental ethic. The educational examples, exercises, books, articles and seminars used in this phase were very effective in connecting the opportunity for economic success to the ideals of stewardship, which to be frank, was a new concept for the leaders of all three firms.

However, it took less than three months for the owners and management of each firm to be convinced that it was worth some of their strategic planning time to investigate the possibilities that could emerge from reinventing their company within the context of the “sustainable enterprise.”

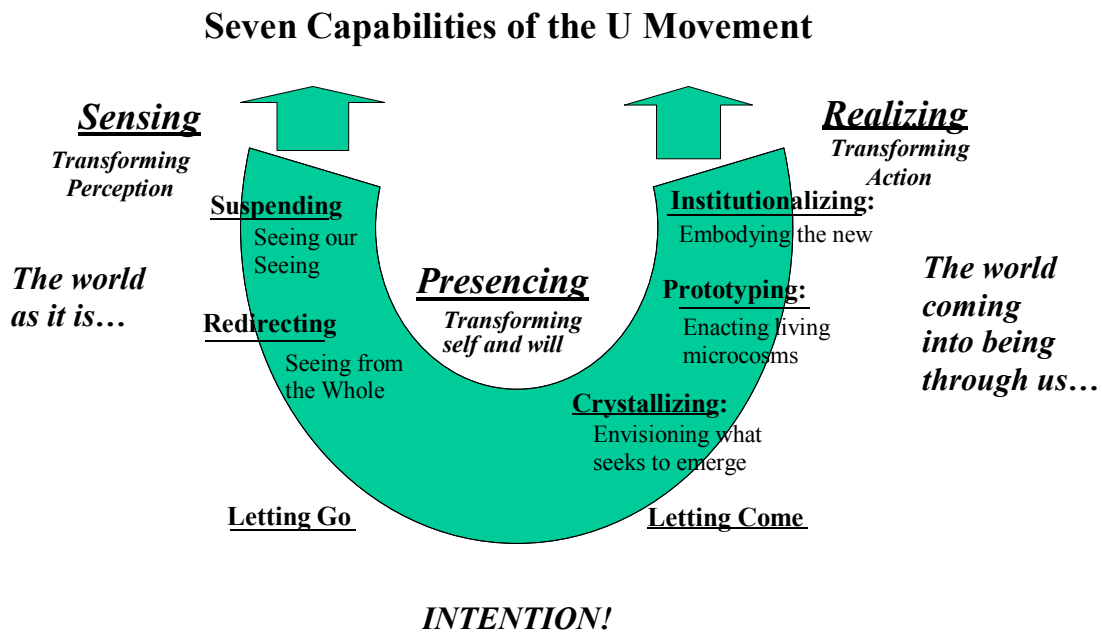


Figure 4-5 Seven Capabilities of the U Movement

Presencing is a conscience process of: suspension of old ideas and paradigms; developing an intention to change; and then taking action to do so. It is a process that is describe by Senge as a reintegration of sense and soul with the intention to find synergies within the integration. There are seven capabilities that must be developed and they normally must all be realized and moved through a U movement where you start high, swing to an emotional low until an intention can be formed and get high again as the new ideas begin to produce. (Senge 2004)

To be very clear, the first efforts with these business owners were devised to explicitly reconnect the ethics of environmental stewardship and social responsibility to a successful business strategy for each firm. All of the previous chapter’s research indicated that if this connection

could not be made, then, it would be impossible to integrate a holistic sustainability framework into the strategy for their firms. Therefore, the importance of this first stage of the action research approach cannot be overstated.³⁴

Detailed discussions of this process of emergence, or reconnecting business to a broader ethical framework, described as “Presencing,” were recently published by Senge (Senge 2004) (see Figure 4.5). The seven steps of Presencing are based upon a process of sensing current perceptions and then suspending this reality and redirecting sight towards a broader “whole” picture. The incumbent perceptions must then be “let go.” The removal of the incumbent reality allows a new intention to emerge. It is this new intention that is institutionalized by the strategic planning process and transformed into action.

In post analysis of the three case studies, this thesis author found that Senge’s description of how to evolve intention were exactly the steps experienced during the three months of education and dialogue that led to the integration of sustainability as a strategy lens into these firm’s leader’s mentalities and commitment. One of the most important steps was the left side of the U, within the steps of suspending, redirecting, and letting go. Reaching the stage of “letting go” was very important to reduce the seduction of maintaining the status quo. The right side of the U came much easier if successful release of the incumbent values, objectives, procedures and measures of success was achieved relatively early in the process and it was done with finality.

The success of this release in these three cases was dependent on the urgency of the financial situation of the company. The more severe the financial crisis — cash flow and inability to obtain capital — the easier it was to get the leaders of the companies to suspend and let go of incumbent models. Traditional thinking was “if its not broken, don’t fix it.” This finding was in complete agreement with Montalvo’s conclusions on the organization influences that effect a firm’s willingness to change. His findings for adoption of clean technologies for manufacturing firms on the border of the USA and Mexico found that economic risk and technological capabilities were almost equal in weight in decision making to adopt clean technologies. (Montalvo 2002, pp. 189-191)

As long as there was a feasible business case for the incumbent business, the owner/founders of the firms studied in this research were very reluctant to “give up” on what had worked for years. In the post analysis of these cases the use of Panarchy system’s diagram connecting stocks and flows to rates of changes and market dynamics provided a consistent way to benchmark where a market or community network might be in its evolutionary cycle. As will be seen within the more detailed analysis of the cases and in the conclusions, the importance of being able to discern when not to conserve assets by reinvesting in markets heading for disruption, is a very critical tool.

During the transformation process utilized by this thesis author, the severe declines in cash flows and markets in turmoil for all three companies were great incentives for them to make major

³⁴ In one additional circumstance, I was given the opportunity to make a presentation to a 100 million dollar handbag manufacturer/distributor who had been asked in 2008 to produce a “sustainability” plan for their customer, a major retail outlet. Several presentations that had been very successful in helping align business owners in the past to the ideas of sustainability fell on deaf ears with these owners. I was never able to get them to see the opportunities in this approach, because the owners were older (60+ years old) and cared nothing about any global environmental or social issues. Subsequently however, they lost some their business with the major retail outlet because their competitor introduced computer bags and handbags made from recycled polyester in WRAP socially certified factories.

changes. Theoretical discussions explaining the urgency of the situations were not necessary. The banks and the owners felt the “whip at the back”, so there were plenty of both internal and external pressures to induce change. As the process of implementing new strategies took hold and these changes in strategy and activities occurred, it “felt good” to the managers and owners of the firm to have those changes in alignment with social and environmental trends, which when translated into new customers and markets, reinforced these activities. It therefore became the most important objective of the initial stages of these action research projects to present fully the case against “business as usual.”

Once there was consensus by the owners and managers that there were opportunities available from expanding their company’s vision, and that the incumbent path would not be successful, the next action was to develop a broader vision for the organization using the newly integrated Sustainability Lens and then to devise appropriate strategies to benefit from it. In other words, after the company had developed the “intention to change,” it began the process of devising the strategy and finally the actions. This had to be developed through gaining a better understanding of the realities of the “present state” of the organization and realization of the desired “future aspirations.” (Senge 2004; Senge 2008)

4.5 Developing a Strategic Plan from Visioning

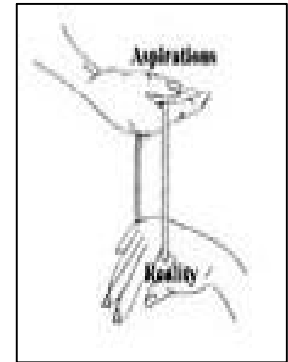
The visioning process used in all three cases was based on a practice developed by Senge’s teams at the Society for Organizational Learning (SOL) (Senge 1990; Senge 1994; Senge 1999; Senge 2004; Senge 2008). Each of Senge’s books builds on the theme of “organizational learning” as the most important asset a company can achieve. His work moves from developing the systems approach for archetypal organizational behaviors in *The Fifth Discipline*, to real world examples in his *Field book and Dance of Change*, towards the integration of organizational behaviors with human ethos and sustainability in *Presence* and *The Necessary Revolution*.

In Senge’s methodology, disciplines are sought within these organizations leading to an organization that learns and adapts quickly. In his first book, the *Fifth Discipline* (Senge 1990), one of the most important disciplines is described as “personal mastery.” This concept of “personal mastery” is very important and the concept is illustrated in the SOL Website, <http://www.solonline.org/>:

This discipline of aspiration (personal mastery) involves formulating a coherent picture of the results people most desire to gain as individuals (their personal vision), alongside a realistic assessment of the current state of their lives today (their current reality). Learning to cultivate the tension between vision and reality (represented in this icon by the rubber band) can expand people’s capacity to make better choices, and to achieve more of the results that they have chosen.

Within the action research process this was accomplished by having the strategic planning team (owners and key managers) perform a situational exercise where the organization’s current reality is described by placing facts or perceptions about the present state in a list. The committee is then asked, without regard to finances or feasibility, to present what they would like to see as a future or desired state for their company. This creates the Reality and Aspiration scenario described in the *Fifth Discipline* (Senge 1990).

This exercise is not straightforward and was generally conducted over a period of three days in three 2-hour sessions to build verisimilitude for the scenarios and also to help build credibility and a learning opportunity for the action researcher. In the first session the owners and key managers are asked to write on “post-it” notes what they believed the “current state” of their business to be, the good, the bad, and the ugly. Typical responses will be poor financial performance, lack of vision for the future, organizational challenges within the structure of the business, etc. Each person is asked to write and describe as many “present state” factoids, as they can think of in 30 minutes. They then are asked to post these on a board and describe them to the team. All team members are given this chance to relate their ideas. The action researcher and the team then correlate the answers into related lists as trends.



During the second day’s session, they were asked to forget yesterday and without any regard to feasibility, to describe and post their vision for a desired future state for their company. It is at this point, that the earlier sustainability training and the developing lens began to impact the results. Typical answers in this session were: to achieve financial stability; develop new sustainable products and customers; engage in pollution prevention in operations; develop new ideas for entry into new markets, new product ideas, etc. In this step the value of earlier work on suspending previous values and limits was invaluable.

A Strategy Framework for Building Sustainable Value



Colorado School of Mines

Figure 4-6 A Strategy Framework for Building Sustainable Value

Attributed to the Colorado School of Mines, this framework moves a management team from assessment of current threats to the enterprise, to auditing and ensuring compliance to regulations, into strategy moving from compliance to performance towards entrepreneurship. It indicates the progression in an evolutionary fashion that is somewhat comfortable for most firms.

The third day was devoted to resolving the tensions between the present state and the future state through developing actions and tactical plans to move the company from its less desirable present state toward its more desired future state. The “U” diagram and process described in Figure 4.5 is utilized.

This resulting vision and the action plan are then evaluated via a more traditional SWOT analysis.³⁵ This sequence evaluates Current Reality and Future Aspirations within a more traditional business capabilities approach. The important difference is that the Sustainability Lens is integrated into the visioning, as the assessment and compliance steps looks at present performance and status quo plus the strategy and entrepreneurship steps necessary to move beyond the present into future intent and actions. At this point, if the team does not adopt a TBL lens for their brainstorming and planning, that the action researcher must press the agenda and continue to develop the metaphors allowing integration. The framework shown in Figure 4.6, attributed to the Colorado School of Mines, works quite well as a way to flow, categorize and evaluate the vision and the action plans that evolved as a result of the present state-future aspiration exercise.

This framework helped the group to begin to analyze and qualify proposed actions by assessing the threats and opportunities in a systematic, progressive manner. This evolutionary approach assures that the science, business and policy environment assumptions are reasonable. These actions are categorized as compliance driven, strategy driven or entrepreneurial.

This framework requires cross-checking if the actions and visions “fit” within all legal frameworks, and it includes an initial assessment of the organization’s abilities and capabilities to perform and then to reframe and adjust the strategy, based on those threats or realities. It is at this time that the opportunities for entrepreneurship³⁶ can emerge.

This is a very critical time in the discussions for the action researcher and the change teams. This is the period when it is very important not to let the discussion of threats retreat into a discussion and debate about the incumbent business. Hopefully any lingering seduction about the “good old days” is squashed. This is a period when it must be driven home that the costs and incremental opportunities of the incumbent business must be set aside to free the resources for the investments in the new visions and activities. This assumes that such a creative destruction strategy is appropriate as a result of the visioning exercise.

A part of the current reality exercise includes additional enlightenment to the current environmental situation and the business, social, and environmental realities (local and global) that have promulgated the global efforts towards sustainable enterprise. At this point more examples of businesses that have become more successful as a result of sustainable strategies may be introduced as examples. Especially important are examples within the client’s category.

It is evident from many sources that many small business owners have never considered including this broader global view of stakeholders and environmental and social circumstances as elements of business opportunity. Examples of current failures by firms that did not change and examples of firms that have emerged as leaders by reaction to these realities should be

³⁵ SWOT Analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. The technique is credited to Albert Humphrey, who led a convention at Stanford University in the 1960s and 1970s using data from Fortune 500 companies (http://en.wikipedia.org/wiki/SWOT_analysis).

³⁶ Entrepreneurship according to Onuoha (2007, "Entrepreneurship" *AIST International Journal* 10: 20-32.) is the practice of starting new organizations or revitalizing mature organizations, particularly new businesses generally in response to identified opportunities

presented factually via several presentations. Examples used in this current reality education are Whole Foods, Ikea, Interface, Inc., DuPont, and others.

Developing a Strategic plan from Visioning” emerges from this process. The vision is developed and is then filtered through the Strategy Development Framework as a SWOT analysis. The current situation and future desired state emerges having then been vetted through an acknowledge business framework.

The next steps in strategy development analysis comes from the tool created by Hart and Milstein (Hart and Milstein 2003), which further categorizes current state, future state and planned activities into a 2x2 matrix where present and future value internal to operations of the enterprise, and the present and future value, external to the enterprise are categorized and can be quantified. These insights are then further examined as networks. This has been discussed at some length in Chapter 3.

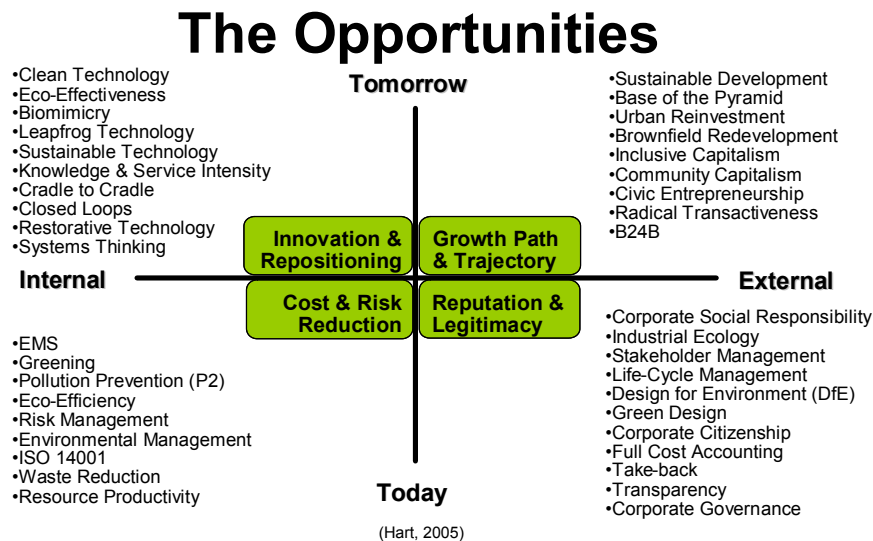


Figure 4-7 Categorizing the Type of Value Sustainable Initiatives Can Produce

Hart’s strategic value model is used to show how sustainable or green initiatives can be categorized by the type of value they can produce for enterprises: Present value from internal activities, Present value from stakeholder engagement, and Future value from internal and external entrepreneurial activities in clean technologies and base of the economic pyramid markets (Hart 2005).

Examples of how clean and green business opportunities can be placed in the Hart-Milstein Matrix as shown in Figure 4.7 below. This Sustainable value strategy matrix is a very powerful visualization tool for translation of ideas and concepts into actions that can be further translated into financial results. The present state and desired future state of the firms have created ideas for actions that must be categorized by present or future value contribution. The critical nature of this step cannot be over emphasized. Montalvo (Montalvo 2002) in his important analysis of enterprise behaviors towards adoption of cleaner production, clearly determined that without a direct link to improved financial performance, transitions to triple-bottom-line behaviors are doomed. This is further reinforced by taking the actions categorized by the Hart-Milstein matrix and placing them into an observation of how they might “fit” or create new networks for the firm.

For example, the visioning exercise may find an internal manufacturing process that is less efficient than desired. Improving this would create positive internal value for the firm per Hart/Milstein's matrix. However, in this scenario, current vendors do not have the products, skills, or technology to produce this improvement. Therefore, a new set of vendors and suppliers is sought which have solutions that are "more sustainable," and alternative "clean and green." Perhaps as a result of these actions, the innovating firm achieves its economic goals and also receives an "award" or article describing this innovation. This advertises the success and opens a future path for new customers (and also competitors) that are also seeking success. A network analysis would indicate that by taking a path off the "status quo" and using the Sustainability Lens, a new path and new networks of stakeholders are created. (Alvarez and Barney 2007); (Shane 2000)

Therefore, even though the process of "realization" (the linking of ethics and business) and the subsequent visioning exercises are seen by many business planners as "fluffy" exercises, by using the SWOT process and utilization of the Hart-Milstein Opportunity Matrix and network analysis, the vision and related actions become directly linked to financial strategies.

In summary, the realization and first actions towards integrating a Sustainability Lens within the strategic planning process for SME firms includes:

1. Introduce the current economic, social and environmental conditions as they relate to the enterprise and catalyze the participant's suspension of reliance on incumbent memes and a Presenting of current and future realities that include a Sustainability Lens;
2. Clarify the current state, and the desired future state and develop an action plan and strategy to achieve the new state;
3. Perform a sustainability SWOT analysis of the new strategy;
4. Perform a Hart-Milstein analysis of current & desired states and develop an action plan designed to translate the new values into strategic action for each firm;
5. Develop an initial network analysis to quantify connections, and the stocks and flows of new stakeholders.

4.6 Enabling and Defining Actions from the Strategic Plan

Based on the realization process and the strategies developed, prioritizing actions and beginning them is the next step. There must be intentional decisions made on the change mechanism that will be utilized to implement strategies within the organization. This mechanism can only be realized after the actions are categorized on the Hart-Milstein matrix and some indications of network effects are envisioned. Using the Hart-Milstein Matrix, each action should be evaluated as producing present value, internal or external to the SME or that actions will produce internal or external value in the future

If the majority of activities fall into the lower left quadrant of the Hart-Milstein matrix (HMM), then it can be assumed that the envisioned change process will be more evolutionary in nature and can produce value through immediate improvement of existing (incumbent) systems. Our previous example of finding increased efficiency in an existing process by scrapping incumbent vendors is a good example. Most of the early successes in all companies will likely be internal to

the organization and fit into the realm of pollution prevention and efficiency improvements, and risk reductions. These are evolutionary changes. This is the most comfortable and most probable avenue of change for most firms (Hart 2005). Many of these types of changes do not aggressively challenge the incumbent assumptions for a company, and thus are organizationally easier to handle. It is wonderful when these changes are successful and can be used as catalysts for more difficult changes that are more radical (Anderson 1998).

Present-External value: transformation practices can also be evolutionary. However these changes generally involved increasing the number and diversity of engaged external stakeholders of the firm. This sometimes is very difficult and involves initiation of discussions with stakeholders that were thought of as adversarial in the past. Such engagement produces opportunities and information that can be utilized in *marketing to increase brand value for the firm or in certain circumstances to protect its license to operate within a particular market network*. This is where the hard work in full realization of the present reality of the firm in the realm of social responsibility is realized. For example, if a firm had been cited in the past for a wastewater violation and seeks to improve by asking for a voluntary audit by the regulatory authority and also asks a related NGO to observe and offer comments on the audit, the number of stakeholders engaged increased and the diversity of the advice and actions suggested improve.

In this theoretical case, adding a Sustainability Lens to strategy for SMEs based on incremental changes of internal policy, increases present internal value to the firm. One would assume that some internal operations get optimized as a result of the audit reducing risk but also costs. However, this process also changes the relationships with external stakeholders. This produces increases in present value external to the operations of the firm as well as in good will, risk reduction, increases in brand value and a more robust “license to operate” within the external environment.

It is important to the strategic planning process and resulting action plan that the mechanism for these changes are realized and documented. This realization begins to create a virtuous cycle of visioning, actions, documenting results and a re-entering of the visioning process but also begins to enlighten the team as to change mechanism that increases present value. The old adage is that one cannot change what one does not measure. This is particularly important during the early stages of seeking value from a sustainable lens.

The question continually addressed during this process is:

- Are these actions resulting in improvements in triple bottom line behaviors that produce tangible present value to the firm and are these evolutionary changes or more radical revolutionary changes?

The recognition and documentation of both intention and mechanism implies that a thoughtful consideration and decision-making has occurred, is working, and the results are an intentional process of change. These mechanisms must be recognized at this stage in the planning process. This assures affirmation of change strategies and the related mechanisms. To help clearly identify the change mechanism being utilized the following questions are helpful:

- Has analysis of the changes identified any political, technological, or market-driven, conditions that are potentially disruptive the firm’s incumbent market, products and structures? If so, is the disruption recognized and potential effects analyzed?
- Do the proposed actions reside in the bottom half of the Hart-Milstein matrix or the upper half? Will these actions produce measurable present value to the firm through mechanisms of continuous improvements and changes? Do these actions *threaten, or enhance, present (incumbent) activities and practices? Are stakeholder networks enlarged incrementally or disrupted?*
- In addition to deliberate placement of these activities in the present value half of the Hart-Milstein matrix, does the return on these investments and actions correlate to the list of 7 Benefits achievable through adoption of sustainable strategies (Senge 2008).

These questions help identify the change mechanism in use as one of *an evolution or continuous improvement of the existing path for the firm or the more disruptive revolutionary type*. Recognizing an evolutionary mechanism acknowledges that disruption is not likely via technological advances or from radical changes in political or market circumstances, and there exists a direct link between investments in these present value activities and production of measurable economic returns. Such analysis “fits” with the two recognized mechanisms of innovation and entrepreneurship, “Discovery Theory and Creation Theory” proposed by Shane (Shane 2000) and Alvarez (Alvarez and Barney 2007). In discovery theory, an organization prepares itself to recognize opportunities as they appear, much like one would identify your baggage at the airport. In creation theory the same analogy would be that you have created and be on the journey to discover what is over the next horizon.

Continuous Improvement vs. Creative Destruction

Strategies for Greening

Focus on Existing:

*products
processes
suppliers
customers
shareholders*

Characteristics:

*Incremental
Continuous Improvement
Rationalizes Industry*

EVOLUTION

Strategies for Beyond Greening

Focus on Emerging:

*technologies
markets
partners
customers
stakeholders*

Characteristics:

*Discontinuous
Creative Destruction
Restructures Industry*

REVOLUTION

Figure 4-8 Continuous Improvement vs. Creative Destruction

Figure 4.8 describes his ideas on evolutionary vs. revolutionary change processes through a Sustainability Lens that looks at “greening” incumbent practices or moving “beyond greening” to discontinuous and revolutionary displacement of incumbent practices. (Hart 2005)

The second possible change mechanism from the first Step of visioning and planning is more radical and depends heavily on creation theory. If the visioning and planning process envisions

that there are substantial changes in the future predicted for technology, political and/or market circumstances, and that such changes threaten the incumbent products or enterprise itself, then a more revolutionary approach is necessary. This approach recognizes the disruptive nature of anticipated changes and mandates a creative destruction mechanism to achieve sustainability. Creative destruction destroys incumbent or existing technologies or processes and through this destruction, assets are freed for investment in perhaps more radical means of obtaining similar results.

It is very important to understand the metaphor and mechanism of creative destruction as it relates to strategic planning (Cowen 2002). A synthesis of Schumpeter (Schumpeter and Opie 1934; Schumpeter 1942), Christensen (Christensen 1997; Christensen and Overdorf 2000; Christensen and Raynor 2003; Christensen, Anthony et al. 2004), and Hart (Hart 1997; Hart and Milstein 2003; Hart 2005), Hawken (Hawken, Lovins et al. 1999; Hawken 2007), Senge (Senge 2008) and Willard (Willard 2002; Willard 2005) indicates that to meet the necessary rate of change in adapting to rapidly changing market, technological, ecological and social conditions, incremental/evolutionary change may not be optimal.

These authors suggest that as the rates of change increase, the ability of an organization to shed its incumbent assumptions, practices, structures and technologies and even its financial stability to chase future opportunities based on these assumptions, requires destruction of the incumbent practices and perhaps even the company itself. For example, an incremental improvement program in gasoline powered fuel efficiency for Pick-up Trucks and SUV's, plus undue protection from market and regulatory pressures has brought GM into bankruptcy. This has occurred for GM while Toyota responded to urgent needs for greater fuel efficiency, and developed hybrid electric automobiles, and as a result has become the largest automobile company in the world. GM's focus on large vehicles and incremental improvements in efficiency for those vehicles did not allow them to invest in any real manner in emerging technologies. It has even been suggested that in order to protect the incumbent industry, the legislators of Michigan, the State where GM is located, protected the company from having to comply with mileage and safety standards, which would have forced the company to respond to broader societal pressures. "It's just that the scale is so large and the changes came so late in the game. The band was all tuned up, the brass was polished, but the ship had already hit the iceberg." (Levin and Helyar 2008)

Continuing with our example from earlier, consider that the visioning team identified the process that needed greater efficiency and continued along the SWOT analysis and network analysis only to find that the basic market assumptions supporting that process were poor. An example might be that a manufacturing process could be incrementally improved but the there were fundamental questions as to whether to product or service produced in this process would even be necessary in a "Hot, Flat, and Crowded" future. So rather than incrementally improve this process, even though there was a reasonable short-term return on investment (ROI) the team decided to sell off or close down that product line or service, "creatively destroying" that endeavor and freeing "capital" for use in other more likely investments.

Recognition that creative destruction is a valid mechanism within an intentional change process is the first step towards utilization of this mechanism. Intentional creative destruction however, is a very difficult strategy to implement (Cowen 2002). *This is because most enterprises have*

become successful due to incumbent strategies and behaviors, and have found it easier to incrementally improve on what one knows well, rather than to address a heretofore unproven behavior. Nevertheless, creative destruction as a strategy option, has gained favor over the last 30 years, primarily due to recognition of rapid technology cycles in computing, communications, electronics, biotechnology and nanotechnology. The examples of products, technologies and enterprises that refused to recognize the necessity of exiting incumbent activities to pursue new approaches are many. The actual numbers of companies that can achieve such a make-over are small (Linux-Information-Project 2006).

As a firm proceeds along the visioning and action steps of the planning process, it will discover future benefits their firm could derive from new activities and structures by anticipating the need for sustainable behaviors. These new actions, even if they threaten incumbent activities of the firm, may outweigh the perceived benefits anticipated from continuous evolutionary changes within incumbent practices. For developers of strategy, the challenge is to recognize when the mechanism of creative destruction should be applied and how to do it without destroying the incumbent value within the existing firm. As GM and many other firms have learned, the destruction can be “creative” within the strategy influences of the company or the financial markets can destroy the firm, albeit via destruction of the owner’s equity in insolvency or reorganization.

More than likely, intentional planning processes/opportunities that evolve strategy will use both forms of change mechanisms, evolutionary for present value changes, and creative destruction strategies leading to formation of new business units, to realize the highest future returns. Examples of such behaviors in larger firms abound. DuPont, after many years of incremental improvements in its fiber business, sold the business to provide cash to invest in biotechnology, nanotechnology, solar, microelectronics, and pollution abatement markets. (Tebo 2005)

DuPont’s management realized: that as a company driven by innovation of new technologies, the textile fiber business could no longer produce the ROI on investments in fiber and textile R&D. This business no longer fit DuPont’s grand strategy of a future based in biotech and nanotech materials science. At the time of the divestment, textile fibers represented over 20% of the total turnover for the company. The planners at DuPont did not see a mechanism to incrementally invest in the fibers business and produce the growth and value needed in a “hot, flat and crowded world,” so they “destroyed” that business segment in order to invest in “greener” technologies. The important lesson from this case is that even DuPont could not afford to invest in both strategies. This is clearly the Schumpeterian idea of creative destruction at work as an intentional strategic change mechanism.

In a similar move, Monsanto sold its fibers and chemical business to focus on biotechnology and food production even though these segments represented a huge portion of the cash flow for the firm and accomplished this transition in less than a decade.

Answering the following questions can help guide small firms that believe a creative destruction strategy may be correct:

- Are there economic, ecological, social, market and/or technology conditions have been identified that threaten the viability of an incumbent process, technology, market, or technology? Think and plan in 3, 5, 10 year blocks.

- Are there any proposed actions resulting from these analyses that reside primarily in the top half of the Hart-Milstein matrix or threaten incumbent present value propositions found in the bottom half of the matrix? These actions will produce measurable future value to the firm through mechanisms of radical improvements and changes and *threaten present (incumbent) activities and practices, so some decision must be made to liquidate the incumbent activities and investments to free capital for investment in disruption.*
- In addition to deliberate placement of these activities in the future value half of the Hart-Milstein matrix, the return on these investments and actions should correlate to the list of 7 Benefits achievable through adoption of sustainable strategies (Senge 2008).

It is important to note, that devised strategies and actions developed using this process of visioning, SWOT analysis and Hart- Milstein analysis, are almost never exclusive to either evolutionary or revolutionary change mechanisms, across an entire enterprise's strategy. Many times, using the Hart-Milstein matrix, there is an apparent path from present value to future value via an evolutionary or revolutionary mechanism, however it is also possible that one segment of an enterprise is ripe for destruction leaving other segments producing best from an intentional evolutionary strategy. It is also possible to consider destruction or radical change in one part of the value chain, while leaving other incumbent unit intact.

For example, it may be that an SME engaged in manufacturing can gain immediate efficiencies by changing its fuel source from coal fired boilers to using natural gas, which produces present internal benefits by reduction of hazardous solid waste, CO₂ and sulfur emissions. These actions lower costs due to: depreciation of equipment, reductions in labor, and reduced operational overheads, carbon footprint and waste. Such changes would be a good example of an evolutionary sustainable change. However projections for 5 years in the future, indicate it may be prudent to remove the boilers altogether and move to a steam-less technology because a new manufacturing process is projected to replace the current incumbent production process. This might be radical technology that is known as a leap-frog technology as it leaps or bypasses the incumbent processes to a totally new production approach, perhaps a move towards sustainability. In the case of moving from coal to gas, this is an update in support to an existing technology. In the second scenario, the old technology is destroyed and replaced with an entirely new approach. One rationale for such a disruptive investment might be that if the example firm does not invest in the new technology, then a new entrant will, and this firm could become the low cost producer in the future, displacing the incumbent altogether.

Making this kind of strategic change uses the assets of the Hart-Milstein Matrix (see Chapter 3) to plot anticipated value production, so it is possible to anticipate what the possible returns on investment might be, however, the Hart-Milstein matrix does not address whether or not the company has the competencies, assets or stakeholder support to accomplish the strategy. Within the strategy planning flow chart, actions are envisioned, placed on the Hart-Milstein Matrix, viewed and examined for network implications, and a rough idea of the mechanism to be used is determined.

There remains the challenge of organizational will and capability to produce the necessary changes. Montalvo describes that the willingness of an organization to adopt innovation in Figure 3.6. Montalvo (Montalvo 2002; Montalvo 2006) approaches a firm's willingness to adopt change or innovate as based on the influences of: *Attitude*, such as is the firm a "learning

organization; the External Environment in favor or against such changes; and whether or not the firm has the Physical and Fiscal Assets required and the capabilities to utilize the assets and change. Ranking these factors provides a systematic approach to assessment of whether or not a particular innovation strategy can succeed.

In his adaption of behavior theory towards cleaner production, Montalvo suggests that the willingness to innovate with in a firm is influenced by the attitude (internal) of the organization, the social norms influencing the changes (external) and control over the innovation (both internal and external). For example, if an organization makes paper books and the public is beginning to accept electronic books, but the firm has no electronic engineers and does not believe that e-books are an opportunity, then the organization's behavior towards electronic innovation will be poor. The company's analysis might indicate that social norms and customer acceptance will not allow for e-books at this stage of technological development. The firm might see any investment in e-books as an indication that their core business is dying or the firm could see itself innovating too early, etc. It is clear that the path towards e-books for this firm is fraught with uncertainty; this is partially due to the fact that the management doing the analysis is too heavily invested in the incumbent market to truly envision the opportunities in e-books. This is where the Sustainability Lens can offer guidance as an indicator of future trends and market conditions by providing carbon footprints and projections of paper availability and market competition from existing web-based media sources. The music industry might be a great example. As part of a strategy, the traditional book publisher might want to form a new firm to explore this new delivery route, while continuing to make traditional books, as the incumbent business simply does not have the tech-staff or resources to achieve results.

This unique approach to strategy development was applied to three action research cases, and this will be described in detail in the next chapter. This approach enabled delivery of a TBL lens induced visions, goals and objectives to the firms studied. This process created new paths forward. Innovation theory indicates that entrepreneurs in SMEs can discover new opportunities from this approach, because they are well prepared to do so, but entrepreneurs can also create opportunities due to travelling on a new sustainable path.

Therefore, an intentional approach towards visioning and change mechanisms for SMEs includes a broader vision due to addition of a Sustainability Lens and envisions actions that are intentionally either an evolution in current activities or destruction of incumbent segments to make room for more revolutionary approaches. The Presencing process (see Figure 4.5) — leading to a traditional approach to strategy planning, resulting in strategies categorized by the value they produce and the capabilities of the firm to carry them out — seems very powerful. However skillful the Presencing and Visioning and strategic analysis might be, a firm's capabilities to enact such strategies, must be assessed and gauged, and a path forward that embraces existing capabilities or creates new ones mapped out.

In summary, the first step in the newly synthesized change process developed for insertion of a Sustainability Lens into strategy formation for SMEs was Presencing and Visioning leading to production of strategies. The second step in the action research process generates action plans and activities from the strategy derived from the vision and a complete understanding of the mechanism of value creation anticipated from those actions. The third step in the process is

critical and relies on producing useful data as a result of actions, verification that the process is meeting the goals, and then using the data to adapt the next visioning-strategy learning loop.

4.7 Creating Data from Actions

The process followed during this research project post-Presencing and visioning, strategy development, and action plan implementation, was to gather data resulting from those actions and formally reviewing these annually, unless there was an earlier indication of success or failure that necessitated action. As describe in an earlier section of the dissertation, SME firms have great flexibility and intuition and are structured due to their size for quick action. Therefore, it is possible in smaller firms, for on-the-fly analysis and adjustments of strategy to data analysis take place. (Manring and Moore 2009)

The data collected should be financial, ecological, social, or performance related, based on the action plan. Especially for present value internal and external activities, some performance and financial returns can be measured quickly. For example, if one of the pollution prevention strategies was to reduce natural gas consumption, this could me measured daily, if need be, and ROI calculated. If however an action was to have 8 hours per quarter of voluntary community service per employee, several quarters of data would be necessary to assess the value of this strategy. Therefore, an important part of the strategic plan and the research plan was to analyze the data that were the best indicators of progress.

Here is where the spreadsheet tools of Willard (Willard 2002) become highly useful. His spreadsheet models allow for input of financial and management data which categorizes savings and value creation (internal and external) from eco-efficiency, organizational behavior, and innovation and benchmarking over any standard time period. This also can be accomplished within any standard ERP or MRP management software as long as the correct benchmarks are indicated. Any of the financial projection software used or suggested by Bradford, can also be used (Bradford and Bradford 1990). The most critical part of any measurement system is that it be consistent, well defined, and most importantly systematically utilized.

4.8 Verification

Verifying the success or failure of these strategies within SMEs is possible by examining performance to the benchmarks, the “data”, produced by the activities described in Section 4.7. The most important verification, however, will come from the satisfaction or dissatisfaction of the owners and managers of these firms and this must be determined from in-depth conversations with these stakeholders.

Throughout this dissertation, the importance and the influence of the owner(s) and managers of SMEs has been stressed. Unlike larger enterprises where there are multiple levels of management and decision-makers between the action researcher and the board or owners, in an SME the tide of support or lack of support can be directly and rapidly communicated. This does not have to be a formal report or a public “vote of confidence.” Rather, as data from the firm’s activities emerges and is reviewed by the SME’s managers and owners, it is important for the researcher to be absolutely clear on the opinion of these stakeholders, so that the researcher may adapt the next cycle of strategy development and activities accordingly. This may require re-education or a

renewal of the objectives as they were originally devised, but often a simple candid conversation conveying that everything is on the right path is all that is needed to avoid miscommunication.

4.9 Summary

This chapter describes the action research process and the flow and step developed to aid in the transition of SME towards adoption of a “Sustainability Lens” within their strategic planning process. In some cases, there are various battles to be fought. One may be to help the owners and managers bridge the gap between personal ethics and sensibilities and business behaviors and vision. The second may be recognizing the need and helping to begin a formalized approach to strategy planning itself. Third may be the realization of the power of intention and choosing an intentional design within a change process. Fourth can be to better understand how to evaluate the networks in which a firm operates. The list can go on and on. However, using the frameworks and ideas of Senge, Hart, Montalvo, and Willard, there seems that a reasonable approach towards addressing any of these challenges can be overcome. Following the various flowcharts in this chapter the steps of: realization-transformation-development of the Sustainability Lens for a particular firm, can be accomplished for the owners of the SMEs and then for the management. The formal incorporation of the lens and the effects of this incorporation and adopt can be readily measure with the tools described.

The next several Chapters report research case where this process was implemented. Chapter 6 describes a Textile Chemical Manufacturing company of 225 people and \$75 million in revenues. Chapter 7 describes a south-eastern family Dairy Farm with revenues between \$1-2 million, and Chapter 8 describes for a printed apparel production firm of 100 people and revenues of \$5 million. A summary and analysis of the results from these three cases is found in Chapter 9.

5 An Introduction to the Action Research Cases

Three action research projects were developed as the result of the extensive experience and research documented in earlier chapters. Simply stated their purpose was to discover if insertion of a sustainability lens into a formalized intentional planning approach could make a difference in the performance and value creation of smaller firms. I also wanted to test several approaches and frameworks of colleagues who had published their approaches³⁷ to build and expand on my personal experiences at Burlington Chemical Company.

Using action research methods based on a narrative approach (Langley 1999), I was seeking the means to understand and resolve the conundrum between capitalistic economic behavior and ethical value creation that includes the off-spring of all living things³⁸. This is the bias that I brought to the action research projects and I offer these cases as an apologia in the classical sense of the term as a formal justification of the use of action research and the process of intentional introduction of sustainability to create economic, ecological and social returns. I sought to be fully transparent to the firms involved and now also to the audience for these cases.

From the journal of Sam Moore, during Christmas holiday, December, 1986:

Earlier this month, in my capacity as research director for Burlington Chemical Company, I attended a public hearing in Raleigh, NC. My goal was to listen to stakeholders discuss the impacts of textile dyeing and finishing wastewaters on Publically Owned Waste Water Treatment Plant (POTW) operation and learn more about the resulting aquatic toxicity impacts from these treated wastewaters on the rivers of North Carolina. NCDWM (NC water authority) provided their findings on the impacts of treated wastewaters on the biota in NC's lakes, rivers and streams. The NCDWM reports and the waste treatment plant operators comments indicated that it was their belief that textile wastes were causing wastewater plants to perform below specifications and that the resulting aquatic toxicity must be textile related. The textile industry stakeholders did not agree.

As this hearing was open to the public, various stakeholder groups were in attendance representing the textile industry, along with environmental groups, individual citizens, and various individual companies. The presentations from each group that spoke were formal and, for the most part, more polite than I expected. However polite, these discussions were contentious at times, and there was a fair amount of emotion on both sides of the issue.

The textile industry's stance was that it could bear no more costs for wastewater treatment. The trade associations representing the industry threatened that if additional cost burdens were added, it would affect the ability of the industry to remain in NC. There were implications that NC was already losing textile production to Mexico and that it was increasingly difficult for US producers to compete with regions of the world outside of the USA where there were no regulations and much lower wages.

³⁷These were primarily the works of Peter Senge, Stuart Hart, Montalvo, Bob Willard, and the approaches used at the Sustainable Enterprise Academy of York University in Toronto, Canada. These works have all been discussed in a significant way earlier in the dissertation.

³⁸ Remember the timeframe of this research began for Burlington Chemical in the mid 1980s and for Reedy Fork Dairy and TS Designs around 2002-2003.

On the other side of this argument, were the environmental groups and citizens that lived near rivers and lakes who provided examples along with NCDEM that increasingly fish and other aquatic species were being impacted. The trouble was that no one was quite sure of the source of the problem, but the statistics pointed directly at the textile dyeing industry, as they produced over 50% of all waste water in the state treated by these facilities that were owned by the public.

I especially remember one particular spokesperson for the environmental position. She was remarkable in that she was quite old, at least 75 I would guess, and she spoke with great passion about how she did not care about fashion, colors or style, if the textile and apparel industry was going to pollute the waters of her great state of NC. She said from this day forward, she was not going to purchase any dyed or finished clothing that were not made of natural fibers, undyed and unprocessed.

The hearing lasted most of one day and after it was finished we all went to our respective homes throughout the state. Though there were many stakeholder opinions, there was no clear consensus on further actions. The NCDEM, however, was firmly in the camp of increasing the pressure on POTWs to improve their treatment processes.

Several weeks later, I was doing some Christmas shopping at the Burlington Outlet Center, a big shopping area in Burlington, NC. This was a place where many textile mills had factory outlet stores for direct shopping. There, I found in the checkout line, this same older lady from the public hearing. Despite her vows, she had two carts full of pajamas and clothes for children and various sweaters. All were brightly colored and I could tell she was having a good time with her husband shopping for her grandchildren.

I felt compelled to speak to her. I told her that I had heard her statements at the hearing last month and that I was surprised to see her there buying these things after her impassioned statements in the hearing against dyed and colored textiles. She was obviously very embarrassed and did not wish to discuss this. She and her husband quickly checked out of the store with their things.

In one way, as a person selling dyes to the textile market, I was glad to see her unable to resist our products, on the other hand, I was a bit embarrassed for her.

I went home that evening and pondered the question about why would an industry not consider making things that did not put the consumer in a conflict between buying their products and protecting the environment. Was it necessary that highly fashionable textiles and clean and safe water be mutually exclusive? It seemed to me that if there was no resolution to this issue, the customers of Burlington Chemical, the dyeing and finishing industry, would lose. If there was no resolution, then the environment would continue to suffer and eventually the consumers of textile products would feel conflicted about buying unsafe or environmentally damaging products.

I decided that night that perhaps Burlington Chemical could be a leader in making “green” textile chemical products and that by doing so could create a unique advantage that could separate us from our competitors and help our customers and the planet as well.

As a young man in a chemical business that was reeling from the fallout from Bhopal India, it was particularly satisfying to see some potential opportunity for making profits by being cleaner than the competition.

This personal realization began my efforts to apply a sustainability lens at Burlington Chemical in the 1980's and '90's. I entered into the current action research projects 17 years later, based on our positive experiences at Burlington Chemical.

As time progressed I became personally determined to demonstrate what we had learned at BCC about how the budding concepts of sustainability could improve a company's performance financially, environmentally, and socially, thereby creating competitive advantages and increased profits for shareholders and non-shareholder stakeholders alike.

As these cases will show, each company's path and approach towards adoption and utilization of sustainability was unique. While each of these cases have yielded certain unique insights, many of the insights were common to all three cases. Both the unique and common lessons are important.

The idea of using sustainability in this manner has matured greatly since 2000, and these concepts are no longer deemed radical and beyond the scope of enterprise. This is due to publicized successes by larger firms such as GE, BP, NIKE, Wal-Mart and many others. I hope these SME cases demonstrate a new path for value creation for SMALL FIRMS as well.

The Burlington Chemical case is presented first. My highly personal involvement with this company as an owner, as an employee and eventually as the CEO, provides a unique point of view. Documentation of the changes that occurred within this company, and the responses using strategies developed and applied within the context of sustainable development from 2002 through 2007, were fascinating and at the same time, also highly personal.

The changes affected on these companies and their management are a clear demonstration of Schumpeterian economic forces in action. Even though the changes were induced and accelerated by trade policy or the government acting as force majeure, the market forces were brutal and the lack of adequate guidance for small firms in such turbulent circumstances remains lacking. These cases should shed some additional light on the subject.

The second and third action research cases, Reedy Fork Dairy and TS Designs, Inc. were performed in parallel as the work to salvage Burlington Chemical was ongoing. This situation allowed me to use the work I was doing at BCC and the work I was doing within this PhD program to develop a structured approach to insertion of the sustainability lens within small firms. The action research model allowed me to be an advocate of my position and to take an advisory role to bring these changes into being.

The businesses cases are written in a narrative format and include business metrics as part of the narratives. The intentional use of narratives is to remind readers that all enterprises and markets are made of people interacting together with both economic and environmental intentions and consequences. In counter distinction to the cold hard archetypes of businessmen generally depicted in the media, the owners of these SME firms fully demonstrate the scope and the depth

of commitment to the stewardship of their human, economic, and environmental resources through the processes of creating sustainable enterprises.

6 Burlington Chemical Company: Research Study #1

6.1 The Human Context

It was June, 1994. Bascom Moore, the 65 year old CEO of Burlington Chemical Company (BCC) was tired. It was the end of a long day. The June board meeting had just ended. The news from the meeting was mostly positive. BCC was on track in 1994 to make record revenue and profits. The company was running at a very high capacity in dye and chemical manufacturing, the color matching and development laboratories were operating seven days a week, and the core customer base of producers of knit goods, yarn dyeing, socks and hosiery were all very strong. The company had 200+ employees, a fleet of trucks for custom distribution, and was taking orders and making deliveries 24 hours a day, seven days a week. BCC had come a long way towards becoming a \$100 million-per-year company in the last decade.

One disturbing bit of information however, made its way from the Board member's television sets into the boardroom. It appeared likely that sometime in 1995, the US would ratify the GATT (General Agreement on Tariffs and Trade) accords for global free trade. This action was coming less than a year after the adoption of the NAFTA (North American Free Trade Agreement) in 1993 (Duke 2009; WTO 2009). For a small specialty dye and chemical producer like BCC, all these changes in national and international trade policies cast a mysterious shadow on the future because it was primarily a regional supplier of dyes and chemicals for the American textile market. Mr. Moore wondered how such governmental policies would affect his company.

Over a 10-year period, the NAFTA and GATT trade policy accords would remove all tariffs on imported textile and apparel items, placing American textile manufacturers at a huge competitive disadvantage with other NAFTA regions such as Mexico, Central and South America. GATT would give Far East textile producers the same access and competitive advantages in the US market. It also appeared that once efficient transport logistics and other supply chain issues were resolved, China and the Far East would be the lowest cost textile and apparel producers globally. These Asian countries had few environmental regulations and paid wages of only \$2-3 dollars per day. The average hourly rate at Burlington Chemical was over \$14.00 per hour and the EPA, OSHA, and other regulators were vigilant with constant inspections and monitoring. Moore had deep concerns about how globalization would impact the whole of American manufacturing. He was puzzled about why the government would want manufacturing capacity to leave the country.

However, in Washington, DC the political case was being made for adoption of GATT by promising that passage would lower the wholesale costs on consumer goods for the major brand retailers such as Wal-Mart, Target and GAP. These cost reductions would "trickle down" and this would translate into lower prices for consumers (WTO 2009). It appeared that the die was cast to fully globalize "free trade" and that the American textile and apparel manufacturing sector would no longer be protected as an asset "strategic" to the American economy or national security.

Bascom Moore knew that nothing good would result for his firm from the globalizing of American manufacturing. The trade association to which BCC belonged was screaming that all manufacturing industries were being exterminated. In fact, he was outraged that his government

and the Republican Party he supported would promote such policies. The whole idea of making manufacturing obsolete and giving it away to Mexico, Central American and the Chinese made no sense to him. However, in his 50 years as an entrepreneur and owner of BCC, he had seen recessions and policy changes come and go. He was confident that while the overall market for the larger textile customers in the US would be impacted and that the US market would shrink due to globalization, the smaller niche textile manufacturers that were the core customers for BCC would not be as significantly affected. Who could afford to ship socks and yarn from China to America? Surely there would be some “local” advantages that remained.

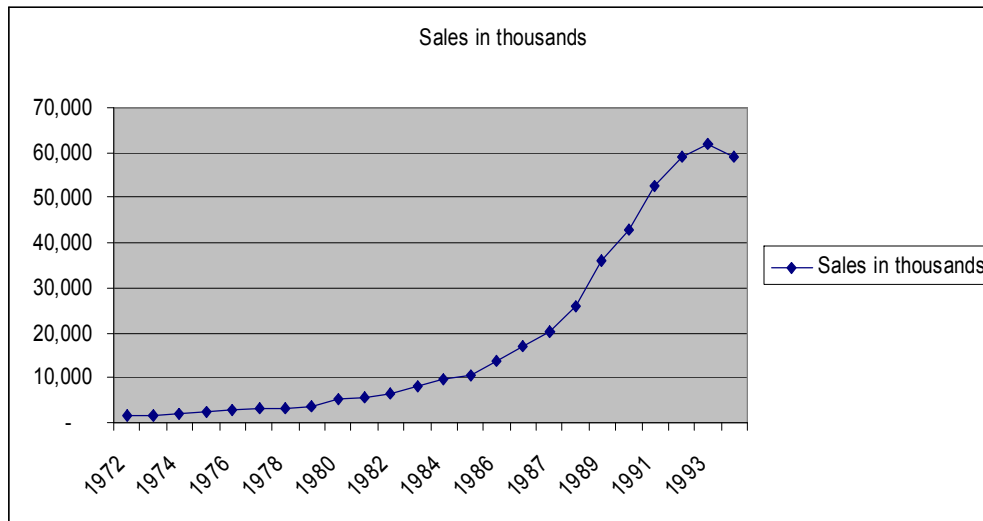


Figure 6-1 BCC’s Revenues from 1972 through 1994

The steep growth curve of the mid-1980’s was due to two factors: adoption of a sustainability strategy and increases in dye revenues due to international raw-material sourcing.

BCC was only a \$70 million company in a \$2.2 billion dollar US market for textile dyes and chemicals³⁹. Just as his firm had adjusted and innovated their way through the recessions of the 1970’s and turned the environmental regulations of the mid 1980’s into a “green” chemistry advantage that transformed the company’s way of doing business, Moore believed that BCC would innovate and out compete the larger global firms for their share of the US textile market. The company was good at turning adversity into competitive advantage and their eco-efficient products and services were very successful. BCC could ride this out and adapt.

To believe otherwise, would leave the company with only one option: to walk away from the textile industry, and sell the firm now. This was unthinkable. The Chairman had spent his life building this business and he certainly did not want to walk away from 50-year old customer relationships and a company that was clearly growing and doing so well. Furthermore, he literally could not believe a basic industry such as textile and apparel manufacturing would change quickly. Changes in the textile market usually came slowly. After all, it had taken this industry a hundred years to move from New England to the South after the Civil War (Prentice Hall 1972). The US textile industry was mature and entrenched with factories throughout the

³⁹ These figures were derived from an industry association credit group report that was compiled annually by various dye and chemical suppliers who collaborated in assessing credit risks and the scope of the US market in textile chemicals.

south-eastern USA, and both NAFTA and GATT had 10-year phase in periods. Surely, this was enough time to find a path forward.



Figure 6-2 Photograph of High Pressure Reactors

These reactors were installed at BCC's surfactants manufacturing plant as a result of investments by the Board of Directors to allow expansion of the company "beyond textiles". (Photograph by Sam Moore.)

Mr. Moore had recently hired a new COO of the firm, an experienced executive, with a solid background in surfactant manufacturing and business management. Together with his son, he would compliment and lead the firm towards the goal of being a \$100 million dollar company. Then, he hoped they would get a purchase offer that would make them all wealthy!!

In fact, just a few weeks prior to the Board meeting, the new COO had received strong indications that a large international chemical company was interested in buying BCC's textile business. The revelation of this opportunity was a catalyst for a healthy discussion in the board meeting on how NAFTA and the sure passage of GATT would likely affect BCC. The COO made a good case to the Board for serious and immediate consideration of selling the company before NAFTA and GATT caused market turmoil. The COO indicated that, in his opinion, the value the shareholders could receive for selling the firm in the near future (5-10 years) would likely not be as high as the present value. It was his estimation that it would take some time for the impacts of NAFTA and GATT to be absorbed and investments in new markets to mature enough for the value of the firm to increase. He also emphasized that the non-textile business of BCC could not carry the company as textiles were still generating over 90% of the revenues and profits.

The attorney present at the board meeting suggested that, for fiduciary purposes, this proposal required a vote. The vote was unanimous to reject consideration for a sale of the firm at this time. The discussions and the vote were a clear indication that the majority of Moore's shareholders agreed that the company had a good future, even when presented with a good opportunity to sell the firm. His managers and shareholders did not want to exit the textile business by selling off the company.

The board proceeded to put on record that they felt that: a) there were many remaining opportunities within the textile market; b) the company was only a small player in the overall market; c) the non-textile performance chemical group was growing, and d) that they had confidence in the managers of the company, including the new COO and the R&D team. The board concluded that BCC could overcome a downturn in the textile market.

While the board did not express interest in selling the company, they did authorize a hedge. They wanted to see an expansion of the non-textile distribution and formulation business and the completion of construction of the surfactants manufacturing plant. The expansion would require a total investment of over \$2 million, which would increase the company debt to around \$2.5 million dollars, a rate that was still very low for a \$70 million dollar company. Both of these investments were solid diversifications beyond the textile industry, and, if the pundits were wrong and the markets continued to grow, the assets could be used to support growth and expansion in textiles.

Bascom Moore thought the board had acted responsibly. He was quietly pleased with the board's decision on hedging the threat to the business with the proposed incremental investments in new markets and the surfactant manufacturing plant. The proposed 10-year phase in period for import tariffs in NAFTA and GATT should give the company plenty of time to diversify and grow into new markets. He was nearing retirement and could look back on a job well done and a solid future ahead.

6.2 The Business Challenge

Mr. Moore and the board were wrong. By 1998, the full impacts of the NAFTA and WTO agreements were destroying the textile industry in America far more rapidly than was anticipated with the 10-year phase in provisions (see Table 6.1, "US Job Losses Due to NAFTA" below). Even as the BCC board was meeting in the summer of 1994, many of America's large textile firms were responding to NAFTA and the promise of lower wage and environmental costs, by building manufacturing facilities in Mexico and shifting production out of the USA. However, even before many of these new facilities were completed and put into service, the full force of Chinese and other Far Eastern textile producers upended the Mexican/American producers in the apparel market. Many of these half-finished facilities never opened, as American retailers such as Wal-Mart jumped past Mexico and directly to the Far East supply chains to take advantage of lower currency, labor, and environmental costs. (ITCB 2001)

Cost pressures rapidly influenced BCC's primary customers, the south-eastern knit goods and yarn producers, after passage of NAFTA and GATT. As domestic retail brands began receiving quotes for apparel from overseas, there was immediate price pressure on US producers to compete. When foreign goods began to show up in stores well ahead of any significant tariff decreases, the realization of just how inexpensively foreign textiles could be produced in China became readily apparent.

Commodity production and niche producers began to rapidly lose orders and no niches were spared. The flood of imported goods was sinking all boats. The rapid transition to foreign made goods occurred first in apparel and spread rapidly to other segments of the textile market including hosiery and yarns. This was a completely new phenomenon for the domestic industry. Domestic producers large or small, despite shorter supply chains, faster design/production

cycles, and other technological and “local” advantages, lined up to file bankruptcy (Brandon 2001). This was reflected in BCC’s financial performance from 1995-2000.

Table 6.1 US Job Losses Due to NAFTA

USA: Post-NAFTA Job Loss In Textiles & Apparel Exceeds 1 Million (2007)⁴⁰

With the loss of another 4,700 jobs in May 2007, the U.S. textile and apparel manufacturing sector now has lost 1,001,100 jobs – a 65 percent loss of employment in the industry – since the implementation of the North American Free Trade Agreement (NAFTA) in January 1994. Despite these losses, the sector continues to employ 547,800 according to data from the U.S. Bureau of Labor Statistics.

Breaking down the numbers, the U.S. textile industry lost 360,600 jobs (52 percent employment loss) and the U.S. apparel industry lost 640,500 jobs (75 percent employment loss) over this period.

“The loss of one million jobs is an outrage. It drives home the point that the current U.S. trade policy has failed and must be changed now. An uncontrolled flood of imports, often heavily subsidized, is crippling the U.S. textile industry,” said American Manufacturing Trade Action Coalition Executive Director Auggie Tantillo.

“The loss of these one million jobs also negatively impacts America’s national security, as textiles and apparel products are vital to the U.S. military. Moreover, the damage happening to the textile industry also is occurring in other manufacturing sectors critical to our military industrial base,” continued Tantillo.

Textile and apparel jobs losses in key states since 1994 are as follows:

- Alabama — 60,800 losses
- California — 38,900 losses
- Georgia — 77,355 losses
- New York — 80,550 losses
- North Carolina — 193,000 losses
- South Carolina — 90,211 losses

While NAFTA alone caused only a portion of the job losses in the industry since 1994, its implementation was symbolic of a sea change in U.S. trade policy. With NAFTA, the United States either gave free access or lowered barriers to imports of manufactured products from Mexico, a country with an economy less than one-tenth the size of the U.S. economy.

While Mexico with its large supply of cheap labor (pop. 102 million in 1994) could undercut U.S. wage rates, its consumers had little ability to buy finished U.S. products in large quantities. Unsurprisingly, the arrangement turned a small U.S. trade surplus with Mexico in 1994 to a \$64 billion trade deficit in 2006.

This model was replicated in the Uruguay Round⁴¹ that led to the formation of the World Trade Organization (WTO⁴²) (WTO), China and Vietnam's accession to the WTO, and free trade agreements like those with Chile, Singapore, Morocco, the CAFTA countries.

⁴⁰ American Manufacturing Trade Action Coalition, *USA: Post-NAFTA job loss in textiles & apparel exceeds 1mn.* 2007, American Manufacturing Trade Action Coalition.

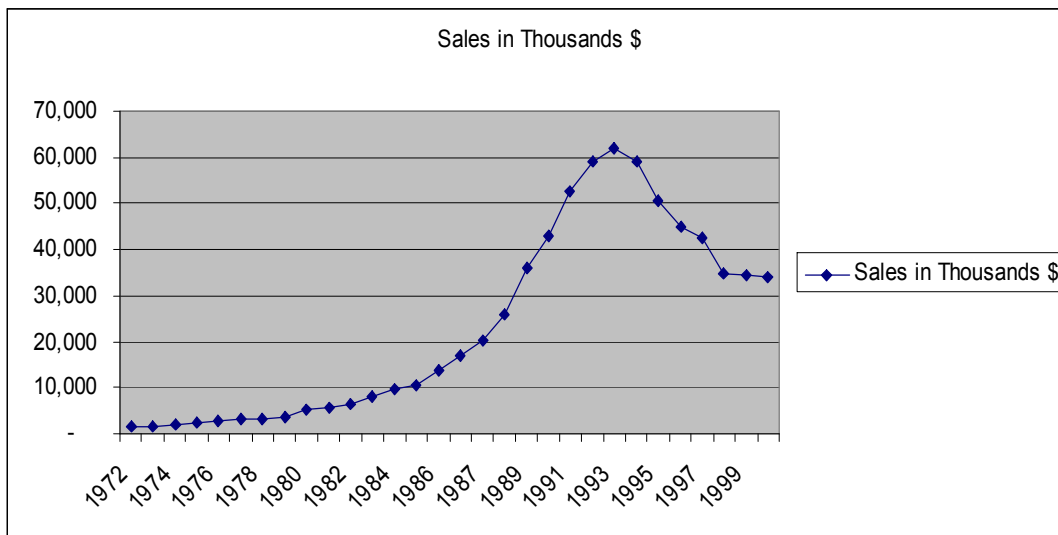


Figure 6-3 Revenue summary of BCC 1972 – 2000

Steep declines in sales revenues were due to the influences of NAFTA and WTO trade agreements that destroyed the US textile manufacturing market.

In 1999, The Bank of America began to *call* all financing agreements for any firms engaged within the textile supply chain.⁴³ In 2000, the 35-year relationship between Bank of America (BOA) and BCC ended when a visit from a young BOA banker from the corporate office gave BCC 45 days to find a new bank, even though no loan violations had occurred. The “local” banking officials from BOA who had been “friends and partners” to the firm during good times, did not bother to attend the meeting, as long-standing relationships meant nothing due to the depth of the crisis.

BCC began to lay off a few employees, something it had never done in 50 years. BCC had to scramble to find an asset-based lender, as most other commercial banks including Wachovia, local and regional banks, tightened textile credit availability and were not interested in the company. As the firm adjusted to the new banking and market realities, it found that asset-based lending instruments tripled its interest expenses and doubled its internal accounting costs. BCC also found that perversely, the asset-based lenders constantly increased the pressure for the firm to declare bankruptcy or sell off assets, rather than to fight to keep the firm open, as their contracts favored debtor financing in bankruptcy as a way to squeeze more interest and expenses from troubled firms with strong balance sheets.

By 2000, just five years into the ten year phased in application of NAFTA and WTO, the company had moved from being a leader in its regional textile business, highly profitable and respected, to a company fighting for its very existence in a dying market.

⁴¹ Spanning the period from 1986-1994 and embracing 110 countries, the Uruguay Round refers to the 8th round of multilateral trade negotiations conducted within the framework of GATT. The Round transformed the GATT into the World Trade Organization. See http://en.wikipedia.org/wiki/Uruguay_Round

⁴² See www.fibre2fashion.com/new/associations-news/world-trade-organization

⁴³ This was communicated directly from the manager of BOA operations in Burlington, NC to this thesis author in 2001.

At the turn of the new century and five years into the age of globalization, the question for BCC was: *could they accelerate significant growth in new markets while maintaining enough textile revenues to fund the transition into the new markets?* What was the best use of the firm's assets in this time of crisis? Could the firm swiftly develop significant revenues from non-textile markets, before it consumed 50 year's of accumulated assets and goodwill? Could the core capabilities in sustainability that had produced highly green and differentiated products for the textile industry and enhanced market connections in that market, lead the company into value creation within other markets in time to save the company?

As a member of the board of directors and a 30% shareholder in BCC, this thesis author faced a significant challenge that pushed him to use a sustainability strategy to anchor a transformation of BCC. The incremental approach towards market diversification, the strategy applied by the board and management to the situation from 1995 – 2000, was not producing change rapidly enough. It was clear by 2000 that BCC's primary textile chemical and dye business was continuing to bleed customers, revenues, cash and receivables. If some sort of solution was not found, the firm would be out of cash in less than four years. However, the managers of the firm saw no way out of the textile industry that provided enough cash to fund a start-up venture and provide enough time for it to mature and prosper. It was a conundrum of epic proportions for the owners and the management of the firm.

The reality facing management in 2000 was that the company's investments in lean manufacturing and green chemistry had *produced the only technology and organizational assets that seemed to translate from textiles into new markets*. None of the other manufacturing units and technologies for dyes and specific textile chemistries was broad enough to carry over into new markets. The challenge for the action researcher was to identify how these sustainability-based assets and capabilities could be used to find a path forward for this firm. The sustainability lens was in place, but could the company develop the will to change (Montalvo 2002; Montalvo 2006)? Perhaps some clue could be found in the past history of the company?

6.2.1 History of the Company

BCC was formed in 1954 by Samuel Odell Rose. He started the company reselling Naphthol dyes produced in Georgia into the sock and yarn dyeing operations in NC.⁴⁴ Though Mr. Rose had only a 6th grade formal education, he had worked in dyeing operations since his teen years and was an exceptional craftsman dyer.⁴⁵ The firm was successful enough during the first several years for Mr. Rose to invite his son-in-law, Bascom Moore, to join the firm after graduating from college in 1955 with a degree in Business Administration. Through the efforts of the two men and their families, the company grew consistently and, in 1963, built a facility in Burlington, NC as a warehouse, laboratory and manufacturing site to replace its first home in the family garage. Over the years, the company continued to expand its geographic market coverage to include most of the south-eastern USA, but the core customers through the mid 1980's remained

⁴⁴ Naphthol dyeing of cotton consisted of inserting a soluble fragment of a dye molecule into the cotton fiber and then coupling it within the fiber to form an insoluble dye/pigment that was entrapped. This technology was basically replaced by fiber reactive dyeing in the 1955-1965. Cellulose fiber reactive dye chemistry remains the standard today for safe, highly wash-fast dye chemistry. Naphthol dyeing is very similar to dyeing with indigo, but the intermediates used were much more toxic.

⁴⁵ The chemistry of dyeing was not approached very scientifically until the advent of synthetic polymer fibers allowed for a fuller understanding and quantifying of dye application and bonding within fibers. Prior to fiber reactive dyes and polyester and nylon fiber, dyeing cotton and wool was little changed over 100's of years.

geographically in the piedmont region of NC. During the period of the 1960's, the SME had an average of five employees, but this number grew as new services were added including transportation and delivery, distribution of "heavy" chemicals, and development of dyeing auxiliary's specialty soaps and detergents.⁴⁶

By 1978, the company had revenues of \$2.5 million and gross profits in the range of 40%. This thesis author joined the firm as a research chemist with a BA in general chemistry and two years of graduate studies in textile chemistry at North Carolina State University. Samuel Odell Rose, the founder, was the author's grandfather, and Bascom Moore was his father. This thesis author's initial responsibility within the firm was to increase investments in research and development, to develop an analytical support for customer service projects, and to broaden the line of specialty chemicals. These objectives were met in an incremental manner, and by 1983, the investments were maturing and the firm was approaching \$5 million in revenues and profits remained steady.

Newly developed capabilities, services and product lines were of increasing importance to BCC's growth during the period of 1980-1990. A processing plant was built for textile dyes and new staff was hired for standardization of crude dyes made in India and China into finished forms for the US market. This process increased the profit margins for the dyes' segment of the market by as much as 100%. The specialty surfactants and softener segment of the market also increased, but at a slower rate than the growth in dyestuffs. For both textile and non-textile specialty chemicals, BCC was also developing applications for a Solvay peroxygen product, sodium percarbonate, as an oxygen bleaching agent.⁴⁷ Within its community, the company was also a leader in supporting local and regional chemical emergency management efforts and it was active in finding areas of synergy between environmental policy and its own product development.

One challenge of critical importance to BCC and the textile dyeing and finishing industry in North Carolina as a whole emerged in the 1980s: how to negotiate escalating wastewater treatment and litigation costs due to increasing wastewater regulations and environmental activist's groups. In 1985, over 50% of all the wastewater treated in the state of NC, was created by textile wet processing (dyeing and finishing of textiles). The government and NGOs were adopting a "polluter should pay" mentality in policy development and enforcement, and the industry was facing a huge increase in wastewater treatment costs if other solutions to the challenge could not be found.

⁴⁶ Burlington Chemical had three categories of chemical products they sold to the industry. The first category included textile dyes used to color cloth and yarns. The second category included "heavy" or commodity chemicals products such as common salt, chlorine bleach, hydrogen peroxide, etc. These heavy chemicals were necessary for the dyeing process. The third category included specialty chemicals and included specially formulated detergents, fabric softeners, resins and polymers. Heavy chemicals had profit margins of 5-10%. The dyes and specialty chemicals had margins up to 50%. The broad marketing approach in the early days was to get as many pounds of as many categories of chemicals on each delivery and offer the customer a single sourcing solution for all of their chemical needs.

⁴⁷ Solvay built a 50 million pound percarbonate plant in Deer Park Texas in the 1990's. The plant was to produce percarbonate for Proctor and Gamble (P+G), but there were technical challenges that prevented P+G from full adoption. Therefore, Solvay has millions of pounds of percarbonate in excess and BCC partnered with Solvay to develop new applications in textiles and consumer products. Most notable of the peroxygen developments was the technical development of a consumer product concept, (OxyClean) which remains on the market in 2010. The concept was not pursued by BCC, after it was deemed that the costs of introduction of such a product was "too expensive". However the raw material for the product, sodium percarbonate would increase in sales to exceed 35 million pounds by 2000 until Solvay's marketing strategy changed and BCC was eliminated from the supply chain.

BCC's textile customer base was expanding throughout the South-eastern USA, and as a result, the company intentionally chose to become involved with various industry stakeholder groups such as the AATCC, ATMI and IHA⁴⁸. These industry associations were seeking help from industry suppliers as key stakeholders to help their constituents address these increasing pressures from wastewater regulations. The US EPA and the North Carolina Division of Environment were also seeking mutually beneficial stakeholders to help reduce pollution from textile operations in surface waters, as were NGO groups such as the American Canoe Association, Nature Conservancy and NC River Keepers. Because of the economic importance of textiles to the region, policy makers, regulators, and NGO's, the factory owners and the general public, were all seeking resolution to the pollution issues, but they also wanted to keep a viable textile industry.

BCC's role in this process began by helping their customers discover the sources within the chemical processes that were the main causes of the high BOD and COD loadings, and high levels of metals such as copper and zinc. This was accomplished by the R+D group through source identification pollution prevention projects and then redesigning process chemistries in dyeing and finishing to reduce organic, metallic, and nutrient loads within the processes. By understanding these challenges, BCC strengthened its network connections with the market but also with environmental stakeholders such as NC regulators and regional NGOs. Managing diverse dialogues and stakeholder relationships became even more important as major policy changes tightened environmental regulations. Another benefit became apparent. These chemical optimization processes also reduced chemical costs as well as water and energy usage for customers. The company's reputation in this area began to increase sales of new products, as BCC became a preferred supplier for many new customers.

In the mid 1980's, the State of North Carolina began a new program to "clean up" and reduce the impacts of treated industrial wastewater on the lakes and rives of the state. This was to be accomplished by adding an acute whole effluent toxicity monitoring and acute toxicity limitation (WET) on treated wastewaters. The second phase of this policy-making (1987) was to set chronic toxicity limits that would limit the impact of treated wastewater discharges from POTW's on the reproduction of fish and small crustaceans. These final chronic toxicity limits were 100 times more stringent than the initial acute limitations.⁴⁹

BCC's response to this crisis within the textile community is reported in the *Journal of Cleaner Production* in an article co-authored by a NC regulator (Larry Ausley) and this thesis author (Ausley and Moore 2004). This article describes the technical and organizational processes developed by BCC to respond to these policy decisions, and it also documents the process and results of involvement of diverse stakeholders in toxicity reduction and pollution prevention programs. To achieve the objective of helping customers and developing the opportunities that

⁴⁸ AATCC (American Association of Textile Chemists and Colorists), ATMI (American Textile Manufacturing Industry), IHA (International Hosiery Association).

⁴⁹ A brief aquatic toxicity primer, acute toxicity (LC50), determines the concentration of a waste stream or compound that is lethal to the test organism, in this case, daphnia and fresh water minnows. Chronic toxicity, "No Observed Effect Concentration" (NOEC), determines the maximum concentration of a waste stream or compound that has no observed effect on the reproduction of the test organisms.

these new capabilities offered, BCC formed a new environmental laboratory and consulting business.⁵⁰

The impacts of these activities on BCC’s sales and market share, as a result of the transformational greening of its product line and the stakeholder engagement described in the article, was remarkable. The approach of first identifying the toxic chemicals causing the problems and then eliminating them and substituting new, low toxicity replacements, allowed customers to pass first acute and then chronic toxicity WET environmental standards. By performing these projects for customers, BCC helped its customers, but also learned to optimize production chemistries and to develop safer, more efficient products. As this cleaner production and process capability grew within BCC, it was also integrated into the product development schemata for dyes to develop low salt and low metal products, and into the design of manufacturing plants of BCC. This created an environment focused on organizational learning and producing increases in eco-efficiency as the company reduced risks, enhanced its reputation and brand, and engaged new stakeholders who became fans of the company.

Sustainable Value Model

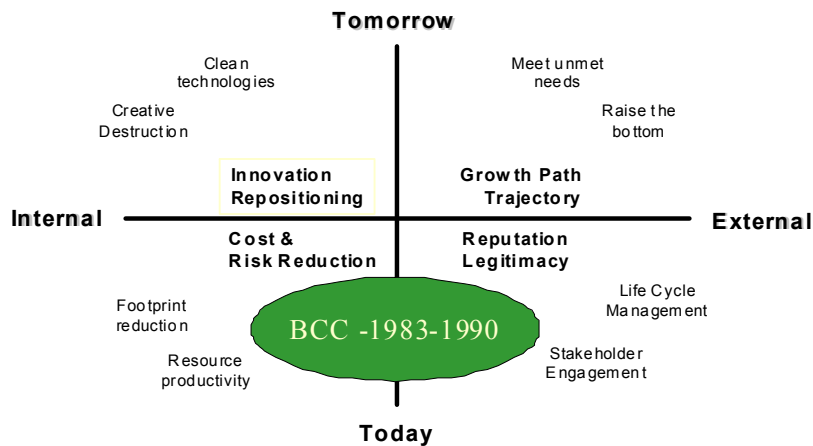


Figure 6-4 BCC’s Strategic Positioning 1983 – 1990 according to Hart’s (2005) Value Modeling *The activities during this period are documented in Ausley and Moore (Ausley and Moore 2004). This foundation laid the path towards development of Design for the Environment (DfE) lubricant and surfactant technologies that supported the firm’s efforts towards transitioning out of the textile market.*

By the end of the 1980’s, as Paul Hawken began publishing in earnest (Hawken 1993) and Ray Anderson (Anderson 1998) began speaking on transformation towards a “sustainable enterprise,”⁵¹ BCC was a proven early adopter and beneficiary of “walking a path towards sustainability.” Revenues for the firm in 1991 exceeded \$50 million and gross profits remained over 25%. However, almost all revenues and benefits from the “greening” of BCC were achieved

⁵⁰ Burlington Research Inc. remained a subsidiary of BCC until 2002 and the wet processing textile industry in NC had shrunk so severely that there only remained opportunities to keep the company open as a commodity water testing lab. The company was sold to a national laboratory chain. At the time it was sold it had 25 employees and \$2.5 million in revenues.

⁵¹ Anderson’s speeches are recounted in his book published in 1998.

within the textile side of the business. Green chemistry was not to gain much acceptance in the performance surfactants business until GreenBlue® and GreenSeal® developed sets of publically transparent environmental standards.

The company had sought diversification outside of textiles with experiments in industrial laundry and water treatment chemicals in the late 1970's, with little success. Its breakthrough investment outside of textiles began in 1980's with the success of introducing peroxygen products into the industrial cleaning industry. With this success, a formal division, "Performance surfactants and chemicals" was formed in 1989 and its financial impacts increased incrementally throughout the 1990's until it produced about 10% of the company revenues. The challenge for this business was that it produced much lower profit margins than the textiles' business and that their successes were small in relation to the growth in sales and profits from the textile's operations. The culture of the company did not allow for aggressive investments outside of textiles that might detract from its core focus, but incremental investments were encouraged.

However, the "greening" of BCC surfactant formulation technology, developed as a result of the lessons learned during the 1980's, allowed the firm to introduce new Design for the Environment (DfE) vegetable-based lubricants and detergent additives through its performance chemical division beginning in the early 1990's and they were gaining some moderate success.

Sustainable Value Model

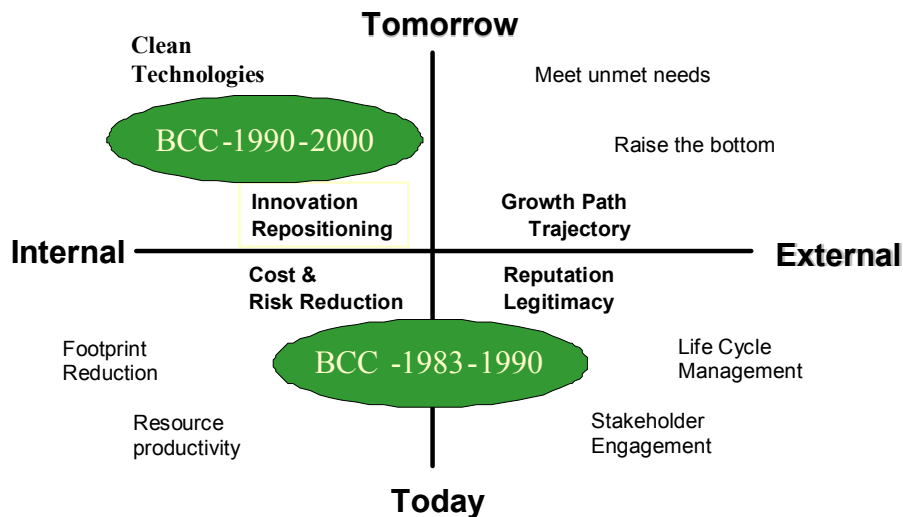


Figure 6-5 BCC's Sustainable Value Model 1990-2000

BCC's cleaner production efforts during 1990-2000 enabled the firm to reposition itself as a producer of green lubricant additives and environmentally sound surfactants for cleaning applications. The firm was also working on products that could be used in developing economies and on strategies to export its cleaner textile production techniques and chemistries into Central America, China and India.

BCC had learned its lessons well. The advantages of strategies using the new concepts and tools of eco-efficiency, diverse stakeholder engagement and intense customer dialogue were recognized and utilized throughout the firm. The management of the firm and the board of directors had however, fundamentally misunderstood the changes that the WTO and NAFTA

would bring on the highly networked and interrelated domestic textile industry. The impacts of NAFTA and GATT were not temporary restructuring and reallocation of resources causing a temporary recession; they were a fundamental destruction and globalization of an entire industry.

Due in large part to BCC's history, its rapid success in regional textile markets, and the fact that it was an SME and had all of the positive attributes of small firms described earlier in this dissertation, the firm found itself in the following position in 2000:

- The textile industry was crumbling much faster than the company's growth in new, non-textile markets.
- The future value of all sales in the textile market (goodwill) were discounted to zero by potential buyers of the firm and the banks, which left the value of the company to be calculated by a highly discounted asset valuation of its inventory, land, equipment and factories. Refinancing and leveraging the very strong balance sheet of the company could only provide a few years of adequate cash at current sales and expense levels. The cash "burn" rate was too high.
- Entry into the surfactants, chemical distribution, and industrial chemical markets for BCC products was occurring, but the entry mechanism for these markets was primarily through producing lower cost, albeit greener, prototype products versus incumbent market leaders. This resulted in much lower profit margins than the company historically obtained from its textile sales. The squeeze on margins was a very difficult reality for a company, which had always been very successful in selling high margin, specialized, problem solving chemical products and services, in a very complex textile-producers network. BCC's core competencies were in problem solving in a market where the firm and its stakeholders clearly understood the added value proposition for their products, and the high profit margins were the result.
- Fundamentally, the company was not a low cost commodity chemical producer and did not have the management infrastructure and cost structure to be a low cost producer. The company's management did not recognize this fact.
- This was a "family" company with, at its peak, 220 employees most of whom had been employed at the firm for 10+ years and many for over 25 years. It was personally difficult for the owner and the management of the company to "creatively destroy" the textile business and to discharge large numbers of employees to chase new business opportunities that were not as profitable. The board did not want to abandon the textile industry and their comfortable expertise and success, while there was any hope of retaining any of that business.
- The composition of the board of directors was entirely made up of family members and long-term managers of the company. There were no outside directors. This created a lack of diversity and objectivity.
- After 50 years of on-going success as a regional textile supplier, the board of directors and the managers did not really have a vision for the company outside of the textile industry.

6.3 The Method of Intervention

By 2000, BCC had little need to convert or create owner and management intention toward the adoption of a “sustainability lens” as an integral part of strategy development. Such a lens had been developed and vetted completely during the period of 1985-2000, and the company had embraced it as described in the history section. In fact, it was this thesis author’s experience in developing the process of integration of this lens at BCC that was the basis for the intentional frameworks developed in this dissertation.

However, the company had no roadmap or expertise for the degree of change that would be necessary to reinvent the company as a specialty chemical manufacturer from its roots as a textile chemical company. As the first step in a systematic approach toward reinvention of the firm, a change team was formed of key managers to develop the strategy. This team included the action researcher (this thesis author, who was then serving as Vice President of Research and Development), the Chief Operating Officer, the Vice Presidents of Sales and Marketing for Performance Chemicals, Textile Chemicals and Dyes, and the CFO of the firm.

The first action of the Change Team (CT) was to hire an organizational behavior/change consultant, Dr. Edward Marshall, author of *Building Trust at the Speed of Change* (Marshall and NetLibrary Inc. 2000) to lead team meetings and to add an outside perspective to the process. Dr. Marshall, a resident of Chapel Hill, NC, was geographically close, and was recommended by several other local executives. BCC had always considered itself to be a “family company” that cared for and honored its associates. The company had a dedicated workforce whose relationship with the company was soundly grounded in “trust.” There was much concern about the effects of radical restructuring on the morale and retention of employees. The CT hoped to avoid mistakes by using a consultant experienced in these matters.

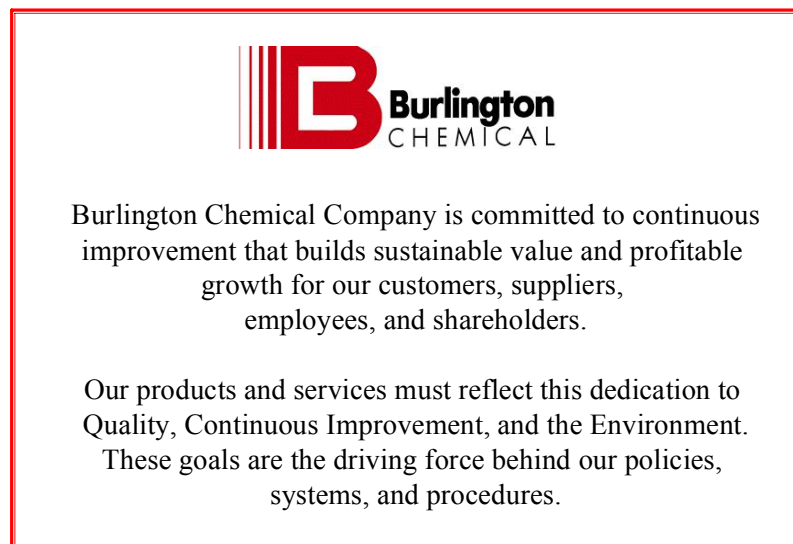


Figure 6-6 BCC’s Mission Statement

It was adopted in 1999 after its leaders engaged in the process of developing a new vision..

Dr. Marshall’s first actions entailed adding a few other employees to the CT to represent non executive employees’ viewpoints. Once this group was vetted, it began with several day-long

sessions engaged in Senge's Present State/Future State analysis (see Chapter 4). This analysis showed immediately that the company's visions, values, skills and competencies were unique towards providing a high level of service to the *textile industry*, but these competencies did not necessarily translate to value outside of the company. These dialogues and meetings produced a consensus for a visionary future state for a restructured BCC. This was a vision that would allow BCC to compete and establish itself in other industries as well as textiles, by managing complexity for new customers in new markets via green technologies producing eco-efficient results; they also produced the mission statement shown in Figure 6.6.

The second action after consensus was reached for the new vision was to conduct a network analysis of the company's existing markets. For the textile side of the business, this would give the CT an idea of an incumbent market network structure that had been very successful. This analysis indicated that the firm had a highly complex and rich textile network structure. Stocks and flows, complexity of inputs and outputs and diversity of connections seemed balanced, and the firm had a high level of stakeholder engagement and value creation in many dimensions. The firm had developed diverse stakeholders in its regional, local and national textile market community. The complexity and chemistry of its product lines and plant capabilities were comparable with Sandoz, Bayer, Ciba Giegy, and other larger international textile firms. The challenge organizationally was how to recreate this, if possible in other markets.

The network analysis for the performance chemical (non-textile) segment of the business was also enlightening. It indicated a similar complexity on the input side of the network, but the actual sales of products in the specialty surfactants performance chemicals division, were mostly based on replacing or prototyping existing market leading technologies. BCC was not yet sufficiently established in these new market networks to take advantage of the opportunities available to fully established and respected members of these market networks. Furthermore, its technologies were not strong enough to accomplish this on their own. Becoming full and valued members of new market communities would take time to establish. It was the firm's intention to do this through leveraging its green chemistry and expertise in cleaner process design. The company had to prove expertise and value creation for these new customers. It was felt that the unique green chemistry and highly safe and effective product emphases would speed acceptance into these new markets.

Montalvo (Montalvo 2002) is clear that changes in behavior, in this case a change in the utilization of assets from a primary focus on textile markets towards a primary or at least an equal focus on lubricants, surfactants and toll production, can occur, if the company has the will and capabilities to make such changes. In this case, there was a financial imperative that demanded change. The board and the management team "recognized" this need at every monthly board meeting as the financial situation worsened and the lender applied pressure. The final assessment of the "will" of the firm would lie in its allocation of financial resources into new business areas while "creatively" destroying the textile business. The CT recommended that the firm obtain an outside assessment of its technical and human resources to determine what capabilities existed within the firm that could be reallocated towards new markets.

The board agreed to a third-party analysis of the company's core physical and technical competencies and assets to determine which ones could be leveraged outside of the textile market. An international engineering consulting and marketing firm conducted this assessment

and inventory. This firm was an expert in the specialty chemical market and known for its services in personal care and cleaning product surfactants and oleo-chemicals marketplace.

Their report indicated that the firm's intellectual property (patents), service, manufacturing assets and distribution capabilities, were a "good fit" for expansion in three areas:

- The regional chemical distribution business,
- Expansion of their performance surfactant and cleaning products business,
- Entry into the industrial lubricants business via BCC's "green chemistry" assets, especially in high temperature fatty esters for high performance lubricant additives for viscosity and corrosion control.

This report fit well into the CT's new vision for the firm, but there were areas of disagreement. The CT, the lenders, and the board did not agree with the consultant's recommendation on expanding the low profit margin distribution business due to the high cost of maintaining the transportation fleet and the regional overall decline in any type of manufacturing in North Carolina. This idea was scrapped.

The report provided enough incentive for the board to adopt the CT's recommendation to launch an ecologically focused industrial lubricants division. This new lubricant division would be in addition to existing efforts in performance chemicals and distribution. However, the division would be highly focused on intense customer and stakeholder dialogues to gain rapid entry and to build trust through its unique clean technology.

A manager at the VP level and two chemists were hired. Laboratories were fitted for lubricant research and applications. The technical and marketing goal for the division was to replace petrol-based industrial lubricant additives with plant-based esters. The specific focus was on the machine parts fabrication business segment in the USA, which was under heavy pressure to "green" its business and to reduce aquatic and employee toxic exposure. Products were developed and Trademarked under the Luberos® (noble lubricant) name, based on green esterification chemical technology. These were green technologies that were adapted from BCC's intellectual property, and technically, the products performed well and were viewed as innovative by new customers.

On the financial front, the board of directors was forced by lenders to hire a reorganizational or financial crisis consultant to further review and assist with "creative destruction" of the textile business. After a few weeks of analysis their recommendations were:

- Reduce the number of employees from 150 to less than 50. This would gain the firm two years of additional cash funding and would force the company to stop focusing on a deteriorating textile industry.
- Increase revenues in the non-textile segments of the business to at least 50% of revenues as soon as possible, holding on to at least \$12 million in textile revenue. This would provide for total revenues of the company in the range of \$25 million, roughly 1/3rd of 1995 sales.

- Begin marketing the manufacturing capabilities of BCC’s factories to other chemical companies through OEM manufacturing services.

As a result of the CT’s strategy development, the following action plans emerged:

- Shift the vision and the market perception of the company away from viewing BCC as a Textile Specialty Chemical Company into a broader vision for a diversified, cleaner-production, Specialty Chemical Manufacturing concern with three arms: surfactants and cleaning compounds, lubricants, and custom manufacturing. The new technologies would all be oleo-chemical based, have excellent toxicological and environmental profiles and the “green” philosophy would be the underlying message. In the longer term, process engineering was begun to produce these products via biotechnology and bio-processing methods.
- Sell the dyes and textile chemical business, but retain manufacturing rights and intellectual property in the textile chemical area. Sell all assets of the dye business as this segment of the business had only textile exposure and had no future outside of textiles.
- The company would have 50 employees and anticipated revenues of at least \$25 million USD and within 3 years, the non-textile revenue portion needed to provide 50% of the revenues. This would require a total staff reduction of over 100 employees.
- The company would exit all specialized transportation services for all segments of the business, as its new reach would be national. Sell all internal transportation assets. Reduce all textile chemical and performance surfactants product lines by 60% and streamline all textile chemical lines towards synthetic fiber processing with a focus on non-apparel segments.
- There would be active promotion and sales activities for OEM services to other chemical companies for “toll production.”

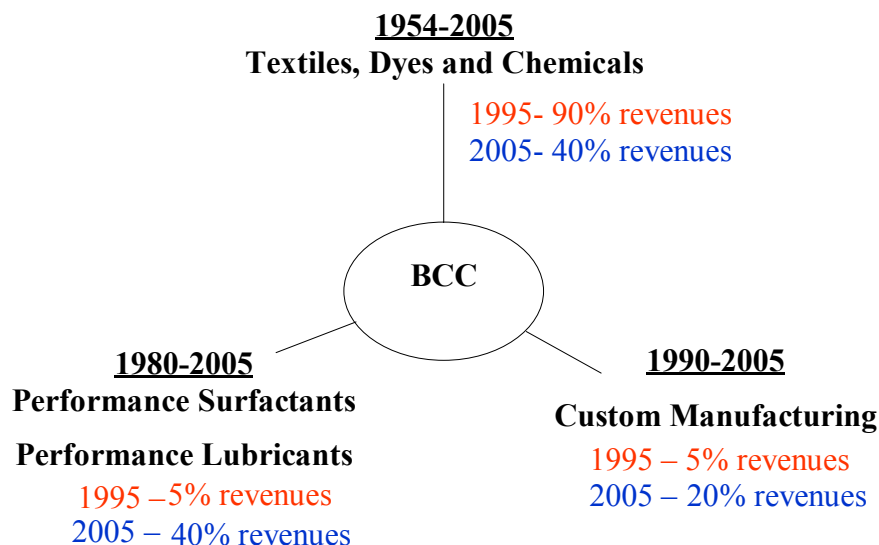


Figure 6-7 Three Segments of Burlington Chemical’s Business with Starting Dates
Red colored revenue percentages were based upon actual data through 1995 and blue values were based on projected data for 2005. The projected values were never achieved and total textile revenues never fell to less than 80% of total company revenues.

Presentation of the action plan to the board of directors in 2000 was received grimly. Never before in the history of BCC had such radical changes in direction and restructuring been proposed. The Chairman retired heartbroken. Several managers in textile functions pre-emptively resigned. Over a period of a few weeks, the CT reduced the number of employees from 150 to 50. Morale was low and the pressures on Performance Chemicals and Luberos were extraordinary. But, a new reality had been created. On September 11, 2001, all US markets received the additional hammer blow as the planes plowed into the World Trade Center and all non military markets entered a significant retraction. A new clock was ticking and there was little time to accomplish a great transition.

Sustainable Value Model

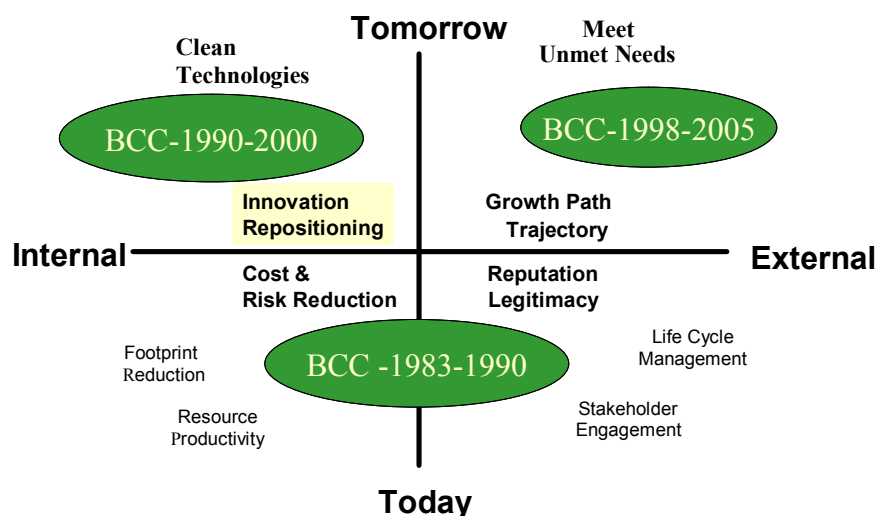


Figure 6-8 Final Projections of BCC’s Sustainable Strategies

This figure shows the final projections of full use of the sustainability strategies of BCC which included geographic and product expansion using DfE chemistries and BOP markets.

6.4 The Outcome

The COO of the firm was able to negotiate the sale of the assets of the dye segment of the business and to arrange for the exclusive marketing rights for BCC textile chemicals to a German dye distributor in 2002. This allowed BCC to exit the direct sales of dyes and chemicals to the US market place, while retaining the production poundage of surfactants and chemicals for textile consumption.

The purchasing firm acquired all dye inventories and assets and this removed BCC from the textile dyes business. However, under the toll production and product development arrangement for textile chemicals, the gross profit margins that BCC would receive for textile specialty chemical sales would be greatly reduced and for the first time in 50 years, BCC would have no direct sales presence in the US textile industry.

The proceeds from the sale of assets went to the lenders to reduce debt. None of the proceeds were allowed to be used for investments in new growth markets. The lenders reduced their

exposure to the company rather than making any further investments in the future success of the company. The lenders wanted to force the firm into bankruptcy and the managers of the firm and board of directors wanted the company to survive.

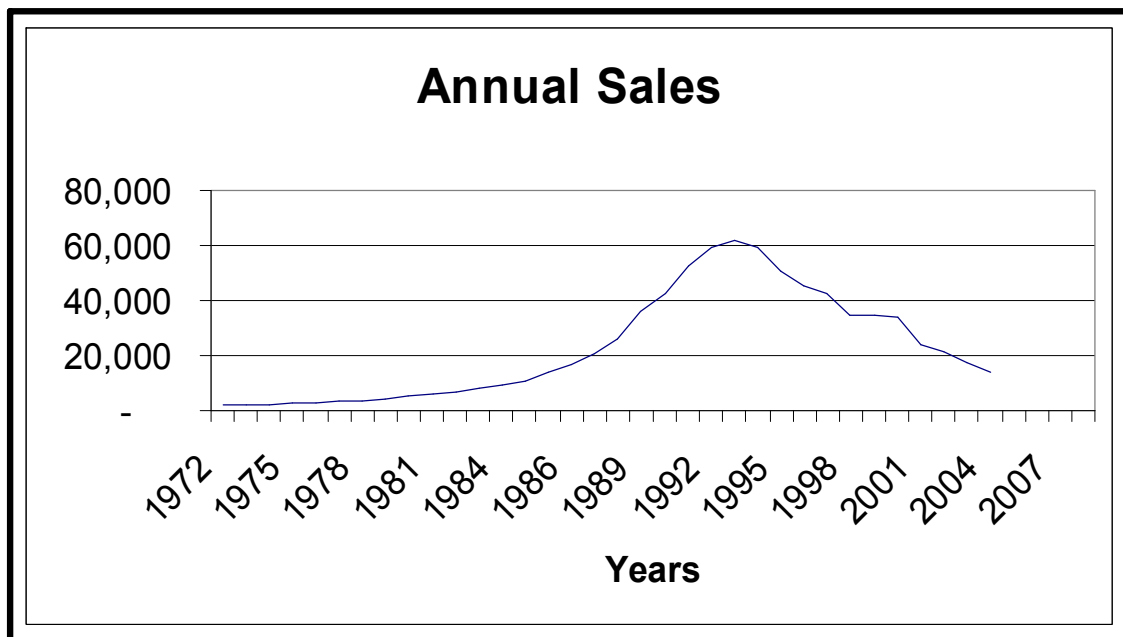


Figure 6-9 BCC's Rapid Decline from NAFTA in 1995 to 2007 as Seen in Its Annual Sales

The financial situation from 2002 – 2006 continued to decline rapidly. Losses mounted. The CEO, Bascom Moore, died in 2005 and this action researcher reluctantly took over as CEO. The company's remaining assets and its book of Performance Chemical and Lubricants business was sold in February 2007 for less than \$1,000,000. There were 35 employees remaining at the time of the purchase; 25 remained with the new company, mostly as plant operators, Quality Control, and health and safety engineers. BCC had finally died.

6.5 Lessons Learned

It should be recognized that over 50 years, there were cycles of technology and policy changes that dramatically influenced Burlington Chemical. Indeed, as described in the history section, the wastewater policies and the highly interconnected nature of the textile industry in the South-eastern USA provided a good policy and market environment for innovations based in sustainability during the 1980's. Using the tools from Gunderson and Holling (2002), these policy shifts produced a circumstance where outside disruption allowed BCC to enter an r-phase of development and to build assets in this area, eventually giving them a dominate position in their markets as a "green" product producer. During this time period the textile industry was financially healthy and important enough to a large number of diverse stakeholders, to support innovation and a cooperative atmosphere for innovation. The competencies created by BCC during this period became part of the DNA of the company, just like the high service mentality defined the company from its earliest days. Both of these assets were recognized as valued by the textile industry, but the trick was to transport that value outside of the textile network, which was in the final years of its K-phase of maturity.

Table 6.2 Phil Bowers' Exit Interview Comments

From an exit interview with Phil Bowers, VP Textile sales group, November 2002. Phil was a Change Team member, Management Committee member and Vice President of Textile Sales until his resignation in 2002.

I have been with Burlington Chemical for almost 10 years. I am a graduate of Georgia Tech University with an undergraduate degree in Textile Technology and have 20 years experience in the textile chemical industry. I also have an MBA from Duke University. The last several years have been the most challenging and difficult of my business life. I feel that we have done everything we could possibly do to reorganize the company to survive this *force majeure* within the textile industry and the manufacturing part of the US economy, but it seems like all our efforts were too slow.

I am really proud of the organization we have built here and proud of the fact that this was built on the pillars of sustainability and responsible behavior by the company. I am not proud, however, of the level of existing sales that we have been able to retain and the lack of growth in new product sales in our performance and lubricants group. I know we have the technology and the facilities to do the job, but we simply cannot manage to get products into the market fast enough. It seems to take a year to get a new product approved through the customer's technical groups and then months to negotiate with purchasing agents to adopt this new greener technology, even though the economic and sustainability message is there.

This company really cares about its people and its community. This decline has devastated Mr. Moore, who led the company through its years of growth, only to see it end up like this. I feel sorry for Sam and Mike (COO) who are struggling to make things happen. There is really nothing they teach you in business school about how difficult it is to really transform an existing business that is one of the best in the world at what it does, into something entirely different. Looking back on the situation, I think the only way this group of managers could have stayed together would have been to have sold the company back in 1995 and taken the proceeds and started an entirely new company. The power of incumbency, the habits and comfort of the "good old days," and dealing with all the uncertainty and risky investments of a start-up situation concurrently, just does not work. It is really difficult to take people that have been so happy and so successful under one paradigm and ask them to stop and accept a new reality full of risk in markets they do not know. I am pleased to see that most of the hundred or so people we have let go have gone on to be successful in other companies. This means we prepared and trained them well and I guess that is all a company can do when your industry collapses.

We have fired so many good colleagues and gotten so little support from customers or the banks that I see little hope for success. Therefore, to save the company money and in reality because I see that I can make little further contribution, I have resigned. I feel that I have learned a great deal in these last few years as a member of the CT and feel I can apply some of these things in a new situation. I wish everyone here good luck and hope for your success.⁵²

⁵² Mr. Bowers went on to found an NGO organization called Sustainable Alamance that remains vital to this day. See www.sustainablealamance.org

This action researcher was surprised to find that the competencies in sustainability and the assets created to support them, were found by consultants to be the primary, transportable value-proposition and physical and intellectual assets of the company. When these results were reported to the Change Team, they agreed. It was also surprising to all involved that so many physical and organizational textile assets were not “valuable” outside of the textile market. Had a strategy development process to define value in terms of diversification “beyond textiles” been incorporated earlier, it may have been more successful.

As an action researcher and highly invested stakeholder in this process, it was gratifying to watch the Change Team become excited about the capabilities and value that had been created from the company adopting sustainable strategies. However, it was also disheartening to realize that the education and adoption of these concepts by the customer was a long term process — and that we were running out of time and money. Despite many customer contact hours, the education process and developing the value proposition at the customer and industry level could not be rushed.

Some of the issues we faced were also due to globalization of the lubricants markets and their customers, as they faced the same realities of globalization and consideration of adopting long term strategies, as the textile industry. This was so similar to the textile situation that we became frightened that our new markets would move before we could move with them.

The visioning work lead by the consultant and the Change Team produced a new vision for the company that transcended the textile industry. The new value proposition was based on eco-efficiency, stakeholder engagement, and a perception that society would continue to mount pressure for greener manufacturing processes and cleaning products.

However, the new vision never took root. While it seemed that the company managers enthusiastically adopted this vision in the meetings, the power of the old incumbency of BCC as leader in the textile industry never allowed full adoption of this new vision. The strength of the connections to the stakeholders of this industry was too strong to break. It was very hard for the textile managers and employees to put great efforts and new behaviors into new markets because of the comfort of working so long and so successfully in this industry. The feedback from new customers was slow, success was infrequent, and any opportunity to interact with any textiles customers was embraced at the expense of focusing on new markets.

This lesson speaks directly to the value of Christensen’s and Hart’s use of “creative destruction” as an intentional change strategy for incumbent firms that need to change (Christensen 1997; Hart 1997). The challenge with this behavior was that none of the frameworks used in the transformation process could forecast this outcome. We believed that the company was working in a good “sustainability space.” Consultants had verified our programs and the corresponding values and the remaining employees seemed engaged, but there was a crisis of confidence because the historically high level of network feedback, which was such a prevalent part of the textile market network, was absent.

The network analysis of the firm’s inputs, outputs and stakeholders, proved to be a very useful tool. It demonstrated clearly that the reason for BCC’s success in the textile marketplace was because the firm was ensconced within a very strong and responsive multi-stakeholder market network. This network had enabled long-term investments and value propositions, while the

network existed. In hindsight the network analysis also showed just as clearly that trying to enter new markets as a low cost producer was difficult because the company's overhead was designed to perform in a market where higher support levels were paid for by higher profit margins.

Psychologically, it was hard for managers used to bonuses based on high profit margins to work as hard to sell twice as much and receive a smaller bonus and less positive feedback from customers in these new markets. However, the strategy developed by the Change Team and sales managers for these new divisions, and verified by the consultants, indicated that prototyping and low cost entry products was the only way to gain the short term sales numbers and create an audience opportunity with the customers. Credible audiences were necessary to begin to lay the foundation for more specialized green chemistries for the longer term.

The analysis of the firm's core competencies and assets to determine its ability and will to change and meet a new vision, which is the basis for Montalvo's Behavior framework, provides an excellent tool to fully understand the "how" and the "what" for changes in organizational behaviors. This tool can help identify areas that support or detract from change activities, but it could not identify the "organization change friction" of incumbency, or the insidious hold of "past success" on adoption of new technologies and new market realities.

Had a more complete analysis of the company's incumbent markets and the markets targeted for entry been done using the ideas of Gunderson and Holling (2002), it would have been apparent that the firm was trying to innovate within K-phase markets where rates of radical innovation are slow and network ties are high. The barrier to entry therefore, through innovation was very high, requiring the firm to have technology strong enough to actually disrupt the entire industry. BCC did not have such capabilities.

The frameworks described in previous chapters worked to provide a path forward for the firm, using sustainability assets that enabled the firm to transcend its vision into new markets. This sustainability lens worked except it could not provide the insights to fully enable the company to choose between an incremental approach of survival, or a revolutionary (creative destruction) intentional mechanism of destruction of the textile business and investments in start-up firms, markets or technologies that were in the α to r-phase of development.

There is a reason for this and it is based in an aversion to pain. Burlington Chemical chose an incremental path because it was psychologically and organizationally easier for the managers and the Board to plan and enact a more peaceful and gradual transition than it was for them to destroy what they had all built over 50 years.

"A revolution is not a dinner party, or writing an essay, or painting a picture, or doing embroidery: it cannot be so refined, so leisurely and gentle, so temperate, kind, courteous, restrained and magnanimous. A revolution is an insurrection, an act of violence by which one class overthrows another."

Quotations from Chairman Mao Tsetung (Mao 1966).

7 The Reedy Fork Dairy: Research Study #2

7.1 The Human Context

The year was 2002. The wind was stirring the red maple leaves around George's head as he lay on his back under hay bailer. He was attempting to fix a broken belt. It was cold, the bailer was old, and it was the second time today it had broken down. It seemed lately that many things on the farm were getting tired and breaking down, including the farmer. Some days George felt old, even though at 43, he was supposed to be in his prime.

George had achieved many of the goals he had set for his life. He was/is the manager/owner of the Reedy Fork Dairy Farm, a third generation, 800-acre, 150 milk-cow family farm. He had taken over the farm officially in 1998 from his father, Franklin Teague. His father had successfully managed and grown the Reedy Fork Farm for 50 years, starting with just a few acres of tobacco and had realized his dream of being recognized as a leader in dairy farming in NC. Franklin, now in his mid 80's, still did some work at the farm every day, but the responsibility for the family's farm was George's now, and he felt the load.

The heaviest load George and his family had to bear, and the one leaving them feeling overwhelmed and powerless, was how to prevent the failure of the dairy operation due to declining milk prices. George had his college degree in agriculture and a lifetime of experience in all aspects of the farm's operations. However, since taking over the farm, his profits were declining year after year. Even though production volumes were up due to introduction of Bovine Growth Hormone (BGH), high protein feeds, and the best veterinary care possible, the farm had little financial cushion left; there was little money in reserve after expenses and his debts were growing. The last several years George had produced little cash to reinvest in anything or even to pay himself a living wage. However, his advisors kept pushing production increases as the answer to his financial troubles. Selling more milk at a loss, just did not seem like a viable answer, but how could he change when the prices for his products were set to favor bigger operations in California and Arizona? He was frustrated beyond words.

Lying on his back on the cold ground, knuckles raw from working with his wrenches, George knew something had to change. He could not let his wife continue to clean houses while he worked 80 hours a week only to get further and further in debt. Land prices were increasing in the piedmont area of NC and the subdivisions from Burlington and Gibsonville were getting closer. Many nights George lay in his bed thinking that maybe they should do what so many other local farmers had done: sell off the farm to developers, settle his debt, and find some kind of work in town. The thought of doing this burned in his heart. George was not a quitter and did not want to be known as the Teague boy that lost the farm. George had no vision for himself as anything but a farmer on his own family farm, but he was becoming desperate and so were the creditors.

7.2 The Business Challenge

The Reedy Fork Dairy Farm has been in operation in Guilford County, NC for over 50 years supplying liquid milk to local and national markets from a herd of approximately 125 fresh cows. Milk production has never been an easy business, but since the late 1990's the costs of

“scientific” dairying had escalated to the point that small and medium sized eastern USA dairy herds were experiencing great difficulties in running profitability.

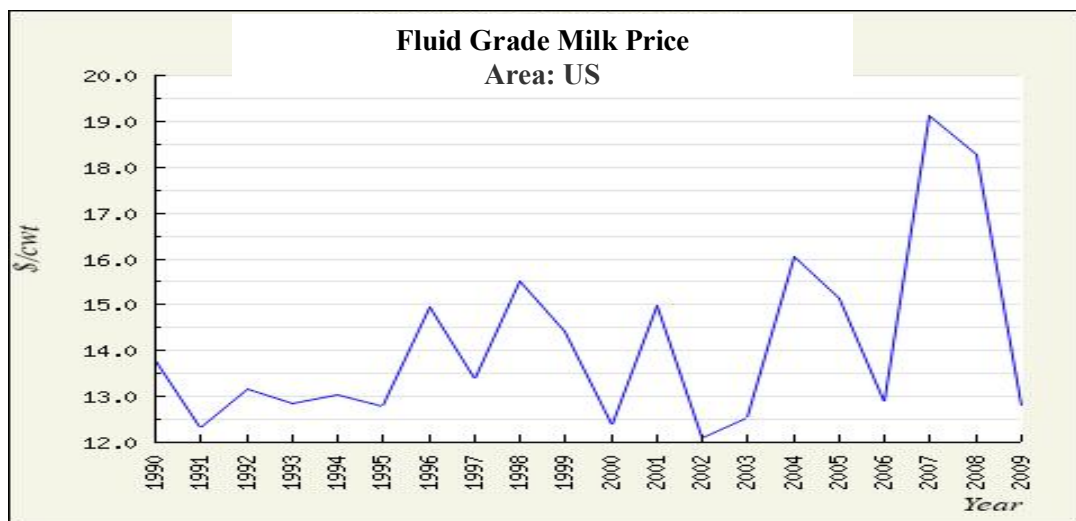
The US dairy industry had practiced its business unchanged for over 100 years. It remains at K-phase market (Gunderson and Holling, 2002), with incremental innovations seeking increased efficiency in liquid milk production, as the norm.

An analysis of the challenges for small holding dairying in the USA in 2002 indicates:

- The price for the commodity, “liquid milk,” was set by the USDA and the National Dairy Board. This system attempts to establish milk prices to balance the national demand and inventories of milk with the numbers of milk producing cows. Pricing and inventories are set to favor large western and mid-western dairy operations, so small to medium operations exist with “productivity” handicaps. (See Article “Understanding Your Milk Check.” (Bailey 2000))
- In a recent article on US farm revenues, data from 2006 indicate that only \$0.19 of every dollar spent on food in the USA is revenue for farmers. In 1980, farmers and ranchers received \$0.31, so prices for all farm-based products have declined dramatically.
- For dairies producing the commodity “liquid milk”, there is no direct link between land stewardship, animal husbandry practices, and milk prices, other than milk production volumes and bacteria count. This means that, to keep costs low and maximize short-term financial returns, a farmer could be “as bad as the law allowed” in its management practices. However, a farmer does this at the peril of his reputation with his neighbors, animal rights groups, and his long-term land values — all of which constitute his local “stakeholders”. But such issues are invisible to his customers, who might be located anywhere in the USA. As a practical matter, unless some law is broken, social and environmental practices have no influence on the price the farmer obtains for his milk because of the “commodity” nature of the product.
- There are no quality designations for milk other than “organic” and “non-organic.” Milk either meets specifications for bacterial content, protein and butterfat or it does not. A customer buying milk in the grocery store has no idea if the milk he buys in NC comes from Arizona, California, or from the farm down the street. Therefore, one value proposition that allows for product differentiation from better farm stewardship and animal management is lost in this national market system. Unless a dairy is running its own processing and bottling operation and has its own private market identity, milk from one farm is mixed with milk from another and sold as “milk”: fat free, 2% fat, Skim, whole milk or cream.
- Fresh milk must be processed within 48 hours to ensure its safety, and long-term storage of fresh milk is not possible without the value enhancing processes of pasteurization that are generally performed by the food processing industry, off-site from the farm. The brand identity of the milk sold in supermarkets is normally associated with the processor, not the farm. Milk processing such as pasteurization and consumer packaging are not performed on the farm because of economic efficiencies of scale, aseptic conditions are difficult to maintain in a farm setting and the assets and core competencies of milk production are different from those of milk processing.

The specific challenges facing the Reedy Fork Dairy Farm were:

- By 2000, land prices in the Piedmont region of North Carolina, had escalated much beyond the average price for farmland in NC. This was due to urban development in the Greensboro and Burlington area. The prices received by other farmers that were selling their land in the immediate area surrounding Reedy Fork, was increasing rapidly. Reedy Fork Farm owns 650 prime acres of land. Subdivided for housing developments, this land could be worth \$20,000 per acre or in excess of 10 million dollars.
- Milk prices had gone through a terrible slump in the 1990's leaving the farm debt very high, and even through farm management was using milk options to hedge prices, there was little profit from operational income after fertilizer, seed, veterinary services and pharmaceuticals, and energy costs were paid. The prices of energy, feed, seed, pharmaceuticals, and ag-chemical costs were escalating while milk prices were declining. Additionally, interest rates were also increasing. The farm had 5 employees, including George.



Ex-farm Liquid Milk prices from 1990 – 2009.

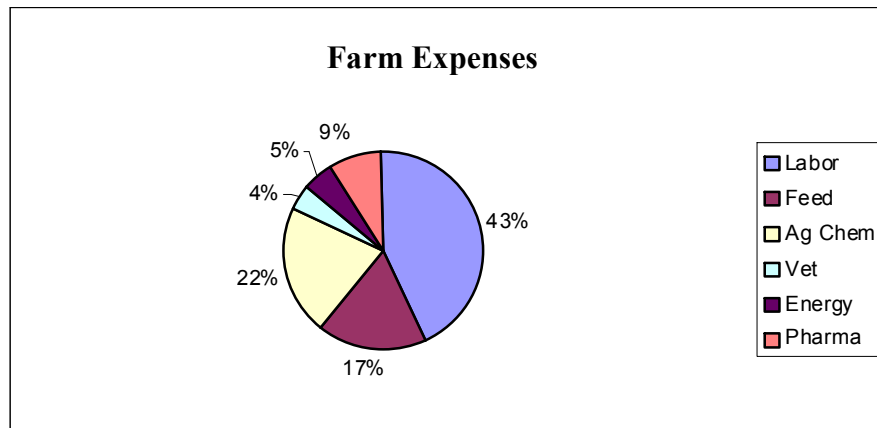
From: University of Wisconsin, Dairy Marketing and Risk Management Program, <http://future.aae.wisc.edu/>
Site maintained by Prof. Brian W. Gould, Department of Agriculture and Applied Economics.

Figure 7-1 Ex-farm Liquid Milk Prices from 1990 - 2009

This figure shows the average national selling prices per CWT (Centum Weight, that is, per 100 pounds) for liquid milk (1998-2009). Reedy Fork Dairy breakeven price for 150 cows must be above \$16.00/cwt. During this same period, certified organic milk was selling ex-farm (that is, without government imposed quotas) at \$25- \$35.00 per CWT or 1.3-1.5 times the commodity price.

George was the youngest son of the four Teague children and had taken over management of the farm in the late 1990's in the middle of a milk recession (see Figure 7.1). All of his brothers and sisters had moved off the farm and had secured livelihoods outside of agriculture. George's wife was forced into cleaning homes to make adequate cash to run the household as farm income fell. George was depressed about his future in farming. He was physically ill due to very long hours of hard manual work and from his depression. He saw no reason to keep producing milk when the milk processors and grocery stores were making a good profit and his net income was

nonexistent. George needed a vision for a profitable and fulfilling future if he was to continue to work the farm.



Reedy Fork *Before* Its Organic Transition – 2002

Figure 7-2 Reedy Fork Dairy Farm Expenses Before its Organic Transition - 2002

This figure shows the percent expense contribution for farm operations in the year 2002. Total revenue during this year was \$500,000. Operation loss was almost \$100,000. This loss was predicted to be on-going due to the high costs of chemicals, pharmaceuticals, and veterinarian costs. Note that expenses for Veterinary services, bovine pharmaceuticals and agricultural chemicals, such as fertilizer, and pesticides, make up 33 percent of all costs.

7.3 The Method of Intervention

In 2003, after many discussions with George Teague and his father about the farm situation, I suggested to George that he consider the fact that he was spending a great deal of money for chemicals, pharmaceuticals, veterinary services and energy, only to produce a single commodity product, “milk.” When his milk entered the commodity marketplace, it was undifferentiated and unrecognized as being different from any other milk entering the system.

There was nothing he could do under his present operational paradigm to influence the price he was paid for his milk. The price for milk was set by the market, based on national demands, not local demands. The high costs for ethically based “stewardship” of his animals and his land gained him no additional profits verses his competitors, who were not as keen stewards. (Pollan 2007) Many of his competitors were working on rented land with poor breeding stock and running intensive feed lot operations. These dairymen viewed the animals and the land as factories, not as a sacred legacy.

I suggested that he might want to look at another path. He agreed, and we began the action research project to seek to discover a better path for him and the Reedy Fork Dairy Farm.

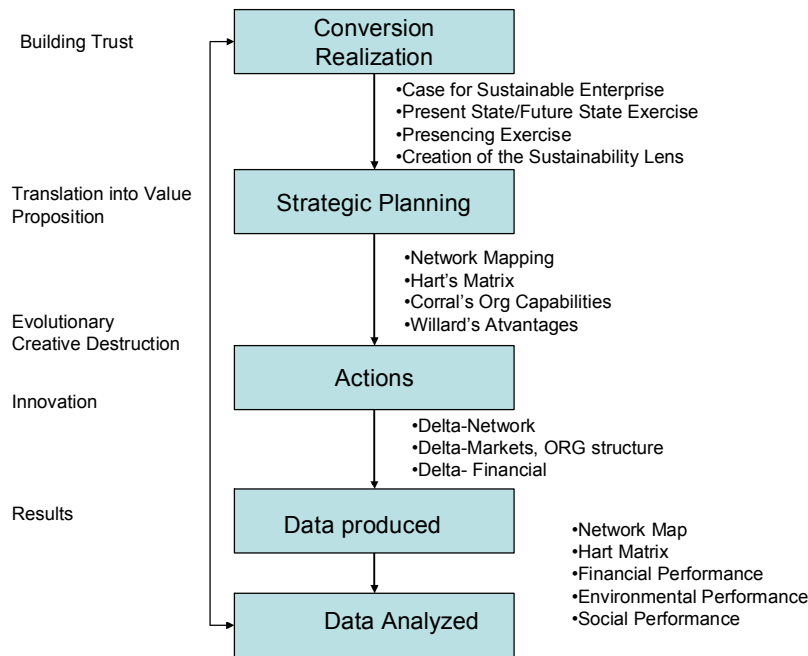


Figure 7-3 Reedy Fork Dairy Strategy Planning Flow Diagram

This figure shows the flow diagram for the strategy planning process for Reedy Fork Dairy. The plan was to move from a realization that the current situation was not sustainable into development of a new strategic vision using the techniques and frameworks described in Chapter 4. (Based on Argyris, Putnam et al. 1985)

My approach to action research for Reedy Fork Dairy was based on the methods discussed in Chapter 4 (see Figure 7.3):

- *Suspension of the Current Vision and Development of a New Vision for a "Sustainable" Reedy Fork Dairy.* This required network mapping to better understand: what the current and projected "new" business might look like; how it might align George's ethical feelings for farming and the planet with his farming activities; and how exploring new ideas during the visioning process might open of George's eyes to the possibility of a different future for him and his family farm.
- *Development of a New Business Plan.* This included exploring several options for new activities and the final choice of direction and preparation of the business plan using the tools of Hart and Montalvo.
- *Implementing the Plan.* By this stage, my role was only as a sounding board and advisor. George was actively evolving and managing the change plan and was engaged in new implementing his new farming model.
- *Measuring Results.* Financial results were calculated on an ongoing basis, but we were also concerned with George and his family's personal barometer. We touched base and held discussions about how he was feeling about the process, how were the financial numbers working, and how was his father feeling about his progress?

7.3.1 Developing a New Vision for a Sustainable Reedy Fork Dairy

Through a series of dialogues and presentations, some formal and some casual, I discovered that George and his wife Cherry had deep personal convictions for natural living and that, for many years, their personal ethics had been in conflict with the standard “scientific” practices for a “modern” dairy, such as the use of large volumes of pesticides, herbicides and feed additives.

While George had never had an overt confrontation with his father concerning his feelings about these practices, it remained a simmering difference in philosophy that added to George’s overall feelings of dissatisfaction with dairy farming. Early in 2003, George felt he might be able to live with this ethical dilemma if the farm was making an adequate profit. Over time, however, his feelings grew more pronounced and active as the financial pressures from the failing incumbent operations became even more intense in 2003. By 2009, George and Cherry had come to believe that this underlying dissatisfaction would have continued to grow even if they had been profitable.

The underlying discomfort and feelings of resentment stemmed from the fact that the pharmaceutical companies, the seed-chemical companies, and the milk processors were making all the money, while George was breaking his back for no profits. There was also no recognition the quality of his product and his labors, his invisibility to the ultimate consumer. Worse, the irrational pricing system for milk was highly biased towards large-scale farms. All of these factors served as levers pushing his openness to seek new opportunities.

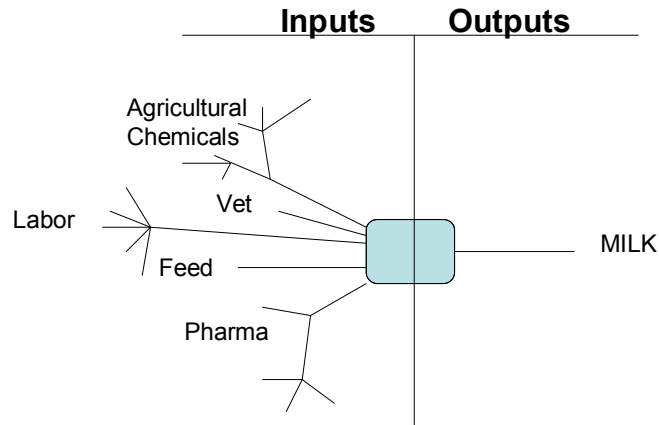
For her part, Cherry (George’s wife) didn’t see how they could do anything worse than what they were doing. This thought really coalesced in her mind one day when a valve broke off a spray-tank with 1000 gallons of Gramoxon (an organophosphate pesticide) mixed in it. The only way to stop the spill was for George to jam his hand into the hole. He became completely soaked with the stuff in the process. “I thought I was going to lose him,” Cherry said, “After that, I knew that this could not go on. There had to be a better way.” George had similar feelings, “After each day of spraying I’d calculate how many days I knocked off of my life. And then realized it was adding up to years” (COOP 2007).

George was developing the attitude that the current vision for the family farm was not working. As we moved from visioning to developing a strategic action plan, he was also discovering that there was a growing organic segment of the dairy market that reflected the consumer’s higher value and demand for higher quality for organic products. This realization was encouraging for George and his wife. Some organic farmers were getting higher prices for their milk and were thriving.

As our dialogues and visioning exercises uncovered possible new paths forward that could eliminate this dichotomy from his personal and business life while also providing a compatible vision for a profitable operation, George and his family discovered the will to change.

Using Montalvo’s frameworks, our analysis indicated that all of the family and the farm workers had the core capabilities and assets to change. Montalvo’s framework describes **B**ehavior as a function of **W**illingness to change. He also believes **W**ill is defined by the **A**ttitudes of the parties, **S**ocial Norms, and **C**ontrol (core capabilities) of the organization: **B = W (A, SN, C)**. As the action research process continued with the intended outcome of conversion of George and his

farm towards a sustainability-based business strategy, it was clear to me that the conversion process was working. Our discussions also led us to believe that they were willing to change to save their jobs and their farm.



**2002 Network Diagram of Inputs and Outputs
for Reedy Fork Dairy Prior to Its Organic Conversion**

Figure 7-4 Network Diagram of Reedy Fork Inputs and Outputs - 2002

This figure shows a diagram of the farm inputs and outputs. On the input side are the agricultural chemicals, veterinary services, and multiple pharmaceuticals. On the outputs side there is only liquid milk. The lack of any diversity in outputs, and the high cost of agricultural chemicals, pharmaceuticals and veterinarian services indicate the “brittle” and dependent nature of the dairy business.

I also had unexpected allies in George’s farm advisors. Ironically, George’s “will to change” towards a more sustainable business strategy was amplified by the opinions of expert advisors from North Carolina State University, the County Agricultural Extension Service, and the National Dairy Board, who continued to push for increasing investments in technology and scientific advances even as expenses grew higher, prices for commodity milk grew lower, and returns dwindled. In their expert view, profits for the Reedy Fork Dairy could only come from higher and higher volumes of milk produced. The message from such “traditional” dairy consultants was that “price was out of his control,” so the only thing George could control was building volume by seeking a greater and greater “efficiency” (more production per cow) in production practices.

The more such advice George received, the more it reinforced his doubts about the modern linear “scientific” approach to dairying and the economic and emotional realities. Increasing the per-cow volume of milk production required growing high-protein feeds. This in turn was predicated on annual monoculture crop-rotations of small grains over winter, and corn and soybeans in the summer, with little or no changes in production practices, year after year. This practice required huge expenditures of energy as fuel for tractors, large capital investments in equipment designed especially for these tasks, large volumes of GMO seeds and ag-chemicals, and large blocks of time seasonally to perform these tasks. Such seasonal tasks did not justify hiring full time employees, so, at certain times of the year, George and his family worked even more hours per week than average. Even though George practiced “no till” planting practices and optimized the

use of synthetic fertilizers, he knew that certain fields were “tired,” which meant they required higher and higher levels of chemicals and GMO seeds each year to increase per acre production.

Under the intensive feeding system required for ultra high production per cow, the dairy cows were fed manually by the farmer in a feedlot, rather than allowing the cows to graze on their own. North Carolina has 10 months per year where the cows can be on pasture and feed themselves, if the farm is organized for this type of production. Because grazing was only a small part of Reedy Fork’s feeding practices, George told me many times that “he was working his tail off to keep the cows fed and milked.” Conversely, when we talked to organic dairy farmers, they described that the cows could feed themselves if the farm was designed differently and the pressures on ever higher production was not so intense.

7.3.2 BGH Hormone as a Tipping Point for Change

During 2002-2003, these highly efficient, scientific practices culminated in the use of BGH (Bovine Growth Hormone) in Reedy Fork’s herd. BGH was touted to be able to artificially increase the volume of milk produced per cow. However, in George’s case, it was also final step that took the cow from being a farm animal to being a milk factory.

Feeding, milking, farming has always been a continuous process, every day of the year. But, once the cows were placed on BGH, the farmer had to increase his milking duties from two to *three times per day* (4 AM, 2PM, and 10 PM). There were also additional feed requirements for the cows on BGH, and putting aside feed for the winter that required larger scale production and storage of hay and silage.

Poor George, on one side of his life he was hearing from the “experts” that this intensive approach was the path to success and on the other side, the banks and his satisfaction with his life told him it was not working.

George began to use BGH on the Reedy Fork Dairy Farm in late 2002. Within a year, George began to experience increases in requirements for veterinary visits because of chronically “sick” or “run-down” cows. George observed circumstantially that the cows receiving the growth hormone just seemed tired and less vigorous than he remembered. George also began to be asked by friends and neighbors at church or in the community if he used this BGH on his cows. The use of BGH had become quite a controversy in the media. The questions got more personal: Did he think this was right and was the milk wholesome? For the first time, the farming practices of Reedy Fork Farm were being implicated in the press. These implications were reducing the quality of his milk in the eyes of the consumers.

This provided the push within the market for an alternative: BGH-free milk, which could disrupt the incumbent pricing structure leading to an Ω to α innovation opportunity for such a product. (Gunderson and Holling, 2002)

In a very fundamental way, BGH also changed the way George looked at the farm. Farming had always been viewed by his family as a sacred trust between the farmer, the land, the animals and Mother Nature. BGH was a chemical that changed the natural milk cycle of the cow, increasing

production 25-30%.⁵³ However, using the chemical was also devaluing “milk” as a wholesome product. Many stores, including Wal-Mart, did not want milk that was obtained from cows treated with this hormone, and this trend escalated in the mid 2000’s. It should be noted here that BGH has never been banned in the USA as it has been in Europe. Health Canada prohibited the sale of BGH in 1999; the recommendations of external committees were that, despite not finding a significant health risk to humans, the drug presents a threat to animal health, and, for this reason, cannot be sold in Canada. But, it is still used in the USA in 2009.

Consequently, using BGH turned out to be the “straw that broke the camel’s back,” the turning point in our transformation discussions. The greater work load of milking three timers per day with even less profits eroded what was left of George’s job satisfaction. By the end of 2003, there was no doubt that he either found a better path forward or the farm would be closed and the land developed into urban sprawl.

7.3.3 Willingness to Change and the Evolution of an Intentional Strategy

George and his family saw little in their future except hard work and little return on their labors. When any leader or executive is trapped in such a paradigm, the first step towards a new vision is obtaining suspension of current reality to allow for visioning or Presencing as Senge (Senge 2004) calls it (see Figure 4.5). George and I discussed what he really wanted. Was it to leave the farm? Sell it? What would he do if he had all the money he needed and nothing in his current reality to worry about?

After a complete discussion of his current reality, a summary of the findings indicated that what George and his family wanted to do was to run the dairy, but to increase profits and to reduce their workload so that dairy farming had manageable risks and opportunities for the long-term. Farming was in his blood. He and his family were farmers and he wanted it to stay that way. He realized this was impossible unless he made radical changes in how he operated his farming business. He wanted a connection to his community and to be recognized for producing a wholesome and high value product, not a faceless commodity product.

We narrowed down his opportunities to three areas. These were three areas we could investigate and pursue within a reasonable period of time (6-9 months) and then be able to move forward towards developing a business plan for the “new” Reedy Fork Farm. These were:

- Discover a new crop or product to grow and process on his 650 acres that had greater profits and used existing infrastructures. This could be done while remaining in the dairy business or by exiting milk production and going into an entirely new area of farming.
- The farm could build and run a milk-pasteurizing and processing plant, increasing value added services and engaging in direct customer interaction through cheese making and/or a “local” bottling operation, to the farm. There were several examples of such operations that had been successful in Orange County, NC.

⁵³ For maximum effect, experts recommend first applying BGH about 50 days into the cow's lactation, just before she peaks. This allows BGH to sustain already-present mammary cells and reduce the rate of production decrease after the peak, thus permitting cows to produce more milk over the span of a single lactation. At its best, this will increase per-day milk production by 7 to 9 more pounds of milk than would be produced without BGH. See http://en.wikipedia.org/wiki/Bovine_somatotropin

- Transform his dairy into an organic farm, as organic milk carried a 30-40% premium over commodity milk and was not a part of the National Dairy program. This would require joining an organic dairy coop for the necessary marketing, distribution, and processing of the organic milk. George also wanted some type of local connection of his product to the community.

With these ideas as the basis of his possibilities, we began to actively research opportunities within these boundaries. Over a period of 6-9 months, the following actions were taken:

- George went to educational classes and meetings on the prospects of transforming his dairy into “organic” milk production via joining the Organic Valley Cooperative.
- I attended a farmstead cheese production workshop at North Carolina State University for a week to investigate the possibility of producing cheese on his farm.
- We had active discussions with Elon University to supply local milk specifically for the university under a private labeling agreement.
- Together, we investigated, through the NC Agricultural Extension Service, various crops for diversification, such as blueberries, apples, grass fed beef, swine, and vegetables.

As a result of these research activities, George and his family produced a decision that the best and highest use of the farm and dairy was to convert it to organic dairy production and then to investigate the possibilities of diversification into some new crops, post organic certification. This decision agreed completely with our analysis of the internal and external situations using Hart and Montalvo’s frameworks.

These frameworks had the following impacts: the ideas of new crop production and/or milk processing and cheese production, before becoming certified as an organic farm were discarded due to control issues, including marketing hurdles and infrastructures for any new vegetable or fruit crop. Farmstead cheese production was expensive to enter, and would require pasteurization, new storage and processing buildings and facilities, and the waste treatment infrastructure for whey, which was not available on the farm.

Becoming certified organic under Hart’s analysis would provide a path that could lead to such investments and diversification in the future, but the organic certification was absolutely necessary to promote the best and highest used of the current farm assets and capabilities.

Using Montalvo’s toolset (Montalvo 2002), a close investigation of assets, capabilities, willingness to learn entirely new things, and the external environment, all indicated that a transition to an organic dairy would:

- Expand George’s stakeholder network and provide him the opportunity to increase his present value economic return for his investments and activities on his land and animal husbandry ethic. (Customers for Organic Milk care about the farmers and their treatment of the land and animals.)
- Would increase the price he obtained for his organic milk by at least 30%.

- Would reduce the capital and time intensity of the farm work, because the cows would graze on their own (move from field to field eating grass) rather than being fed field grown products that had to be grown and brought to the cows.
- Would reduce capital costs for pharmaceuticals and agricultural chemicals because BGH and high intensity feeding was causing the use of these inputs.
- Would produce a more healthy animal, lowering vet bills
- Once certified, his 650 acres could be used to produce all kinds of highly sought after organic produce, albeit this would have to be done after the core dairy business was profitable and the debts were paid.

7.3.4 Developing the Business Plan

The business plan was developed, after a careful SWOT analysis had been done, addressing several challenges that had to be overcome by the Reedy Fork Dairy Farm, if the transition to Organic production was to be successful.

- A milk coop and processing partnerships had to be established;
- Farm infrastructure changes to move from a feedlot based program, to pasture fed cows, must be made;
- Organic feed and seed supplies had to be obtained;
- A cash flow and profit management plan during the organic transition period had to be developed and implemented;
- There was the need for immediate cash that would be required to fund the transition.

The first decision was for George to open discussions with Organic Valley, a national organic milk cooperative whose owners were farmers and milk processors. After investigation of several other organic farm cooperatives and franchise opportunities, this seemed to be the best fit from philosophical and geographical perspectives. Since there were few certified organic dairies in NC, the idea would be for Reedy Fork to be an anchor Organic Valley farm in North Carolina's Piedmont Region and for the farm to be highly visible in the Piedmont region of NC to build the Organic Valley Brand.

The Organic Valley Family of Farms was organized in 1998 by a small number of family farmers who shared a love of the land and a belief in sustainable agriculture. Now made up of more than 1400 organic farmers in 32 states and one Canadian province, the Organic Valley cooperative is achieving record success. A video clip from the Organic Valley Website, is an example of the vision for change that gave George and his family the incentive to join the coop and to begin the process of conversion to organic. (COOP 2009)

Once a relationship with Organic Valley was established, negotiations were begun with them to subsidize the commodity prices Reedy Fork would receive for its milk for the three year

transition period.⁵⁴ Since Organic Valley was opening a milk-processing center in Asheville, NC, The timing was excellent and a satisfactory resolution was achieved.

During the 3-year conversion period, Organic Valley would provide the difference between the commodity milk price and the organic milk price as a transition supplement payment to Reedy Fork. This in essence allowed George to receive payment for his milk equal to organic market prices even though, by law, the certification of his milk and farm could not be achieved until after 3 years of successful organic practices. This subsidy would also help pay for the additional expense of buying certified organic feed and seed during the transition period.

The subsidy, however, still left a large funding gap that would be necessary for the transition from traditional to organic milk production to pay for higher organic feed prices and infrastructure improvements in pastures, etc. This funding gap was covered by placing several acres of land surrounding a tributary of the Reedy Fork River into a stream conservation program. This provided approximately \$300,000 in cash and helped to provide the soil amendments and farm infrastructure necessary for conversion to organic.

George was also able to establish a relationship with a supplier of organic farm supplies, feed, seed and nutrients. The firm Lancaster Agricultural Products, became the supplier of the “certified organic” inputs that were necessary for Reedy Fork’s operations, However since the owners of that firm quickly realized that George and his farm were in a great location to help them to expand their business, they invited George and Reedy Fork Farm to become a distributor of Lancaster’s Agricultural Products. George provided transportation of feed and seed to other budding organic farmers in the area and received payment for this through commissions.

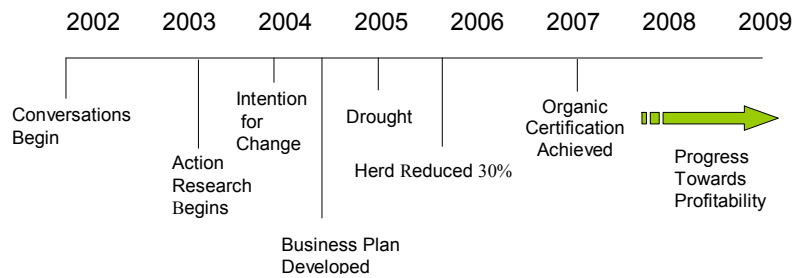
The final business plan resulted in the following activities:

- Reedy Fork Dairy would become a member of the Organic Valley COOP in 2004 and would transition their dairy from its current practices into a certified organic dairy by 2007. George’s milk would be sold by Organic Valley in local stores. His milk would be converted into higher value products, such as cheese and butter, and, as a member of the COOP, George received increased profits from these operations. George would also agree to be a spokesperson work for the Organic Valley COOP in south-eastern USA, to help build the image of Organic Valley with local grocery stores.
- Reedy Fork Dairy would become a customer and a dealer for Lancaster Ag. Products and receive commissions based on sales volumes. Lancaster would provide certified organic soil amendments, seed and nutrients to farm that meet USDA Organic specifications.
- For three years until his certification was complete, Organic Valley would pay Reedy Fork Dairy an equalization payment that covered most of the difference between the price of commodity milk and the market price for certified organic milk.
- George would file to have his streams put into the State of North Carolina’s stream conservation program, which would help generate the cash necessary to redevelop his pastures.

⁵⁴ The USDA regulates all milk production in the USA including organic. The USDA achieves this through their National Organic Program (NOP). When a traditional dairy farm decides to achieve certified organic status, it must go through a three year program to “clean” the land and animals and then a final inspection and certification must occur.

7.4 The Outcome

Figure 7.5 shows a timeline the results of the action research plan.

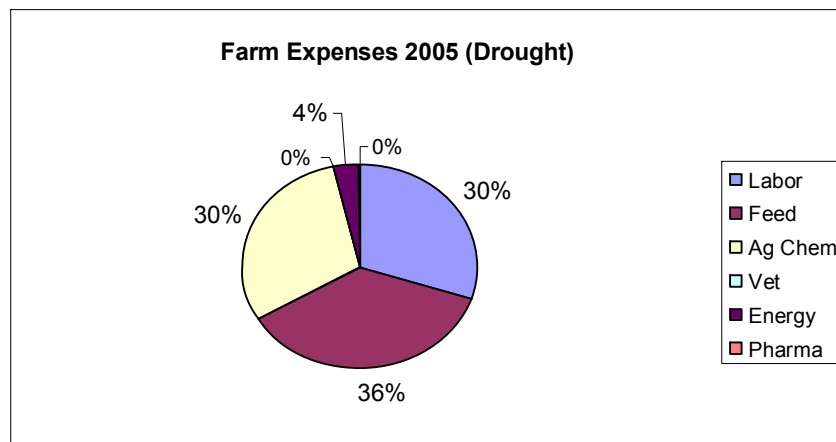


Action Research Project Timeline for Reedy Fork Dairy Farm

Figure 7-5 Timeline for Reedy Fork Dairy Action Research Project

This figure shows the timeline for the Reedy Fork Dairy project. The intentional conversion began in 2002 with a visioning process for a new direction for the farm. The Formal Action Research project began in late 2003. The decision for a new business plan was completed in 2004. Application for Organic Certification began in 2005 along with the worst drought in 100 years. Organic Certification was achieved in 2007 and reorganization and optimizing farm operations continue.

As with any reinvention strategy, movement towards the goals and objectives was not linear. A terrible 100-year drought occurred in 2005. The drought forced George to spend a great deal of the money he received for the stream conservation project on feed and soil amendments that were supposed to be used on farm infrastructure improvements.



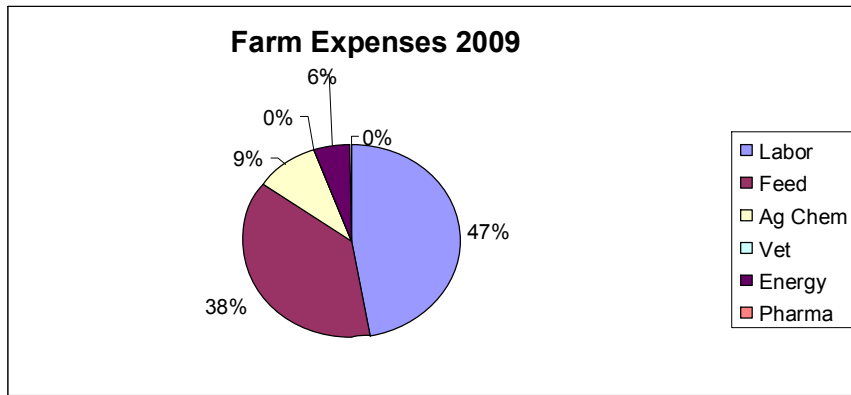
Reedy Fork Farm Expenses *During* the Organic Transition Year (2005)

Figure 7-6 Reedy Fork Farm Expenses During the Organic Transition Year - 2005

In the midst of the worst drought in 50 years, note the decline in veterinarian and pharmaceutical expenses as well as the increase in feed costs due to organic feed that had to be purchased from the outside market due to drought. Total revenue was \$520,000 and the Operational losses were \$210,000. Stream restoration payments helped pay for the additional feed expenses and soil adjunctivants.

In 2006, 30% of the cows had to be sold due to lack of available organic feed and water. After such a sell-off, it would normally take several years of internal breeding to repopulate the herd

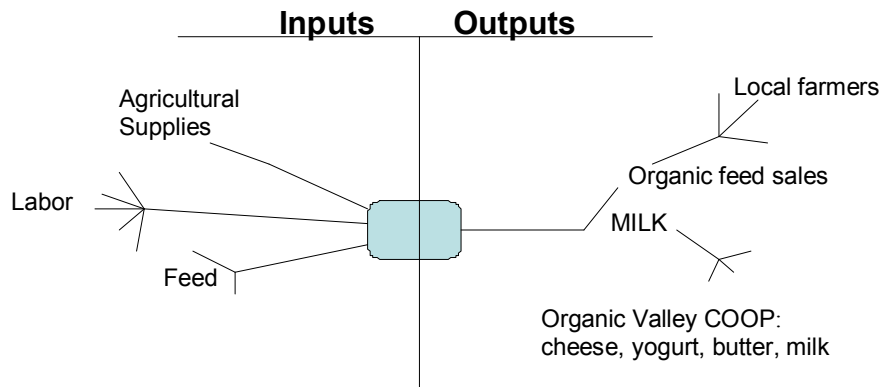
back to the ideal number of 150. However, by the end of 2009, the farm and farmer were on a much sounder financial footing. Debts accrued during the drought were being repaid and the farm was within \$30,000 of operating profitably.



Reedy Fork Farm Expenses (2009)

Figure 7-7 Reedy Fork Expenses at the End of the Organic Transition - 2009

Now fully certified as an organic farm, pharmaceutical and veterinarian costs are nearly zero, and feed purchases and farm operational costs leveling out. Revenues are down due to the herd size-reduction that took place during the drought, but the purchase of 35-50 new cows in 2010 should put the farm back to profitability in 2010. Should the cows not be available, labor costs will be reduced.



Network Diagram of Inputs and Outputs for Reedy Fork Dairy After Organic Conversion and Joining Organic Valley Coop (2005-2009)

Figure 7-8 Network Diagram of Reedy Fork Inputs and Outputs After the Organic Conversion

Note the added diversity of outputs and fewer inputs due to the lack of agricultural chemical, bovine pharmaceuticals and veterinarian services after the organic conversion and joining the Organic Valley Coop. As an owner in the Coop, diversity is achieved due to processed dairy products made by the Coop.

A post change network analysis of inputs and outputs revealed a significant change for Reedy Fork Farm. Inputs and the suppliers associated with inputs are down significantly, while the outputs (customers and products) have increased on complexity. George's milk is now sold

within NC and is identified as Organic Valley Milk. Reedy Fork Dairy has strongly identified itself with Organic and Organic Valley in web-based, sign-based, and print advertising.⁵⁵



Figure 7-9 George Teague and his Dad Franklin Advertising Their Farm as Local and Organic
Photo taken outside of their largest barn located on Sockwell Road in Guilford County North Carolina., 2008.

George is very active in promotion of Organic Valley products and services through various public appearances and lectures throughout the state of North Carolina. In an interview held with George in the autumn of 2009, George said he felt connected through his farm to Organic Valley and Organic Valley's customers. For the first time in years he feels connected to his community and feels he is making a contribution that is appreciated locally and regionally. Many tours of students and other farmers studying Reedy Fork's transition come by every month.

In an interview in late 2009, George said that even though they had not returned the farm to profitability, the cash flow gap was closing and there was a clear path to the future that could be resolved simply by getting the 50 additional milk cows in the herd. No longer was there any doubt about his path, his place in the world, his vision for the future or the future of the Farm.

7.5 Lessons Learned

At the initiation of this action research project, George Teague, owner/operator of Reedy Fork Farm, was practicing land and livestock stewardship, but was receiving no financial value for it. He was firmly connected to his land and his animals as stakeholders on his farm, but due to expansion of the market for milk from a regional market to a nationally coordinated commodity market, the connections between his local and regional stakeholders in environmental and social issues and his customers was broken.

The first lesson learned from this case was the usefulness of mapping inputs and outputs for the owners and managers of the firm. Hart and Montalvo's visual tools both to assess and map

⁵⁵ See <http://www.organicvalley.coop/our-story/meet-the-farmers/southeast/george-and-cherry-teague/page-2/>

activities, and then use them to help evolve the triggers to induce the will and opportunities to change were also extremely useful in distilling many complex concepts into a final essence.

When the first map was completed, George and his wife could clearly see that all this money was going out to many suppliers, but that there was only one source of income and that *they had no control over it at all*. Furthermore, the network analysis also showed while most of the inputs were paid out in local dollars, the final product, “milk,” was a national commodity and had no local links. This made the family feel insignificant. Not only were they not making money on what they sold, no one could link the Teagues and their good stewardship to their product because it was not identified as created locally.

In networking terms, while there was rapid and continuous feedback from local and regional regulatory authorities and his farm practices were judged locally by his peers and the NC Agricultural Extension services, his animal husbandry and land stewardship was invisible in the price he received for his product. This isolation between the economic performance of his operations and the quality of his management allowed for artificially low milk prices and a disassociation with his most important stakeholders: his customers.

Therefore, the sustainability lens that was applied to his situation by a mapping his business network inputs and outputs, indicated a severe disconnection that could only be corrected by finding a new market network where the value of his products could be reconnected to his customers.

It is clear that connecting and defining stakeholder values, shrinking his market network back from a national to a regional geography, and reconnecting the farm to its customers through the marketing programs of Organic Valley, has created a new vitality for this business and for he and his wife. When the farm went through its transition from “traditional” to certified organic production, a new set of skills were learned and developed. Decades of “modern scientific” farm practices were discarded. George developed new traffic patterns to and from the pastures for the cows, which are still evolving. New sources of organic feeds and a whole new business of commercial feed distribution were developed and these resulted in an entirely new source of income and a new class of customers. As of January 1, 2009, when the price for commodity milk was \$13.30/CWT, George was receiving over \$30.00/CWT.

In this case, the most important educational tool was getting George, his family, and his employees to realize that there must be a *financial connection* between good stewardship and the price he was paid for his product. Being a good steward without a value connection to profits and cash flows is philanthropy. Philanthropy is a great practice, but it is not a business. Therefore, for George, resolving the ethical conflicts between doing good things and the insistence that one be paid for it was a critical connection. Once empowered with the realization that the conventional national dairy market was fully disconnected from environmental and social stakeholders and it was impossible for this national commodity market to even recognize that his farming practices had value, he knew that he must either find a way to make this connection or he needed to get out of the business.

The critical realization was that the correct market network to make it possible for Reedy Fork Dairy to thrive was going local and organic. This realization was accomplished by mapping the incumbent practices of the firm. Mapping made it possible for George and his wife to recognize

the disconnections between farm expenses and revenues. Reducing or eliminating expenses was made possible by abandonment of factory farming practices by achieving “organic” certification. Once certified, joining Organic Valley Cooperative made it possible for George and his farm to reach and interact with customers that were willing to pay a fair price for the farm’s investment in cleaner production and organic milk.

I have though a great deal about what would have occurred had there not been a specialty market available for “organic” milk and had Organic Valley not been there as an organization to provide access to this market. It is my opinion that the farm would have been sold had these options not been available. If the value differential between Organic and non-organic milk shrinks or if the healthy prices paid to organic farmers today declines, again it is my projection that the farm would be sold if the land values continue to escalate in the region. In short, without the sustainability lens and a commitment to a structured strategy development process, this farm would be out of business today.

A formal educational process to discern a foundation and definition for sustainable enterprise cannot be overlooked. Sustainable Development, of course, implies a balancing of present value and future value in three value-categories: financial, environmental, social responsibility. The presentations of the business case for sustainable enterprise are critical in moving feelings and sensibilities into strategy and actions. In this case, the family had environmental and social ethics. Because the family owned the land and the common wisdom in rural areas is that one “does not piss in one’s own drinking water,” or “kill the goose that lays the golden egg,” caring for the land and the animals was just part of “normal” operations in this organization. What had been lacking was the realization that sustainability does indeed mean balancing economics, environment and social responsibility. The owners had to realize that an imbalance in financial returns was due to a fundamentally flawed strategy, and even more importantly, it was a flaw that could be resolved.

In many published cases, the enterprise studied has financial success and is lacking in transparency and investment in social or environmental stewardship. The enlightenment or education on sustainability (such as the Natural Step, for example) links environmental and social stewardship and stakeholder groups to long-term innovation and a prolongation of profits. This case was just the opposite. The owners were doing the “right thing,” but doing it in a market that could not measure or pay for the value of these activities in the price they were paid. So, they had no choice but to change markets.

7.6 Addendum: The Economics of Dairy Farming⁵⁶

Milk is priced by the hundredweight (cwt) nationally by the United States Department of Agriculture. In 2003, farmers received an average price of \$12.50 per cwt, or \$1.08 per gallon before expenses. Next year, preliminary estimates indicate that the price will rise to \$1.14 per gallon.

⁵⁶ Based on information from: Marcel, J., The economics of dairy farming: milk prices, *Vermont Business Magazine* (Vermont, USA), November 1, 2003, San Francisco: All Business, Inc. (650 Townsend Street, Suite 450, San Francisco, CA 94103).

That seems like a good thing, but the bad news is that most dairy farmers need \$1.30 to \$1.40 just to break even, said Doug DiMento, director of communications for Agri-Mark, Ltd which is owned by 1,470 New England and New York dairy farm families. In Vermont, it has about 430 farmer-members, including the Robb Family Farm in West Brattleboro.

Prices are starting to go back up, but they're not going up enough to make up for two years of low prices. That's the difficult part, DiMento said. "The most important fact about milk is that it is perishable."

Milk is not like sugar beets or potatoes or corn, where, if you don't like the market price, you can put it in the warehouse and wait, DiMento said. Milk has to be in a processing plant 12 to 24 hours after it leaves the farm. Because of the perishability of the product, the farmers have no bargaining position. That's why the federal government intervened in the early 1900s. To establish minimum prices for farmers and to maintain what's called 'orderly marketing'."

For the last two years (2001-2003), the price of milk has been on a roller coaster ride; it hit its lowest levels in 25 years.

Nationally, demand has slackened, and supply has outpaced demand, DiMento said. Unfortunately for Vermont dairy farmers, the price is based on the national supply/demand situation for milk. No regional considerations are taken into account.

The big problem for New England dairy farmers is the consolidation of the processing industry specifically with Dean Foods⁵⁷Co., the nation's leading processor and distributor of milk and other dairy products. Dean Foods has bought just about every bottling company in New England except for Hood. It used to be that these smaller processors competed for milk, and would offer premiums above the USDA-set price. These premiums are now disappearing.

Every time we've tried to increase farm prices, Dean Foods has fought us, DiMento said. They fought us on the dairy compact. We've met with opposition from many of the processors, but Dean Foods in particular has always been against our efforts to increase prices. When they bought everybody out, how much competition was there in the market for farmer's milk? Very little.

Another issue that troubles dairy farmers is that milk in stores is priced far higher than what they get for it in bulk.

The fluid bottlers take the farmer's milk, put it in a bottle, have a quick turnaround, and get the highest level of profit, DiMento said. If you get \$3 a gallon — which is what milk is going for on the shelves now — you get over \$34.80 cwt. In other words, the farmer's getting paid \$12.50, but the guy who's bottling it is getting \$30 for it. What upsets farmers like the Robbs is that the farm price has gone down, but in many cases the retail price has gone up, but in some cases it hasn't. The farmer has no control over that, but it upsets him.

⁵⁷ <http://www.allbusiness.com/government/business-regulations/1103800-1.html>

7.6.1 Competition

While Vermont is certainly the premiere dairy state in New England, according to Byron Moyer, chief of the dairy section of the Vermont⁵⁸ Department of Agriculture, it is ranked only 14th in milk production.

We produce only about 1.75 percent of the nation's milk, Moyer said. The price of milk is based on supply and demand.

If milk is in short supply nationally, prices rise, Moyer said. And if it's not flush nationally, prices plunge. Because the government's base price drives the industry; and because that price is set nationally, states are pitted against each other. Vermont has to compete with Western states like New Mexico, Idaho, California and Arizona, where there has been significant growth in dairy farming.

I think the largest farm in Vermont is milking about 1,400 cows, and we think that's huge almost beyond imagination, Moyer said. And it is, when it's compared to typical Northeast dairy farms. But out west, they have 2,500-, 4,000-, and even 5,000-cow dairies.

To make it even more difficult, other regions of the country have better climate and better soils than Vermont.

Take alfalfa, Moyer said. If we've got a nice alfalfa field, we'll get two cuts off it, or maybe three. They can get six or seven out in California, because they don't have frost on Oct. 1 and snow on the ground in April. Because they can grow more crops on a per acre basis, they can maintain more cows on a per acre basis.

The water supply out west is the monkey wrench that basically screws things up, and has for several years, Moyer said. If the Western states are in a drought that inversely affects milk production. If they are being inundated with rain, that adversely affects crop production, which then affects milk production.

How can milk produced in California affect Vermont?

As a liquid, milk is generally sold regionally. The value-added end products of milk, like ice cream, cheese, butter and dried milk powder, have a longer shelf life and can be sold nationally. Because California is the nation's largest milk-producing state, producing 20 percent of the nation's milk supply, an increase in milk production there can cause a domino effect across the country, Moyer said.

If the farmers in California are able to increase their production 10 percent on an annual basis, which they've done many times in the past, that increase is a greater volume than the entire output of the state of Vermont, Moyer said. A lot of that California milk gets manufactured into value-added products. You don't see a lot of California cheese and ice cream here in the Northeast but as that product moves east, it displaces locally produced products. So you have

⁵⁸ <http://www.allbusiness.com/government/business-regulations/1103800-1.html>

kind of this domino effect: everything is moving east. By the time it gets to New England, you see a lot of New York⁵⁹ and Pennsylvania products here in our markets.

The economics of dairy farming make it a roller coaster ride, Moyer said. There are good times and there are bad. Unfortunately, if you look at the last 10 years, the good times are both infrequent and of short duration. The not-so-good times, which we are just re from now, have tended to be of much longer duration.

⁵⁹ <http://www.allbusiness.com/government/business-regulations/1103800-1.html>

8 TS Designs: Research Study #3

8.1 The Human Context

Eric Henry was stunned. It was 2002 and Tom Sineath, his partner, just handed him a fax from one of their biggest customers. This large sportswear firm, located in Oregon, had just cancelled next year's purchase orders which they had authorized several months before. This was one of their largest customers, providing a base load of thousands of t-shirts to be printed nearly every week. There had been no notice that this production would be cancelled, no personal phone call after more than a ten-year business "partnership," just a fax, cancelling the orders.

TS Designs, Inc⁶⁰.(TSD) had not been immune to the revolution in textile globalization that had impacted every other American textile company for the last 4-5 years(Anderson, Schulman et al. 2001). Tom and Eric had struggled with the collapse of the domestic textile industry, since the passage of NAFTA and the formation of the WTO, but had managed to keep most of their employees by dropping prices and taking additional jobs printing socks and shopping bags, rather than high end t-shirts and name brand apparel. However, these routine sportswear printing orders from major US sportswear and apparel brands were the foundation of their screen printing business. They had seen orders decline as they lost customers, but nothing as callous and drastic as this.

This fax, which stated that a billion dollar company, would not honor its purchase orders for the next year, proved to Tom and Eric, that the status quo in their industry was gone. Over 50 employees and their families at TSD would be impacted as they lost their jobs. While all of their forecasts and communication with their customers had projected that declines were coming, they did not anticipate it would happen so rapidly that their existing strategic plan became irrelevant.

This customer was one of the world's largest sportswear and sports equipment firms. They endorsed celebrity athletes for millions of dollars. This customer's quality and logistics staff had just completed the annual quality and logistics performance audits a week before the termination fax was received and TSD had gotten a stellar quality and performance report, as they had for years. They had valid purchase orders that had always been honored before.

All of these factors, however, made no difference in the larger scheme of things. Despite the efforts spent by both firms over the last decade to develop the "relationship and the partnership," the reality was that the lowest price was really the only thing that mattered. And so, without any advance notice, all further orders and all contracts were cancelled.

A phone call to their contacts at the company yielded little information. The only explanation their liaison officer offered was that their costs were too high and the supply chain was being moved to China.

⁶⁰Since, more than either of the other two cases in this dissertation, TSD has used social media and the Internet to document its transition and technologies, this thesis author will use web-page references from www.tsdesigns.com throughout this case. Since TSD evolves and changes its web sites over time, it is likely that these webpage links may change. Should links become inactive over time, please go to the primary site, www.tsdesigns.com, and seek the required information.

Eric felt his stomach souring and knew his face was white as a sheet. His partner Tom sat slumped at his desk. His face looked the same. There would be no way to incrementally adjust their existing screen printing business from this blow. They could not operate the plant with its current overhead costs without this volume of routine printing. They also knew that other major sportswear companies contracts and a large volume children's apparel printing contract was up for renewal. The managers of these firms had provided warnings to expect volume reductions of these contracts over time, and not immediate termination, but the handwriting was now on the wall. All of these big retail brands would move their production to the Far East.

The irony in this situation was that TSD was in the process of developing new strategies for a gradual transformation of their business out of commodity screen printing. This new strategy was developed with the help of this thesis author who began to advise TSD on a transformation strategy that aligned profits and sustainability. This thesis author and his company, Burlington Chemical Company (BCC) were the inventors of the printing technology that TSD had licensed and would be the cornerstone of their change from a contract printer into an apparel company. This technology was trademarked "Rehance" and was a patented nanotech printing process.⁶¹ The Rehance® printing technology produced a very soft, indestructible print that customers liked very much. Rehance also produced a large reduction in toxic material inputs versus Plastisol (PVC) based printing processes which were the industry standard and contained phthalates and other harmful chemicals.

The grand strategy was to improve the Rehance printing technology and get it commercialized. The first actions were, to print the technology on other company's t-shirts to demonstrate the higher quality and unique properties of Rehance. This would get the message out about the new technology and introduce it to consumers and the major retail brand. The second stage of the plan was for TSD go become an apparel producer, introducing a new organic t-shirt of TSD's own design with an organic cotton yarn and eventually a local cotton fiber supply chain. This new strategy included producing organic cotton t-shirts in a local factory and then eventually sourcing locally grown cotton to encourage job production and reduction in carbon footprints from shipping and creating local jobs and local supply networks.

However, this technology and their new green business models were only in development, and introducing new technologies and a new business model was slow work. TSD had expected the phased in tariff reduction rules of NAFTA and WTO to provide them with several more years of protection for their incumbent business in order to help them avoid total disruption (Robert 2000). The market and the banks however, were not waiting for these phased tariff reductions before discounting the value of US textile manufacturing.

Nevertheless, with this one fax, immediate change became a necessity. TSD did not have the cash flow without this major customer, to make a gradual transition from a custom printer into a "green" apparel manufacturing company. TSD was financially leveraged as far as the bank would allow and with the lack of any significant profitability since 1997, there was a real threat that the bank might discontinue the loans once they knew that the West Coast customer had cancelled its orders.

⁶¹ <http://tsdesigns.com/products/rehance/>

It was time for the change strategy that was being developed, to be implemented. If the preferred plan (Plan A) was a gradual transition into an apparel company from a custom screen printer, but Plan A could not survive the reality of the current situation, then, it was time for “creative destruction” of the incumbent business and implementation of the envisioned Plan B.

The only problem was that Plan B did not yet fully exist, because everyone had thought the current paradigms would last a few more years. Plan B was a work in progress, but it would have to be completed and implemented soon, if they were to save the firm.

8.2 The Business Challenge

Prior to beginning the Action Research project in 2002, this thesis author was involved with TSD as a research and development partner for a new “green” printing process developed at BCC, this thesis author’s old company.

BCC and TSD were both located in the Willow Springs Industrial Park in Burlington, NC. There, TSD had always been seen as a funky apparel company, the company on the corner lot that let wild flowers grow, did not mow their grass, and had lots of constant activity. But, having started in 1977,⁶² it had been in business over 30+ years and was known to be an innovator in the screen print industry. So, when BCC developed a new nanotechnology printing process in 1996, it was a natural progression to seek “practical” application advice from the very successful screen printing operation just down the street.

Eric Henry, the President of TSD, immediately saw in this technology a way to set a new technical paradigm for “green” screen printing apparel. Eric perceived that this technology could differentiate TSD from competitors and was a conversation starter for an industry that seemed to always be looking for new ways to differentiate fashion products. However, the first couple of years of working together on this project proved that the transformation to the Rehance® printing process would not be straightforward for an incumbent US textile industry that was fighting to be a low cost global producer with survival as a prime directive. This new printing technology would require significant retooling of equipment and the manufacturing process and start up volumes would be small.⁶³ However, BCC saw the opportunity that this technology could be a “disruptive innovation” as the quality of the end product and the environmental footprints were termed “spectacular”.

The commercial development of Rehance® began at Burlington Chemical Company and then in conjunction with TSD continued from 1996 and peaked in 2000. During these years many of the technical variables such print stock quality, chemistries, reactive dye selection, and garment dye procedures, etc., were controlled. BCC and TSD worked together on making the transition for Rehance from a laboratory development into a commercial product. Slowly the process began to be commercialized and proven at TSD for apparel screen printing and garment dyeing. BCC

⁶² See <http://tsdesigns.com/about/history/>

⁶³ While the patents describe the technology adequately, it is important for the reader to understand that the Rehance process turned the traditional screen printing process on its head by applying the print chemistry *before* the shirt is dyed and finished, allowing designs to emerge during the dyeing process, much like instant photography. Traditional textile printers found it difficult to understand Rehance because, in traditional screen printing, putting the Plastisol ink on the apparel was the last step in manufacturing a printed item. This radical shift made implementing Rehance extremely difficult because it required shirt manufacturers, printers and garment dyers follow unusual directions exactly.

sought commercial development and business opportunities in the rotary and continuous fabric printing markets.

As described in this thesis through the Burlington Chemical Case, in 1995 the market paradigm for the US textile industry changed, as the impacts of NAFTA and adoption of GATT Trade Accords rocked the US textile industry. There was radical reorganization of the industry occurring and the industry was seeking ways to use innovation to off set the low labor rates in the developing economies where textile production was moving. TSD managed the early gradual downturn by employee attrition and driving operational costs lower.⁶⁴ Historically from 1990 through 2002, TSD had maintained revenues between \$1.5 and \$2.4 million based on business cycles with an average of 75 employees. This was achieved as a “toll” or “custom” screen printer of all kinds of textile apparel from panty hose to t-shirts, and children’s clothes.

However, by 2002, it was becoming clear that neither TSD nor BCC was going to withstand the changes within the textile industry *with their incumbent business models intact*. Both firms were shedding employees and trying to adjust to declines in US textile and apparel production. The difference was that TSD had not accumulated enough assets during its K-Phase cycle to allow for conservation as a path out of the decline of textiles. For TSD the decline was radical and the response had to be radical not incremental. TSD saw no incremental paths out of their dilemma.

Eric Henry had a vision that the Rehance® technology, with its extraordinary lack of material impact and low ecological footprint, could be a major point of differentiation for TSD. Conversely, BCC, after extensive industry trials in the larger textile printing market, did not believe that Rehance technology would have a major impact on their financial success in this rapidly deteriorating market. Therefore, after five years of R&D investment BCC no longer believed that the Rehance® technology was adaptable for the larger continuous printing applications in the general textile industry, and began to withdraw from the development project. BCC sought to sell or license the technology to TSD. An exclusive license was granted in 2002 and the patents were sold to TSD in 2005.

As the Rehance process was developed during the period of 1996-2002, the decline in TSD’s business was gradual enough that the changes, while very difficult, were evolutionary and in sync with other rates of change within the industry. The company maintained its revenues within margins that were normal for the company (see Figure 8.1). TSD managed itself within the paradigms of its historical business strategy as a contract screen printer of textile apparel. Production in the early 90’s consisted of totes socks, panty hose and large contract sportswear and apparel accounts.

The late 90’s saw declines begin due to the effects of NAFTA. During 2000 and 2001 there were declines in core contract customers as well as a recession during the aftermath of the terror attacks of September 11, 2001. The circumstances in 2002, therefore, demanded creative destruction of the old models at TSD, with the final impacts coming in 2004 as revenues declined significantly and the employee count declined to less than 15.

⁶⁴ Unlike larger firms, as owners, Tom Sineath and Eric Henry also personally felt the financial pain. From 1995 – 2009 there were several extended periods during which they were unable to pay themselves in order to pay the banks, meet the payroll and fulfill their supplier requirements.

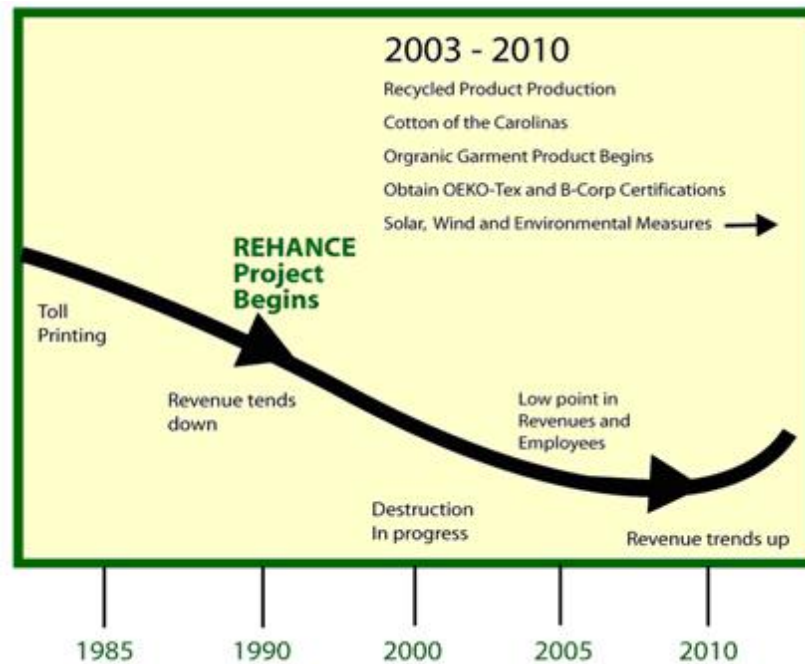


Figure 8-1 TSD's Transition Timeline from Contract Printer to Sustainable Apparel Producer
From 1985 through the mid 1990's the incumbent model maintained steady revenues and profits. Revenues bounced from \$1.5 million to \$2.4 million but rapidly declined as NAFTA and WTO accords globalized the textile production for US retail brands. With the insertion of a sustainability lens beginning in the late 1990's and especially from 2002 to present, the company transformed itself through a variety of environmental and social programs and technologies. This was coupled with a huge stakeholder outreach program to introduce a greener and more sustainable t-shirt.

8.3 The Method of Intervention

As with the other two action research cases presented in this thesis, the plan was to move TSD from their realization that the current situation was not sustainable towards sustainability focused new strategic vision using the techniques and frameworks described in Chapter 4. However, in the TSD case, there was little need for the steps of "Building Trust" or education on the need for environmental or social sensibilities because of the owners' existing "sustainability" ethic. Eric Henry had begun his environmental voyage on the first Earth Day in 1990 and had formed the first local Environmentally Responsible Business Circle soon after, with quite a few local firms joining the discussions and meetings, but there was no clear connection of these efforts to the customers of his business.

As this action researcher became engaged with TSD, first through the Rehance development project and finally as a strategic advisor, the two owners' deep ethics emerged strongly, in this thesis author's assessment, as the primary guiding forces for the future of the company. Both Tom and Eric had strong environmental and social sensibilities with a deep caring for environmental causes and social justice. When the business began to collapse, it was natural for these owners to look for a larger purpose to keep the firm viable.

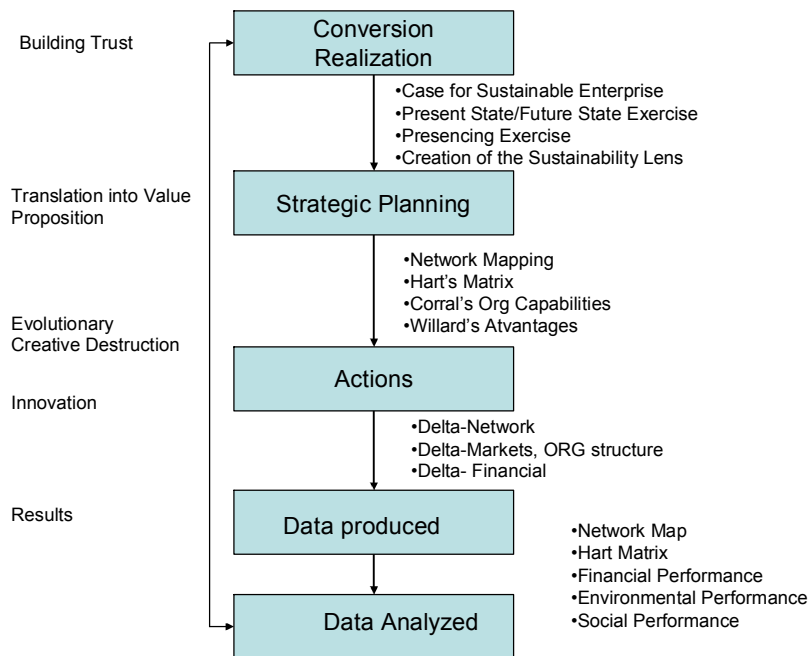


Figure 8-2 Flow Diagram for TSD's Strategy Planning Process
(Argyris, Putnam et al. 1985)

This ethic had been integrated over the years into the operations of TSD. Therefore, there was a strong sensibility and little need for any “conversion” towards a sustainability viewpoint. What was lacking was connecting these investments and sensibilities to the financial and market performance of the company. TSD needed a vision and strategy to produce the business case for creation of a sustainable enterprise. This was the primary role of the action researcher in this project, to help TSD find the correct sustainability lens connecting the environment and products of the company to its financial success.

Furthermore, the abrupt cancellation of orders created an urgent need for action and the immediate development of a new strategic vision and action plan. So, after a brief education period, the Present State/Future State exercises were conducted and the strategic planning process was started.

As BCC was undergoing its changes to produce greener and more sustainable chemistries, which eventually produced the Rehance technology and other DfE chemistries (described in the BCC case in Chapter 6 of this thesis), Eric, Tom, and this thesis author had many casual and eventually structured conversations about the impact of sustainability on BCC and the textile industry. Tom and Eric eventually asked this thesis author run an educational program for their managers and a few key customers to describe the concepts of “sustainable enterprise.”

What was needed was a new paradigm that could remove TSD from the vicious commodity pricing cycle and differentiate them from competitors. They agreed to begin a formal action research program based on inserting sustainability as a primary strategic lens to discover such a path forward. The formal educational presentations were started in 2002.

After these sessions, both Tom and Eric, for the first time, began to connect the idea that their environmental and social ethics could be the foundation for their business's profitability and could help them to develop and implement a new paradigm for TSD. The metaphor of "People, Profits and Planet" was the key concept that cemented the vision for TSD.

One of our first steps was to incorporate Senge's process of using the Present State/Future State exercises to produce a picture of the present state of the company and the US textile industry (Senge 1990; Senge 1999; Senge 2004). After there was clear agreement between Tom and Eric on the present state of the textile industry and of their firm, the exercise was continued to envision the desired future state of TSD. Figure 8.3 shows a summary of the broad ideas that emerged from this exercise.

Present State/Future State TS Designs, 2002

Present State	Desired Future State
<ul style="list-style-type: none"> ▪ Major Customers have moved business off-shore. ▪ Company has not been profitable for several years. ▪ Price is the only consideration for existing customers. ▪ TSD has no way to differentiate its products or services. ▪ There is no link between environmental and social performance of the company and its customers and market. 	<ul style="list-style-type: none"> ▪ Become profitable. ▪ Use Rehance® Printing as a springboard towards becoming a "sustainable" apparel company. ▪ Find a connection between "doing well and doing good" and create as many opportunities for as many stakeholders as possible. ▪ Become recognized as the leader in sustainable apparel production.

Figure 8-3 TSD's Present State-Future State Scenario Planning

In 2002, TSD engaged in a series of meetings to develop Present State-Future State Scenarios for the company as a first step in the strategy development process to create a new vision and strategy for the company. There was a failing Present State due to globalization of the industry and a failure of investment in social and ecological dimensions to bring about sales growth and profits to the company. The desired future state of the company would destroy the old contract screen printing paradigm and produce a strategy aligned with sustainability and a new set of products and services for the "Lifestyles of Health and Sustainability" (LOHAS⁶⁵) consumer.

The results of the exercise helped the company personnel to envision their company not as a contract printer, but as a specialized green apparel company. The basic elements of the strategy were:

- The major brands were not going to market and introduce a new printed apparel product in the midst of the deflationary environment caused by the globalization of the textile apparel industry. Their costs were decreasing for the Plastisol printed apparel product due to lower labor costs in Mexico, China, and India, so there was little incentive to introduce a new product that was higher priced, even with its technical and environmental advantages.

⁶⁵ See <http://www.lohas.com/>

- This meant that TSD would have to develop its marketing message and direct it to consumers who care about environmental footprints, fiber sourcing, chemical additives and high quality differentiated products. This meant reaching out and becoming involved with new, previously ignored stakeholders.
- Information on the LOHAS⁶⁶ consumer segment was improving due to sales of organic food, hybrid cars, and eco-tourism. This indicated that this growing segment of consumers cared about local production, lowering carbon footprints of consumer goods, elimination of toxics within supply chains, and that they were willing to pay higher prices for goods that met these criteria.
- TSD's first goal was established to contract print t-shirts for existing customers and they would also seek to transition by designing their own t-shirts to have a modern fit pattern, produced from ring-spun (very soft) certified organic cotton, produced in North Carolina and printed and dyed via the Rehance Technology.
- TSD would develop a sustainability message around these shirts, which by 2008, had evolved into the following message: TSD is a company that is "Printing t-shirts for Good."⁶⁷
- The "old" TSD, as a contract printer of commodity Plastisol t-shirts, could not exist in tandem with the new vision for the company. Therefore, the incumbent business had to be phased out as rapidly as it was possible to creatively destroy it. This was a necessary, intentional strategy, as some of the old customers continued to call for small Plastisol print jobs if they had supply chain issues out of China and needed inventory. The seduction to go back and do these jobs was great and this element needed to be addressed within the strategy. However, the managers decided to continue to print these jobs as long as they had inventory of Plastisol inks and capacity that did not interfere with Rehance® development, thereby, salvaging as much cash flow as possible.

There were three important factors in this case that were substantially different from either BCC or the Reedy Fork Dairy:

1. Tom and Eric, the co-owners of TSD, already had a profound ethical and spiritual connection to the environment and to corporate social responsibility. They simply had never integrated the idea of connecting their ethical principles with the financial performance of TSD by seeking stakeholders with similar ideals and turning them into customers.
2. The financial condition of their firm did not allow for leveraging any assets to cushion the rate of change necessary for the company's survival. The new vision had to work or the company was dead.
3. Because TSD rapidly lost critical customers that provided a majority of their production volume in the old business model, the company had no choice but to innovate or die.

On that grim day, described in the introduction to this case study, the stark reality of the situation was finalized for the owners. All the preliminary strategy development became real. The new

⁶⁶ See <http://www.lohas.com/>

⁶⁷ See www.tsdesigns.com

strategy must become the foundation for the new TSD because a single focus on being a low cost producer of screen printing services could not save the company. There could be no gradual evolutionary change. As quickly as possible, all incumbent operations would have to be shut down and the survival of TSD would hinge on selling organic t-shirts, printed with Rehance technology, to a whole new set of customers.

As the educational and strategy development process with the managers of the firm unfolded, it became clear that that in order to succeed in the creative destruction of the old business and the re-creation of the new sustainability-based model, all company assets would have to be invested in the new business model.

Using Hart’s and Milstein’s value matrix as a guide, we mapped the anticipated strategy (see Figure 8.4).

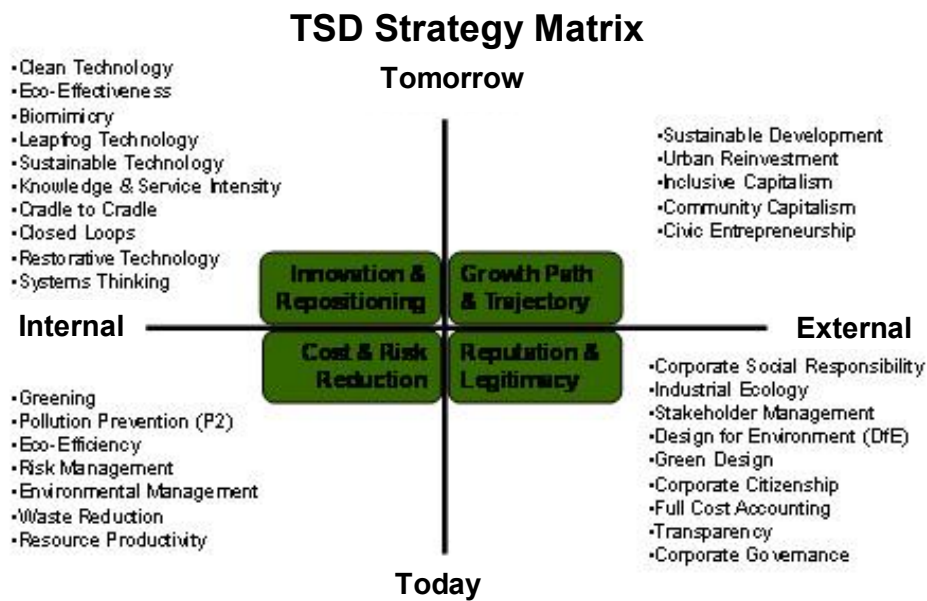


Figure 8-4 Mapping the Strategy for TSD According to the Hart and Milstein Model

Adoption and development of the Rehance® printing process for organic, local and recycled fibers provided present internal value to TSD by pollution prevention, risk management and waste reduction by elimination of PVC and phthalate as raw materials. This also produced a quality print with a soft handle unequaled in the market. Shifting to an organically certified cotton increased attraction of the products to new LOHAS stakeholders, who became fans and supporters of the company. The real value from 2002 forward would be from the advanced “clean tech” aspects of the new printing and production system and the opportunities to obtain cotton locally and to involve local garment production facilities. The company was very careful from 2002 forward to make sure all investments provided present and future value both internal and external to the firm.

Soon after that fateful day in 2002, it was necessary for the firm to immediately shed all personnel that would not be associated with the new business. All but a few Plastisol printing

staff were let go. Creative design staff were maintained and educated in the new print technology. Within three months, the number of employees was down to less than 50. The sad reality was that over 50 good employees were released. The positive aspects of this for the company were that these actions significantly reduced operational overhead expenses and provided high present value cash flow internally to the company. It was a hard time. Managers were advised not to view these actions as a retreat, but rather as a creative destruction of the old to enable the growth of the new.

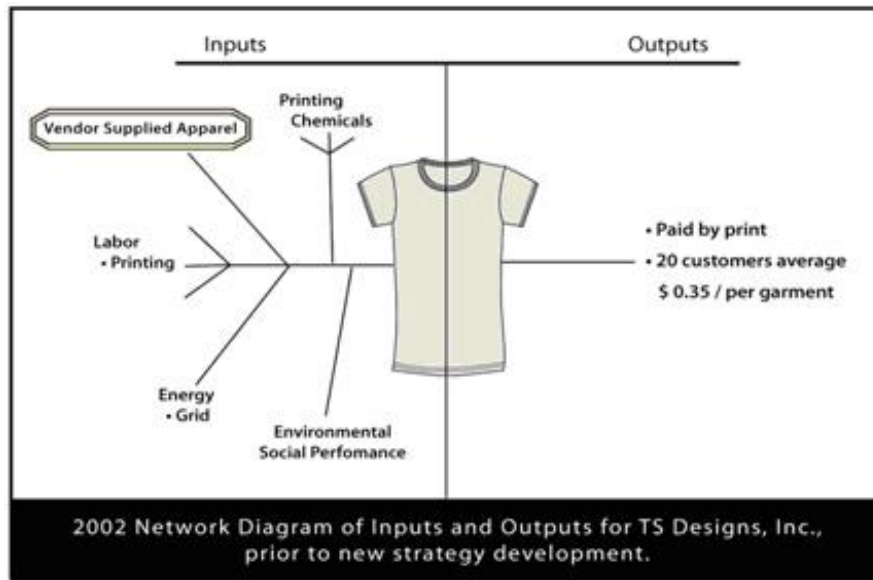


Figure 8-5 TSD's Input/Output Diagram - 2002

Prior to 2002, the inputs flowing into TSD's business model indicated a broad investment in people and planet that did not produce any value for its major-brand customers who were only seeking the lowest possible price for custom screen printing, and, hence, did not care about "clean, green" practices and products.

A network analysis of the inputs and outputs of the incumbent business model of TSD indicated a large variety of material inputs, knowledge, and skill-sets had been required to meet the demands of major retail brand customers. Under the old paradigm, TSD received the garments for printing from the customer. The customer also provided the basis for the artwork or design to be printed on the garment. TSD adjusted the artwork, produced a sample to be approved by the customer, and once approved, they printed anywhere from 2000 to 200,000 garments, which were packaged and shipped to the appropriate locations. TSD had nothing to do with design or materials of construction of the garments. They did not market the garments. They only printed and shipped them.

In TSD's old business model that focused on major-brand buyers and lowest price options, the print chemistries and materials of construction were not important. Prints only had to meet a minimum quality criterion for color fastness, color intensity, and placement of print. The design of the garments, such as fiber selection, cut and fit, etc., was the customer's responsibility. TSD's job was to print and ship. This would not be the case within the new paradigm.

In the new business model, TSD would care about and be responsible for all these materials, skills, and attributes because their new customers would care about their "green-ness" and sustainability. Initially, blank, ready-to-print, white t-shirt suppliers were selected to provide off-

the-shelf, prepared-for-print, Rehance Technology shirts. A moderate number of initial orders were sold, some to existing big-brand customers on a trial basis and some to new customers such as NGOs.

The efficiency of production for these first shirts was marginal, partly due to the quality of the blanks available on the market and partly due to the lack of experience with the new printing and dyeing process. The customers never saw the faulty shirts, but internal quality records indicated that the percent of “off” quality items produced in the early days was as high as 20%.

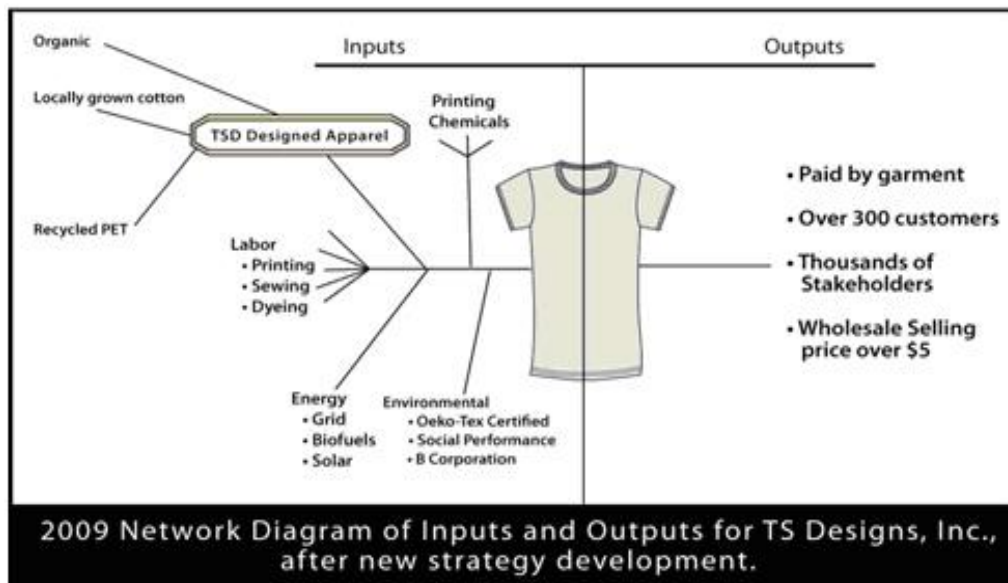


Figure 8-6 TSD’s Input/Output Diagram after Implementation of the Strategy - 2009

The input complexity of TSD’s business model continued to increase after the 2002 strategy implementation phase and the number of customers (outputs) increased by a factor of ten. If one counts the number of contacts made on the firm’s website, the number of requested speaking engagements, and the green awards presented to the company, the numbers of stakeholders interested in the company are in the thousands.

However, the quality of the final product was remarkable and the customers loved them. The production process and quality issues were eventually resolved by designing and manufacturing organic cotton shirts with chemical inputs in alignment with the Rehance process and having them cut and sewn in NC where rapid, effective communication was possible. This was the formation of new networks based on speed, quality and innovation. Another quality milestone was the purchase of a garment dye house, which enabled effective optimization of green dyeing processes to meet the needs of the higher quality Rehance prints.

As Rehance was introduced, it soon became clear that the major-brand customers did not appreciate, nor did they desire to develop the marketing skills to educate their customers on the improved environmental footprint or the higher quality of the Rehance printed garments. The major brands refused to allow TSD to provide educational tags on the garments explaining how

this printing had environmental and social benefits and how the print technology allowed for ironing and high durability of the image on the shirts.⁶⁸

To develop the market for potential “green” customers and NGO and LOHAS stakeholders, Eric Henry went on the road to every “green” or environmentally themed meeting and festival in the USA. Beginning in 2002, he introduced the new paradigm of printed apparel that did not use PVC, Phthalates, or solvents at alternative energy festivals, Earth Day festivals, music festivals, organic food festivals and green grocery store chain events, outdoor retail shows, etc. To introduce their Rehance t-shirt, TSD became sponsors at these events, sold shirts at booths or provided shirts to the event sponsors, and reached out to NGOs who sold t-shirts with poor environmental profiles, pointing out their liabilities if their traditional Plastisol printed shirts were examined for toxics and their environmental footprints. Rehance apparel offered an excellent resolution to those problems with a product quality that was readily apparent to the consumer.

In addition to stakeholder outreach through direct calls and “events”, the company also began to use the Internet and social media to advertise its investments in its facilities and community.⁶⁹ Beginning in 2002, in addition to the fundamental re-tooling of the business of TSD, they also developed an onsite bio-diesel production cooperative, installed a solar power system, replaced water-based toilets with water-less systems, developed company gardens, and implemented a grey-water reuse and rainwater harvesting system. Additionally, they implemented waste recycling systems and worked with local, social groups to employ less fortunate members of the local community. (See “Banking Green” Insert).

The shirts began to sell in lot sizes of 200-500 per customer to a wide diversity of customers, including several co-marketing firms such as Green Label Apparel,⁷⁰ which sought TSD as a product partner. Such co-branding relationships helped to increase turnover while maintaining the integrity of the product and the message.

In TSD’s old business model (pre 2002 custom Plastisol printing) less than ten customers comprised over 80% of TSD’s production sales. These included major brands such as NIKE, William Carter Company, Abdias, Kayser Roth, etc. In contrast, under the new organic Rehance apparel paradigm, it became clear that there would be hundreds of customers with orders 1/10th of the volumes TSD had previously enjoyed. By 2008, this was confirmed with sales spread over hundreds of customers nationwide. New information systems and data handling methods were developed internally to manage the new business realities.

⁶⁸ The largest order was provided to NIKE, where the company’s famous trademark was printed using Rehance technology. These shirts were placed on the shelf next to Plastisol printed shirts of the same color and design without any explanation to the customers. The test market was deemed a failure by NIKE when the customer did not recognize the difference without any special labeling or education. It was at this time that the change team realized that we would have to educate these customers and that they needed to find customers who cared about the social and environmental responsibility of this product and who would appreciate the fine hand and appearance of the shirt, enough to educate their customers about the superior quality and lower environmental footprints of the new products.

⁶⁹ See <http://tsdesigns.com/about/virtual-map-of-tds/>

⁷⁰ See <http://www.greenlabel.com/>

Success in the old model was based on: efficient purchasing of inks and printing materials; automated printing machines; efficient drying and curing ovens; excellent packaging, quality control, and logistical services.

Table 8.1 Banking Green

TSD Sells Their Banker on Green Investments in a Down Economy:

Related by Tom Manning(TDS Banker) in a meeting at TSD, December 2008

In 2008, Eric and Tom set down with their accountants and bankers to negotiate a loan for an investment in solar panels to continue them on their path of sustainability and to help reinforce this message to the hundreds of customers and stakeholders that were visiting their production site each year. See <http://tsdesigns.com/about/virtual-map-of-tds/> and click on the solar panels to see the installation.

They had asked their accountant to take into consideration the current tax rebates and power purchases from NC Greenpower⁷¹ and calculate the payback to justify the loan with the bank. The final calculations are posted at <http://tsdesigns.com/solar-payback/> along with a string of comments from stakeholders.

The banker in the negotiation was no stranger to the green revolution that was going on at TSD, and his role over the last 20 years had been to be the conservative voice as an advisor and bank to TSD. He was quite concerned going into the meeting that the guys at TSD were over the top this time! Prior to the meeting, he could see no way the current profit picture at TSD could support such an investment. Their previous small solar array and the small wind turbine had been “gifts” from the used equipment market that were low cost but had a big impact on visitors to the plant site. However, this was a significant investment and he did not see how the company could make this pay.

However, after the two hour meeting and reviewing the accountant’s numbers and projections, and gaining a better idea of how this linked the company’s facilities to its current and future sales, he approved the loan. The investment had the payback on multiple levels and was/is strategic to the company’s success.

The good news from the network analysis for the new strategy was that many of these skills and competencies would also be needed in the new business model. However, there were textile and apparel procurement and design skills that would have to be obtained from outside of TSD or be developed within TS, because they did not exist at that time in TS.

Within the action research activities, Montalvo’s behavioral templates were found to be very useful in assessing what skills and competencies TSD could use and what was missing.

It was very clear to all involved that TSD was willing to change because the existing business paradigm could no longer support their business. The firm had a great attitude toward innovation as adoption of the Rehance technology and installation of bio-fuel and solar technologies indicates. The percent of the general population that were entering the LOHAS market segment

⁷¹ See <http://www.ncgreenpower.org>

had been increasing since 2000, as sales of hybrid automobiles, organic food and other green textile products also indicated.

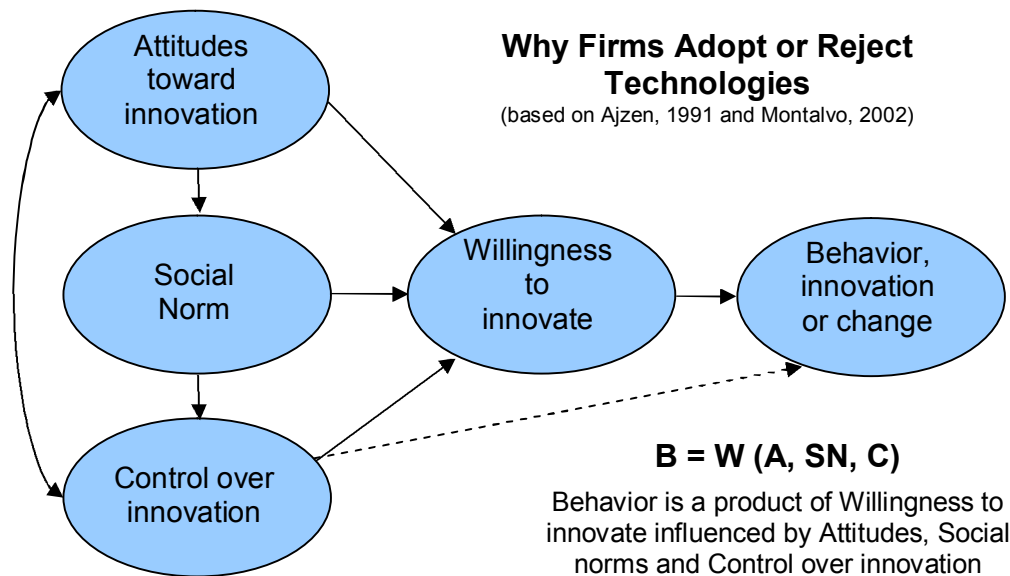


Figure 8-7 Montalvo's Willingness to Innovate Diagram

TSD exhibited behavioral changes due to their willingness to innovate and change because they had the correct attitude towards their change strategy, they were supported by a growing number of LOHAS orientated customers and stakeholders and that evolved the capabilities to support or control the change process (From (Montalvo 2002).

Judging from an “Assessment of Organizational Capabilities” perspective, control over the change strategy indicated the firm had the basic skill set to run the business from the printing process forward to dyeing, shipping and logistics, but they lacked expertise in the garment production processes. Therefore, new supply chain partners were sought to produce internal present value and also to bring in new stakeholders into the company that would eventually supply a “newly defined and designed” t-shirt made especially for use of the Rehance Technology. This required inventing or entering new supply chain networks that consisted of other SME textile firms. A vertical knitter with a cut and sew operation was found in NC, and this was a critical link towards success as production of shirts was essential if TSD was to have a “unique” product style to go with its special printing and dyeing processes. An organic yarn spinner was purchased from Turkey after a search of US equipment producers failed to find the quality and availability of equipment needed to produce the necessary type of yarn. The yarn-production technology coupled with a garment manufacturer in NC provided the first new supply chain links for TSD.

In summary, TSD began this creative destruction and reformation process with a set of owners that had the environmental and social ethics necessary to recognize that there was a growing segment of the population that was concerned about the environmental and social impacts of textile and apparel production and was willing to pay for it. The use of Senge's Present State/Future State planning tools allowed the firm to find a vision. Then Hart's matrix was used to connect that new vision to anticipated financial returns from the resulting activities. Finally, Montalvo's toolset helped them to assess the organization's capabilities and willingness to

change and to embrace a revolutionary use of technology and reinvention of the firm. As always, there were anticipated and unanticipated results from this careful planning.

8.4 The Outcome

By 2004-2005, TSD had lost all its original customers to Chinese producers. The success or failure of the business was dependent on the Rehance production of organic cotton t-shirts from two sources. One was the locally produced shirt from Wendell, NC made from imported organic cotton yarn, and the other was a National Organic Program (NOP) certified organic shirt from a California supplier.

The lowest revenue year was 2005 because all incumbent business was gone. This was also the third year of the full transition of the company. TSD was reduced to 14 employees during this time from their highest employment of 100 persons. But, by the end of the year it was apparent that the company would survive and that the new paradigm was beginning to work.

By the end of 2006, the company was becoming the firm envisioned by the business model and it was functioning well and adding employees, as it grew back towards a goal of \$2.0 million. In 2006 TSD had made a return to profitability. To their delight, 2007 was a much better year with continued profitability and sales growth. However, business slowed down during 2008, as the year progressed and as the global banking crisis began to impact consumer spending. However, in spite of all of this, TSD produced a small profit. They had 35% less revenues in 2009 than in 2008 due to the economic recession.

In 2009, the company slipped again into a slight loss, but the robustness of the new business model had proven itself and the firm adjusted by introducing new marketing approaches and new products in locally produced cotton fabrics and in recycled polyester/cotton products. As the company entered 2010, it still faced challenges to continuously redefine what sustainability means in terms of its business, but the company is in a much more stable situation than it was prior to 2002, due to its paradigm shift in vision and strategy.

The strategy for incorporating a sustainability lens into TSD followed the flow process diagram in Figure 8.2. Tom and Eric began to understand that, within their old contract-printing paradigm, the customers did not value their social and environmental investments. On the other hand, as the new strategy developed, they also learned that there were customers and other stakeholders who valued and purchased products produced more sustainably.

Once they realized these two facts, it was as if a floodgate was opened, and the innovation genie burst out of the bottle. Energy flowed from frustration built up from years of working with major-brand customers who had no vision or will to develop and to implement a path toward sustainable value creation. Particular innovations that resulted from being on the path towards sustainability was creation of a new label or product content stamp that adapted standard label protocols used in food products and applied it for sustainable TSD product innovations (Figure 8.6). The first innovation was TSD's Certified Organic Cotton garments. The second innovation was "Cotton of the Carolinas" which was grown locally, spun locally, and cut, sewn, dyed and printed locally. The most recent addition is a cotton-polyester shirt made from recycled cotton and recycled polyester soda bottles. This label innovation has become a well known "trademark"

of TSD products describing quite accurately the content and the mission of the company and the product.



Figure 8-8 TSD's Product Content Stamps from 2009

Designed to mimic food content labels that are used in grocery stores, TSD's product content stamps reflect their sustainability message and show how it pervades the product and company culture.

Innovations such as these and the introduction of solar and wind power, a company garden complete with a few chickens, a company kitchen and a biodiesel production facility have all sprung from this initiative and the energy of this company. A renewed sense of mission grew out of the discovery that satisfaction, efficiency and resilience all increased when dealing with like-minded customers and innovative practices that were ethical as well as sustainable. Personal satisfaction helped salve the transition years when personal economic returns were minimal.

Things have changed since the "good old days" of managing a few large customers. Now TSD partners with hundreds of customers in a business model that is focused on sustainable local production, and equitable supply chains.

What began as a line of locally-produced, organic-cotton t-shirts has diversified into a network of local, recycled, organic offerings.⁷² In 2008-2009 TSD obtained Oeko-Tex Standard 100 certification⁷³ for its organic t-shirt line, based upon verification by a third part that their products were free of toxic substances. Also in 2008, TSD became transparent with its social initiatives by endorsing and becoming certified as a B Corporation.⁷⁴ It should be apparent to anyone reviewing TSD's website, that the whole company's mission is now based on the quest for sustainability including creating as much value for all their stakeholders as possible.

As an example, in 2008 a group of people came together at TSD to celebrate the first production of "Cotton of the Carolinas." This is a cotton t-shirt produced from cotton: grown in Albemarle, NC; spun into yarn in a mill in Thomasville, NC; knit, cut and sewn in a mill in Wendell, NC;

⁷² See <http://tsdesigns.com/products/shirt-styles/>

⁷³ See www.oekotex.com

⁷⁴ See www.bcorporation.net

and printed, dyed and finished at TSD. The whole process and all of the people involved are described at the website: <http://www.cottonofthecarolinas.com/>.



Figure 8-9 The Cotton of the Carolinas Network

Photo includes the grower, gin operator, yarn spinner, knitter and sewer. Eric Henry is on the far right.

The concept of reviving the historical textile supply chain, which had been so important to this region of NC in the 1900's, came about as a result of studying other agricultural appellations such as special wine growing regions in California and France. Cotton of the Carolinas was also highly influenced by Shuman's (Shuman 2006) ideas about "local" value creation and what made viable was the intentional creation of a local network that included the cotton farmer, the gin operator, the yarn spinner, the knitter and cut-sew operation and TSD, the printer/dyer/marketer of the final t-shirt.

This concept for cotton became a viable concept for creation of a highly differentiated product, as the "local" food movement was popularized and there was rapid growth of local farmers markets. The buying public became more aware of the value of connection the farm to local jobs and specialized products and the product had great appeal as each step of production was made visible and the people that made up the Cotton of the Carolinas supply chain were introduced to the customer. The Cotton of the Carolinas concept was to use this "local" opportunity to create value for everyone in this supply chain, connecting people to products produced by their neighbors. The idea was summarized by the slogan of "dirt to shirt" within 750 miles.

Cotton of the Carolinas is a radical departure from the traditional "trade secret" mentality concerning textile supply chains, and a significant measure of how far TSD is willing to share success. From the beginning the concept was for all stakeholders within the supply chain to share their successes with everyone in the group finding increased benefits by creation of a local branded product.

The long-term objective of this project, beyond even the "local production" network benefits and "local" as a brand differentiation, was to eventually develop cotton fabrics and garments that are technically designed to meet local needs directly associated with the climate and activities of the

south-eastern USA. Success of this strategy retains jobs at home, reduces the carbon and travel footprint for the apparel products, and connects local people to highly specialized regional products and to the value they create.



Figure 8-10 The Company Shops Market COOP, a Local Food Coop Grocery Store
This is a concept drawing. More information can be found at www.companyshopsmarket.coop.

Also springing from this outpouring of innovation related to agriculture is the role of TSD in the development of Company Shops Market COOP⁷⁵ a local food coop grocery store. Because in part of the successful models developed at TSD for local cotton production, and good success of other food coops in the region, Eric has led their local stakeholders to embrace this concept of local agriculture jobs creation to food production. Company Shops Market COOP is now building their own grocery store to sell products from local farmers within a cooperative organizational model. We can be sure that TSD printed products will be featured at this new retail location along with local foods.

Eric and Tom are both heavily engaged in speaking about their experiences in using sustainability as a compass for the new directions for TSD and how this adventure has changed their personal and business lives. On more than one occasion, both of them have explained to this thesis author that seeking sustainable production in their work life has reintegrated and removed separations between their private and business values. The ideals and concepts of balancing ecology, society and profitability to create abundance for as many stakeholders as possible, has set them free to innovate on many levels with many different stakeholders in all facets of their lives. The TSD of 2009, while still in the textile apparel printing business, is not the same TSD that this thesis author began working with in 1998. The reinvention of this firm due to embracing sustainability and the hard work of the owners and the entire TSD team has been truly a wonderful thing to be involved in.

⁷⁵ See www.companyshopsmarket.coop

8.5 Lessons Learned

At the dawn of 2010, Tom and Eric still share a corner office at TSD, as they have for 30 years. Two desks with computers, an old couch in between, with samples of printed t-shirts scattered about in small piles here and there, make it look like every other textile office in the world. Numerous awards and pictures cover the walls, most of them the color green.

However, the most indicative feature of the office is a long strip window that provides a 180 degree view to the jungle of landscaping around the parking lot. Off to the left side of the window provides just a glimpse of the biodiesel facilities⁷⁶ at one end of the building and out the right front part of the window, you can see the solar panels, the company gardens, and the public biodiesel pump. The window runs through two of the four walls of the office and when the sun is high in the sky, the office is full of light and when the windows are open, you might hear one of the chickens that have run of the garden.

When they designed the building with this window, twenty plus years ago, they acknowledged the greater outdoors and brought it inside. This is a perfect metaphor for how this company performed their Schumpeterian transformation by fully embracing sustainability and linking diverse stakeholders directly into TS Design's new ideas in sustainable apparel production. The outside stakeholders of TSD are everywhere in this company. In the products, the philosophies, the food, the fuels, electricity and all the people of TSD, there is the ever expanding network of creation linked to the metaphor of people, planet and profits

In 2009, when you visit these guys, it would be rare to find them both in the office. Tom was generally out in the mill keeping the printing presses moving, or on the grounds building something or working in the company gardens. Eric, the salesman and the green front man, was usually out with some group of stakeholders, selling his vision and products for a local, sustainable economy. There is also a new collection of young people, interns and new employees who have sought out the opportunity to work at TSD and bring their computer and social networking skills, enabling ever further growth of their stakeholders.

There is a never ending stream of visitors touring and asking questions about the company, its transition, its products, including its gardens, biodiesel production, solar arrays and of course the t-shirts. People are excited to see what this company is doing. The positive nature and spirit of the place and its people is exciting, even during weak economic times. This is in full contrast to the reports out of banking and Wall Street with the nightly television news reporting a never ending stream of corporate malpractice and ill will.

This thesis author remained active as a member of TSD's advisory board through 2009 and will remain as an advisor in some capacity, so the action research continues. What new visions and directions will motivate this firm in the future remains to be seen. There are plans to help the farmers producing Cotton of the Carolinas to continue to reduce the ecological footprint of its cotton. There is even talk of trying to grown organic cotton in the region. The new recycled polyester and cotton t-shirts are a new success and this line is growing as well. It is reasonable to expect that the company will continue to use its newly developed skills in addressing the needs

⁷⁶ Described in <http://tsdesigns.com/about/virtual-map-of-tsd/>

of diverse stakeholders to find new avenues for value creation that are firmly rooted in sustainability.

9 Summary of the Three Case Studies

All three SMEs used in these action research projects found that the inclusion of a sustainability lens as part of their strategy planning process provided unique perspectives and opportunities that would not have been available to them without this perspective.

Burlington Chemical was very successful for 20 years by using the tools of greener chemistry and pollution prevention to manufacture a line of “green” textile chemicals. As this core competency developed, the company revenues grew from six million dollars to over sixty million and the company moved beyond being an upstart, disruptive innovator within the US textile industry into a more “mature” manufacturing firm with vertical manufacturing and over 200 employees to manage. Assets were accumulated and strong customer connections were made producing great efficiencies that translated into high profits reinforcing these behaviors. During this same period, using the analysis techniques described by Holling (Gunderson and Holling 2002), it is clear that the textile industry was in a fully mature “conservation” K-phase and the industry, as a whole, was doing everything politically and financially possible to protect its market and incrementally increase profitability. There was a very slow and mature rate of technological innovation, productivity increases due to automation had flattened and were incremental, and therefore, when globalization allowed the Far East and Central American markets gained access to the garment market in the US and Europe through large retail brands, the availability of low paid garment workers disrupted incumbent markets.

BCC’s lack of ability to transcend the collapse of the US textile industry was due to a poor understanding of the nature and depth of this collapse and the lack of understanding of the process and the costs (time and money) of “creative destruction” as a part of a dynamic change strategy when faced with such business conditions. Had BCC not had the tools of sustainability and the resultant “green” chemistry, it is possible that the company would have been sold much earlier in the business cycle. Therefore, in some respects, their resilience within the domestic textile industry and a lack of diversified investment and innovations in other markets gave the company a false sense of security that enabled it to ignore deficits in network building and new market penetration, while assuming its green chemistry was a more powerful asset that it really was.

The consequences of over resilience is discussed by Gunderson and Holling and described as “maladaptive consequences” to short-term success. Goerner, et al would describe it as “brittleness” (Goerner, Lietaer et al. 2009). My own observations⁷⁷ after some time and more objective reflection had past, was that: 1) within a mature market 2) which has incremental innovation and growth, 3) where incremental increases in productivity and hyper-efficiency are the primary drivers of increased value creation, is a situation that is ripe for disruption.

Burlington Chemical is a “classical case” of not using the strategy of “sustainable development” in a broad enough fashion. While TBL concepts were applied vigorously within the paradigm of the textile industry and this created huge advantages for the firm as it disrupted its competitors with its “green chemistry”, it did not seek diversity on its board of directors and it sought

⁷⁷ During interviews with Ed Parsons, Mike Scott and Jeff Morgan in 2008, we discussed what happened at BCC and what we would do as managers in the same situation today. All agreed that the textile assets should have been sold and the headcount and debt reduced radically to give the firm a chance to innovate on several fronts and to be able to fail.

markets that seemed to “fit” the business paradigms it was comfortable with. We leveraged existing assets; financial, intellectual and infrastructure, to find incrementally profitable sales increases. Had the company sought a path that enabled new voices and an intentional diversification of assets to have been heard and understood, the maladaptive nature of its embeddedness within the textile industry could have been avoided, and I believe the firm would be here today.

During a 2010 interview in Mr. Michael Scott the former Chief Operating Officer of Burlington Chemical verified the findings of this action research case:

In the mid 1980’s Burlington assumed a leadership role in the environmental arena with the elimination of alkyl phenol ethoxylates from its product line. As Vice President of Technology, this effort was lead and mentored by Sam Moore. At the time the textile market was still thriving in the US and the American Association of Technical Chemists and Colorists played a key role in documenting the environmental impact of chemicals used in textile processing. Burlington Chemical took an aggressive stance in providing documentation on the environmental fate of its products in effect setting a new industry standard. This facilitated market share expansion in the textiles resulting in significant sales gains from 1985 thru the mid 1990’s.

In January 1994 the NAFTA trade agreement became effective and this was quickly followed in 1995 by the WTO agreement. These pieces of legislation forever changed the face of the US textile industry. Realizing the vulnerability of the US textile market Burlington sought to leverage its technical expertise in formulating for the environment by focusing on industrial chemical and consumer products thru its performance chemical sales division. Sam expanded his sphere of influence thru his participation in a number of trade and technical associations and technical committees. His expertise in the industry was recognized and appreciated.

This technical approach expanded over time into what we now know as the green chemistry era. Emphasis on renewable resources facilitated a migration from petroleum based feed stocks to renewable and therefore sustainable resources. As the markets changed the technical production moved to plant based resources for alcohol and fatty acid sources. Because of its strong technology base Burlington was able to aggressively participate in the green market expansion. Much credit goes to Sam for his leadership role. (Interview conducted by Sam Moore, August 30, 2010)

In planning for the future at Reedy Fork Dairy, the key insight that came from the inclusion of sustainability was the understanding that investments in environmental stewardship and ethical treatment of animals, areas of high cost for the dairy, must be aligned with the price paid for the milk they produced. George Teague and his family had not realized that the movement in the pricing structure for the commodity “liquid milk” reflected the transition of dairy farming in the US into a scientific agri-business since the 1950’s, and that, in this paradigm, stewardship had no value. Including sustainability in planning for the future encouraged investigation into alternative markets and production strategies that allowed them to find a niche in the dairy business where they could realize returns from their investments in stewardship and good animal husbandry. This was a very radical and brave decision for the Teague family. Again, in a post analysis, the dairy industry is fully mature and in a Conservation K-phase cycle, except for the “local” and “organic” segments of the market. Interestingly, because the speed of transition to “organic” is

controlled by government policy and the steps to achieve organic certification is controlled by the National Organic Program, Reedy Fork Dairy is not disruptive to the incumbent market, but is participating in a speciality niche that will slowly roll back up the hill toward its K-phase. The challenge for Reedy Fork moving forward will be how quickly the “organic” dairy niche becomes commoditized as more farmers enter the niche and supply and demand force prices down.

During a 2010 interview, Mr. George Teague, owner and manager of Reedy Fork Dairy, verified the influence the systematic approach had on helping his dairy achieve a new vision:

I have dairy farmed all my life. The past 10 years we knew that there was no way to stay in business just selling milk to the conventional market. We needed to change or go out of business. With Sam's help we explored the options of agri-tourism, bottling our own milk and making cheese, within the framework of becoming more sustainable.

Sam attended cheese making school at North Carolina State University. I sought the paths towards a bottling plant or opening a farm store as an agri-tourism approach. All of these options didn't seem to offer the results we were looking for.

Cheese, bottling or a farm store all just seemed to be the same battle only with different challenges. Then we looked into organic milk production which Sam and I thought might be the best fit. Converting the farm to Organic was the right way to go to make our farm sustainable and to lead us in the future. Now my son and nephew are back on the farm to take the farm to the next generation. Seeking sustainability was the right approach for us. (Interview conducted by Sam Moore, August 29, 2010)

For TS Designs, full adoption of sustainability and the realization that incremental improvements in their Plastisol custom-printing services would never allow them to compete with printers in the developing economies of the far east, forced them to destroy their old business model and reinvent themselves to meet the demands of an increasing population of LOHAS consumers who would pay for organic, high technology, more sustainable textile apparel. Of the three cases, this was the most radical reinvention and adaptation.

TS Designs, more than either of the other two cases, had the fewest assets to cushion its transition. This forced adaptive change rapidly and put them into the role as a disruptive influence within the T-shirt market. TS Designs intentionally targeted “green” potential customers because many NGOs who espoused sustainability, were selling cheap plastisol T-shirts that contained PVC and solvents. TSD discussed this with the industry and they knew that these types of products did not “walk the talk” of sustainable development. Besides they also had a clear technical advantage with their printing process and the opportunity to reinvent a local market for cotton textiles that had, on paper at least, sustainable TBL efficiencies. Currently TSD continues to experiment in how to reinvent the T-shirt market using sustainability as their primary strategy driver.

In a 2010 interview, Eric Henry, the President of TSD, verified these results:

Sam introduced the idea of a triple bottom line or sustainable business model to our company in the mid 1990s when we were in the throes of NAFTA, which was destroying our very successful textile screen-printing business that we had started in 1977. This [help with TBL] was in addition to the technology he had developed at Burlington Chemical Co. as REHANCE printing, the patented, water-based,

environmentally-friendly print/dye process that has become the cornerstone of our business along with our triple-bottom-line strategy. We even changed the mission of our company: “To build a sustainable company that simultaneously looks after People, the Planet, and Profits.” Sam has continued to be an advisor to our company as we journey to be a more sustainable company. There is no way that we would have survived in the global commodity market of ever cheaper screen-printing prices without this radical change to our business model. In these times of Wall Street meltdowns and disasters in the Gulf of Mexico I think more and more people believe a business should be run on more than just the bottom line. The realization of a sustainable strategy has provided our company a path forward. Without it, we would not be here today. (Interview conducted by Sam Moore, July 29, 2010)

In sum, the diversity of efforts that arose in all three firms from TBL strategies focused on profits, people and planet was really quite remarkable. In all three cases, the insertion of the sustainability perspective and the integrated approach to educate, analyze, strategize, and iteratively modify behavior within this perspective adapted to a fairly standard strategic planning framework, was successful. When important managers and owners of these firms were asked about the importance of sustainability for the success of their firms, the reply in all cases indicated that these companies would not exist today had these efforts not been undertaken.

Mike Scott, President of Burlington Chemical stated in a meeting in 2002: “Using our sustainability strategies to leverage ourselves out of the textile industry and into new markets must be our goal. If we do not accomplish this task, we may not survive”.

Tom Sineath, the founder of TS Designs said in an interview in 2009: “Had we not finally made the connection between business and sustainability, specifically the triple bottom line, we would be out of business.”

George Teague, manager of Reedy Fork Dairy: “Going Organic saved this family farm. It has provided me a way, as the third generation of this family to put my mark on this place that I was never able to do before. I would be out of farming if we had not made this decision (from an interview in December of 2009).

In the final chapter of the dissertation, this author examines, in more detail the answers to the research questions and analyze the usefulness of the various frameworks and approaches that were developed during the seven years of this research and where there is a need for additional work and investigations, especially in the area of SME sustainable network creation as a competitive answer to commoditization of goods and services by globalization.

10 Summary and Findings

This dissertation's primary objective was to better *explicate the value of using a "sustainability lens" to incorporate the principles of sustainable enterprise into the strategic plans for small to medium sized businesses*. Since SMEs comprise over 80% of all global enterprises, it was important to understand the potential results of adopting such strategies in "real world", working in circumstances that are discontinuous, disruptive, and highly competitive.

Once some understanding of how a sustainability lens might work and the business case for sustainability was better understood, it was the further objective of this research to develop frameworks to incorporate such strategies into SMEs in a normative process to determine if positive results emerged. The dissertation, therefore, addressed several formal research questions:

- What are the roles for SMEs in the global economy and what are the implications of "sustainable development" on the evolution of business strategy for SMEs in an era of globalization of markets, communications, and technology?
- Can utilizing the paradigm of sustainable enterprise provide new core competencies, creating value, abundance and prosperity enabling SMEs to flourish during times of great change in technology, globalization of markets, and the resultant environmental and social conditions?
- What methods of education and transformation can be used in SMEs, and within three action research cases? Which ones were successful and why?
- What are the directions for future research in this area?

This chapter summarizes the discoveries made during the dissertation and research process.

10.1 Introduction

The author's experience incorporating a sustainability lens into the business planning process at Burlington Chemical in the 1980's was the catalyst for this thesis. The author saw that, when alignment was achieved between economic performance, social and environmental value creation, truly impressive efficiencies and innovation were produced throughout the company. This experience produced the realization that environmental and social investments were not counterproductive, but in fact synergistic with financial success. This was the keystone to this entire research effort.

This researcher was also motivated to explore how SMEs and SME networks might contribute to an effective economic world through a better understanding of how to maintain healthy global and local economies and the remarkable efficiency of capitalism, while also remaining within the planet's finite resources and civil society's need for social responsibility and healthy outcomes.

While this motivation was an honest one, in light of what has occurred during the first decade of the 21st century, today it is a naïve approach. As described in Loorbach (Loorbach, Whiteman et al. 2010), sustainable development must be a hybrid reorganization that involves business, government and all of society. While business has the potential to adapt and change much more

rapidly than government or society at large, it is maladaptive due to the necessity of growth and profit maximization with narrow views of mission. The common resource challenges described by Ostrum (Ostrom 1990) and many others, places us in a situation where the question of who owns and protects the commons that are vital for our future, places capitalism at the crossroads (Hart 2005). Capitalism will contribute, but Lorrbach et al are correct: greater cooperation from all parts of society is key.

However, the result of these efforts was action research into how to motivate SMEs to adopt intentional strategies for developing socially- and economically-sustainable enterprises and networks that create abundance, while remaining within the limits to growth.

The intellectual underpinnings for this research are found in the literature review in Chapter 2 and the integration of the strategy frameworks in Chapter 3. The literature review and research cases indicate that, as the planet and global markets becomes ever more “hot, flat and crowded” capitalism and enterprise are undergoing significant changes and producing powerful, but also often deleterious new effects on local and global social networks and natural environments.

The question of what needs to be done to protect the environmental commons and create social equity is becoming more rightly understood (Capra 2002). Even the most primitive aboriginal people know you do not “mess your own nest” and resources must be equitably distributed, leaving some for future generations. But, at the heart of all of the studies on how to create “sustainable enterprise” is the conundrum of the “tragedy of the commons” (Harden 1968) and, as more recently stated by Ostrum (Ostrom 1990; Ostrom, Gardner et al. 1994; Ostrom 2005), the “common-pool resource allocation challenge,” meaning: how can equity be achieved in managing limited resources?

Montalvo (Montalvo 2002) summarizes the underlying issue on a final page of his book: for our planet, our economies and our civilization to survive, companies have to consider the greater good as well as the bottom line; unfortunately, evidence suggests most businesses act only in response to short term profit. Paraphrasing Darwin via Theodore Sturgeon, Montalvo sees this rule implicit in Darwin’s law:

Implicit in this [Darwin’s] law was humanity. With it, the base of survival emerged, a magnificent ethic: the highest command is in the terms of the species, the next is survival of group. The lowest of the three is survival of self. All good and all evil, all morals, all progress, depend on this order of basic commands. To survive for the self at the price of the group is to jeopardize species. For a group to survive at the price of the species is manifest suicide. Here is the essence of good and of greed, and the well spring of justice for all of mankind. (Montalvo 2002, p. 197).

Many groups throughout the world that are struggling to respond to this “sustainability” challenge, of course, but most focus on symptomatic relief, not underlying business dynamics. Lester Brown, for example, advocates for what he calls, “Plan B” (Brown 2003) (more wind power, eating lower on the food chain, etc.), and researchers in the EU are calling for “degrowth.”⁷⁸ Perhaps these efforts will eventually yield a paradigm shift in economic and political theory that will augment capitalism, but the challenges of aligning personal economic

⁷⁸ See <http://www.degrowth.eu>

gain with what is best for society as a whole will remain a powerful impediment. For example, communism as it was practiced throughout the 19th and 20th century failed to produce economic equity or prosperity because it ignored the power and, indeed, the seduction of capitalism for entrepreneurs who demonstrate every day how passion ignites productivity.

In contrast, this author's experience at BCC suggests that SME networks organized around Triple Bottom Line sustainability principles might provide a more effective resolution to today's sustainability challenge by producing realistic but efficient human boundaries on markets. Why SMEs? Based on data from the literature review, SMEs represent over 80% of all tax-paying enterprises and their numbers continue to grow along with the global market economy. The literature review also suggested some significant differences between large and small firms in speed to innovation, ability to bring disruptive innovation into the marketplace, and the ability to achieve returns on R&D investments. This explains the "niche" that smaller firms fill in local and regional economies. There are emerging insights from ecological science, which support the idea that "small is beautiful" and also critical to systemic resilience. There may simply be a size limitation to efficient markets, which protects the commons based on how many diverse connections can be maintained.

This author's additional focus on building effective SME stakeholder networks grew out of several concepts and trends he discovered concerning SMEs' role in the global economy, and how they behave, form and work dynamically within networks throughout the world. For example, thanks to vast improvements in global communications, the Internet and other technology-driven resources that allow SMEs to network and offset certain advantages traditionally held by larger firms, smaller firms have greater opportunities to compete in global and local markets than ever before. Consequently, a positive trend is now emerging of SMEs working together, joining in networks to produce value in a market that favors speed to market and innovation within shorter and shorter innovation cycles. It is most heartening to see the revitalization of local foods and production clusters of SMEs in the USA and the globalization of the "Slow food" movement, not to replace global supply chains for economic reasons, but for broader social and ecological ones that are based upon deep community development issues.

At the same time, when it comes to competing for resources, small firms face the same competitive pressures and limits to growth as large firms, but they have to navigate an even more demanding economic environment that sees low price as equal to high value. Accordingly, the potential for using sustainability pressures and demand to serve these competitive and adaptive needs became a central query within this dissertation as an opportunity to use sustainability as a point of differentiation.

In summary, this dissertation's premise is: If SME firms can consciously recognize the organizational efficiencies and strengths of joining in networks, and truly discover sustainability related efficiencies, their own viability and profitability will be greatly strengthened along with the health of the planet and local and global communities and economies. Conversely, if such strategic directions and advantages are not realized, then the synergistic effects of efficiently networking 80% of the world enterprises will only accelerate the predicted collapse of global society and ecosystems (Gilding 2005; Costanza, Graumlich et al. 2007).

10.2 Methodologies for Creating Sustainable SME Enterprises and Networks

Inspired by the growing concern over the currently changing dynamics between enterprise, environment and society, this author studied the literature critically and then applied an integration of his discoveries in the action research cases.

The first discovery was that much of the research within the field of sustainable development and sustainable enterprise has been performed only on large firms.⁷⁹ The literature review, for example, uncovered several scholars who had produced strategic frameworks for defining and achieving sustainable enterprise using sustainable strategy development, organizational behavior, and change management in larger firms (Senge 1990; Montalvo 2002; Willard 2002; Hart 2005; Goerner, Dyck et al. 2008; Senge 2008). These frameworks were centered on value creation through sustainable development and innovation while also measuring financial impacts of these changes on enterprise. And, they appeared to be positively affecting the organizational behavior of these firms, while also increasing value for a wider spectrum of stakeholders. However, this work had been done using techniques that were too complex for most SMEs to utilize within strategy and change management programs apropos for small firms.

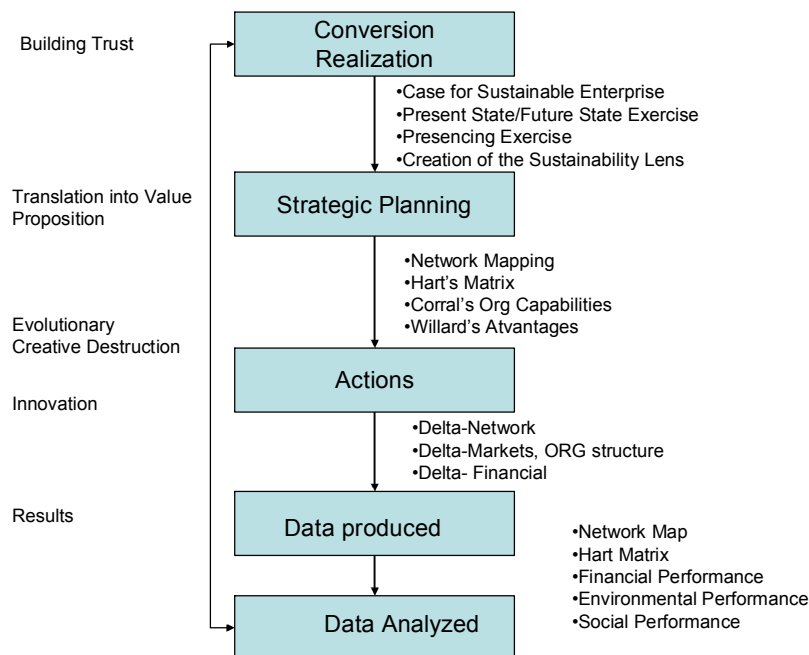


Figure 10-1 The Integrated Frameworks Used in the Three Case Studies

Not all cases needed every step of this process, however, in all cases, Hart's matrix, network mapping, and Montalvo's organizational assessments proved highly valuable. Willard's toolset for measuring value was important in the Dairy case especially, where financial tools were not as readily available. The entry point for each of the cases was somewhat different depending on the level of the financial crisis within each firm and the ethical and environmental sensibilities existing within the owners and top managers of the firms.

⁷⁹ Presumably, most research focuses on large enterprises because their perceived impact on the environment and society is also large, while their operational and market information is also more readily available because publically owned firms must be more transparent with financial and regulatory reporting.

In order to allow SMEs to use a sustainability lens to develop their own unique competitive strategies, this thesis author took the “basics” from several scholars working with large firms and integrated them into a more simplified approach appropriate for SMEs who want to insert a sustainability lens into their strategy planning process. Over a period of five to seven years, this framework was applied to three SMEs located in the piedmont area of North Carolina: Burlington Chemical Company, Inc. (a textile chemical manufacturing company owned by the author’s family), Reedy Fork Dairy Farm, and TS Designs, Inc., a contract screen printer of apparel.

The research methods were based on the techniques of action research, a social science investigation and intervention method in which the bias of the researcher is transparently the “cause” for the change being induced, which is clearly known from the inception of the project (Argyris, Putnam et al. 1985; Argyris 2009). In honor of this need for transparency, this action researcher openly promoted the agenda that *incorporation of a sustainability lens will provide value to SMEs by broadening the strategy of the firms through inclusion of as many stakeholders as possible with the ultimate goal of creating value and abundance for as many of these stakeholders as possible*. The process applied is shown in Figure 10.1.

It is crucial to state that the field of sustainable development and sustainable enterprise has grown swiftly since 1987 and that concepts from many niches of natural science were applied to economics and business during this period. This has occurred at such a rate that new metaphors and concepts were coined almost daily. Sustainability concepts have had highly disruptive and adaptive influences upon enterprises; and this author found it to be impossible to keep up with all of the new concepts that arose within relevant disciplines.

10.3 Observations from the Three Case Studies

It is important to note that not all the available tools were applied to every case. Different firms required different points of entry and the owners and the firms were all in different stages of inquiry pertaining to their personal and company-wide understanding of sustainable development and sustainable enterprise. The following discoveries were also made:

In all three cases, the owners of the SMEs were at different levels of understanding in connecting economic performance to their social and environmental investments, but none had a laissez-faire attitude towards business success at the expense of society or the environment.

At BCC, the discovery that low toxicity chemistry could be translated into a competitive advantage (through production of greener chemistries and textile dyeing processes) was recognized as an important key to growth within a healthy US textile market. But, there was never complete commitment at the management or board level that this could be an asset which could transfer beyond textiles, as measured by the capital ventured for investment for this change. As discussed previously, the company was too efficient within its market to change. Like the grand railroad companies at the dawn of the automobile age failing to see themselves as “transportation” companies, BCC continued to innovate within the traditional textile dye arena even as the NAFTA was killing textiles and the green/sustainability writing was already being painted on the wall.

The Teague family of Reedy Fork Dairy had always practiced environmental and animal stewardship, but the incumbent market for commodity milk could not recognize the value, or the costs of such responsible behaviors. They had not recognized that their stewardship must be paid for within the value of the final product, and that there were methods to find pathways. The only option left for them was to find a more specialized market for their product that could recognize and pay a fair return on those investments.

In TS Designs, Inc., the owners had always been “green,” but they also had never acknowledged the disconnection between their external and internal investments in “green” things and their incumbent business. Instead, like the Reedy Fork Dairy, it took a crisis in their incumbent markets to force radical change. The major retail brands that were their main customers for contract screen-printing, would not pay for sustainable technologies and TSD could not be a global low cost producer of screen printed t-shirts. This circumstance forced TSD to find new markets that were more aligned with their technologies and capabilities to survive.

Especially in the TS Designs and Reedy Fork cases, the owners already held personal sensibilities and beliefs in the positive benefits of value creation beyond maximizing short-term shareholder economic returns. The challenge was to redefine their philanthropy into a vision of profitable changes towards “sustainable enterprise.” This was accomplished through education and introduction of new metaphors and business paradigms that they did not know existed or had not examined fully in the context of business.

For all three companies studied, the initial education process had to include a step by step approach towards linking the concepts of sustainable enterprise and advancing stakeholder engagement to produce a healthy long-term economic return for the firms. The difference between enterprise and sustainable enterprise had to be “rightly understood” and described to SME owners and managers. There had to be a personal and a business case linked together because SMEs more closely represent their owners than is true with larger firms. However, there was no single metaphor or concept that would allow for breaking through existing mental models in all cases. Instead, the tools used in the early strategy and education sessions were a critical step in the process for all three cases.

The integration of Hart, Montalvo, and Willard’s concepts and toolsets proved to be highly useful. As the first decade of the 21st century ends, tools and concepts are emerging that I would incorporate into the toolbox. The tools for building sustainable business will continue to develop and diversify, but in order for them to be useful for SMEs, they must be “simple and straightforward”.

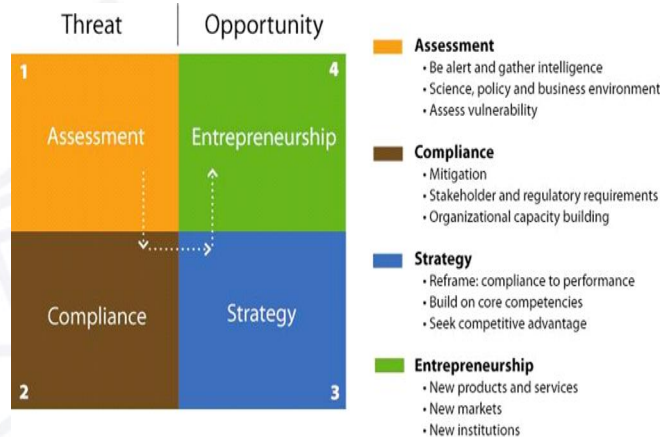
Above all, these useful tools had to link improved financial performance to investments in environmental and social issues. Demonstrations were given on how larger firms were achieving improved financial performance using the tools of Senge, Hart, Montalvo and Willard to connect sustainable business practices to solid value creation. Eventually, one or more of these frameworks always resulted in the formulation of several approaches for creating a more stable and profitable business. These sessions created the “A-ha” moment for all of these entrepreneurs. Tom Sineath from TSD and George Teague from RFD both proclaim that realizing that customers must be willing to pay for sustainable innovation, or that a particular market must be

deserted because there are no other comparable opportunities, created a new and powerful mental model for all involved.

It can be inferred from all three cases that the power of understanding and producing a business strategy based on the assumption that it is not unreasonable to seek balanced returns in all investments, including ecological and social investments, is important. Teaching firms to expect financial returns from investments in ecological and socially responsible activities is in alignment with “rightly understood” company performance. Conversions of capabilities for engaging stakeholders and production of eco-efficiencies and clean technologies are crucial in a hot, flat, and crowded marketplace where companies must be resilient to withstand the battering of global waves of change.

All three firms inherently understood the value environmental and social investment had for producing a reputation of being a good community and network member. Compliance with regulations was important therefore, and, once the link to improved business performance was made, such a compliance ethic was the foundation for further investments. Moving beyond compliance and including previously excluded stakeholders into consideration for strategy development proved to be the second important step towards sustainable value creation. See Figure 10.2.

Sustainability: Key Driver of Innovation



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Figure 10-2 Assessment, Compliance, Strategy Development to Entrepreneurship

This flow was a particularly powerful pattern when paired with Step 3 of Strategy Formation in Hart's Matrix, and then with Montalvo's organizational assessment for behavioral change. In all three cases, an alignment developed among the expectations of stakeholders who understood that they must become customers for high quality, more sustainably produced products if they were to align economics with ecology and society. As these links between the companies and their stakeholders developed, it became imperative to better understand what forces were in play among them. How did networks of small firms and their stakeholders form and organize? What behaviors could evolve from such network formation? How did they synchronize and to what benefit? Were there size effects to be concerned about and were there limits to size of these new networks that could affect efficiencies and creation of competitive advantages? The cases provided good insights into the formation and workings of such networks.

In BCC's case, engaging with the Water Quality Division of the state of North Carolina and forming a partnership to help textile mills prevent pollution, greatly increased BCC's universe of opportunity for value creation. Customers who had not previously recognized a need to purchase from BCC began to become customers because BCC could solve their environmental challenges and help them to increase their profits.

When Reedy Fork Dairy engaged with Organic Valley COOP, a customer who was willing to pay more for milk produced under rigorous "Certified Organic" standards, their opportunities for financial success increased. Reedy Fork Dairy now had consumers who were willing to pay for the stewardship that was inherent of their operational costs and recognized this value.

TS Designs' opportunities increased when they provided their customers with organic or locally grown cotton t-shirts that connected the people producing the products to the customers, thereby teaching the customers about the complexity and importance of these products. By finding customers that appreciated and were willing to pay the company for the complexity and stewardship of its process, TSD was connecting heretofore unknown stakeholders by "making t-shirts for good."

Prior to its NAFTA-induced collapse in the 1980s, the south-eastern textile and apparel market in the USA provided a perfect example of how a successful market network worked. Burlington Chemical, a member of the south-eastern textile network, had successfully operated within its boundaries in a highly efficient manner for over 50 years. Feedback was rapid, producing a highly innovative and competitive network of textile producers that was bounded by the trade policies of the US government and regional social and environmental regulations. This formed a virtuous cycle of innovation that included basic labor and environmental protections via regulations, which in turn produced repercussive effects, both positive and negative, when a network member was impacted by such regulatory boundaries. When these boundaries were removed and the market globalized beyond the legal jurisdiction of the US and its south-eastern region to regions with fewer labor and environmental regulations for protection of basic human rights, economic livelihood and protection of the environmental commons, the network failed to compete economically.

The dissertation and the articles published during this research by Manring and Moore (Manring and Moore 2004; Manring and Moore 2009; Moore and Manring 2009) have only barely begun to relate the concepts of network science (Hopkins and Wallerstein 1996; Strogatz and Watts 1998; Strogatz 2001; Dorogovtsev and Mendes 2003; Strogatz 2003; Watts 2003; Rogers 2004; Wheeler, Mckague et al. 2005; Goerner, Dyck et al. 2008) to small business networks. However, it is clear from all three case studies that recognition of the importance of networking and an intentional process to analyze and select the appropriate network is a significant new tool. The cases clearly demonstrate that mapping stakeholder networks provides significant insights into the diversity of a firm's network and its opportunities for improvement.

The most important issues remaining unresolved after this research concern the effects that size, structure, complexity and types of boundaries have on an SME's behavior and its relationship with its stakeholder network. For example, while it seems clear that SMEs tend to be more responsive and innovative because smaller and more interconnected networks tend to create more rapid and higher quality feedback loops, apparently the rules (boundaries/fences) that

surround and map the network also create more complex repercussive effects. A new path must be forged that unites private enterprise, governments and civil society in a new way, to create new ways to define growth and prosperity that is less divisive.

Boundaries seem to form a two-way system, where the network and its members are constrained (bounded) under its defining rules (mores), at the same time the network and its members also benefit from these rules. An example is the national organic certification standards for organic milk production. All members of this network must live by the feeding, pasture production and quality standard define by “organic.” At the same time, like-minded consumers recognizing the value of this network behavior is what differentiates and values this market. If SME members of the Organic Milk network run into one of its fences (accidentally violates a rule), then the feedback is likely to be rapid and firm; the SME learns not to do that again because it has a direct impact on its own and the network’s value proposition. “Sustainability” boundaries create particularly powerful incentives for “self-modifying” behavior while simultaneously supporting flexibility and open ended innovation plus providing long-term foundations for strategy, if the consumer helps provide incentives for change.

TS Designs also found that sustainability boundaries create a level of expectation that increases efficiencies. These boundaries tend to build trust and, when trust builds confidence, the wheels of business turn faster and more efficiently. When engaged in the old paradigm for business with the large consumer brands, TSD was continually being bombarded with detailed contracts that slowed deliveries and limited innovation. In their new business model, TSD is free to operate with more flexibility and inventiveness as long as the basic confidences with their customers are not broken.

How far can such network efficiencies expand? Can these synergies be found globally as well as within local or regional networks and can a multidimensional definition of “trust” extend beyond the exchange of goods and services for currency? The answer to these questions may come in the form of international regulations for environmental and social performance that set the critical boundaries to provide a uniform operational ethic that is equitable.

Network mapping allowed the use of Hart’s Matrix for sustainable value creation (see Figure 10.3) and helped all three firms to recognize how important a diversity of stakeholders is in launching into a vision that envelops sustainability. In all three cases regulations and quality principles were a norm of behavior for each business. This meant that pollution prevention and eco-efficiency were organizationally relatively easy to adopt. However, it was only after each firm began to engage with a greater diversity of stakeholders that it began to develop strategies to move beyond compliance and pollution prevention in new entrepreneurial markets.

Sustainability Portfolio: Mapping & Measuring Performance

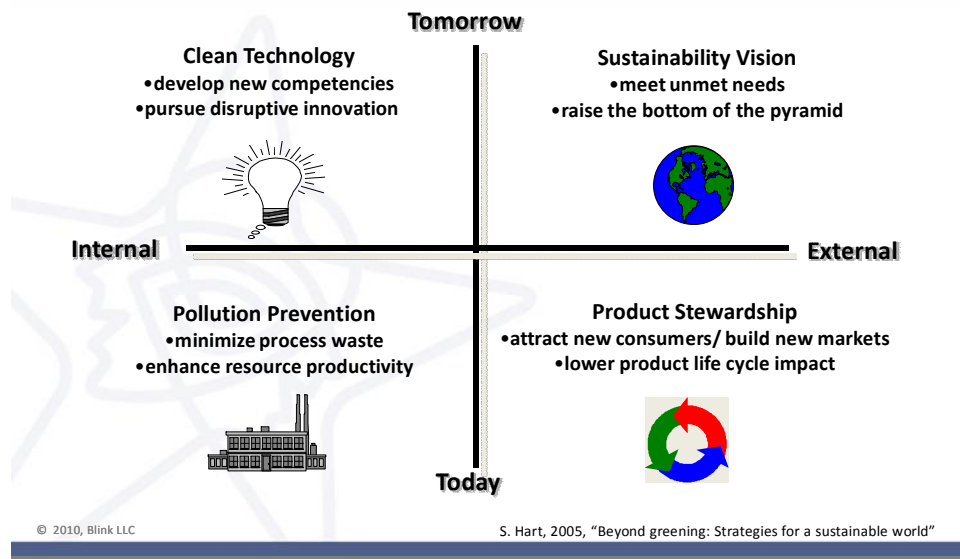


Figure 10-3 Hart's Matrix for Value Determination for Investments in Sustainability

A firm can map investments for present value creation from internal operations, but cannot move this value external to the firm creating present value or future value until it develops the skills and embraces the needs of a diverse cadre of stakeholders.

10.4 Answering the Research Questions

1. *What are the roles for SMEs in the global economy and what are the implications of "sustainable development" in the evolution of business strategy for SMEs in an era of globalization of markets, communications, and technology?*

If global markets continue to open and entrepreneurial opportunity continues to spread, the role of the SME will expand. If we are to avoid the multitude of problems that arise from an economic model based on value by scarcity, then creation of value for SMEs through realization of business as an "infinite game" can only be realized through adoption of sustainability as a major synergy within business networks. Sustainability, as a common strategy, is an imperative if SMEs are to survive and provide economic stability within the markets of the world. As discussed in earlier sections of this chapter, the timing and uniformity of the adoption and understanding of sustainability, together with useful management strategies, are the keys to rapid adoption. If successful firms or networks adopt TBL sustainability and become more successful than non adopters, then market forces will ensure adoption.

All of the modern media and social networking, which continue to improve both in numbers connected and the bandwidth of the communication, will also speed this transition. As the cases have shown, most firms should benefit in some way from including a sustainability lens into their strategy formation. To not do so, is to deny what is becoming a highly recognized set of conditions that is affecting every company and consumer in every market. (Friedman 2008)

2. *Can utilizing the paradigm of sustainable enterprise provide new core competencies, which create value, abundance, and prosperity while enabling SMEs to flourish during times of great change in technology, globalization of markets, and the resultant environmental and social conditions?*

The cases indicate that utilization of the paradigm of sustainable enterprise produces highly positive results both for internal and external operations of the SME. For adopting SMEs, the act of incorporation produces new competencies in eco-efficiency, stakeholder communication, integration of strategy planning practices, innovation fitting with both Discovery and Creation theories, and, very importantly for the owners of these SMEs, integration between personal and business ethics that frees innovation.

In all three cases, the firms studied were in crisis due to changes in technology and globalization of markets. In all three cases, there was also the rise of LOHAS consumers. These firms' old visions and their successes in incumbent markets no longer worked in their new market realities. In discussions with the firms' managers and owners a consensus emerged that, if these efforts to become more sustainable had not occurred, the two firms that did survive would not have done so. This is a very strong endorsement for shifting to a sustainability lens.

3. *What methods of education and transformation can be used in SMEs, and within the three action research cases, which were successful and why?*

The process flowchart (Figure 10.1) indicates that sustainability is important and must be incorporated into a strategy planning process. The cases made it clear that the key to unlocking sustainability's strategic advantage lay in making sure that the owners and managers of the firms understood that "sustainability" meant linking financial performance to environmental and social performance.

The use of formal presentations to introduce these concepts followed by the use of Senge's "Present State and Future state exercises coupled with the Presencing U diagram were also very useful. I would also adopt a formal use of the Panarchy system diagrams to more fully explain and analyze where a particular market or development cycle resides.

The importance of "suspension" in opening up the minds towards future opportunities that might conflict with incumbent practices and memes also proved extremely useful tools. The concept of organizational learning that leads to adaptive behaviors, and viewing organizations as dynamic rather than static entities, would be something I would emphasize more today than I did in 2002.

Once the conversion was achieved, using the tools of Hart, Montalvo, and Willard within a normalized planning process such as Bradford's (Bradford and Bradford 1990), enabled the strategy and action plans to form. The concept of "Transition Management" has formalized this approach for envisioning a logical process of sustainable change management; this concept did not exist when this researcher began his work. (Loorbach, Whiteman et al. 2010). Although less discussed within the case-history process, Willard's spreadsheet tools enabling ready calculation of present value internal to operations, effectively engaged the financial segment of the business as well. In all three cases, Willard's spreadsheet models were used for financing and accounting proposals to banks, accountants and boards of directors. While Hart's theories and projections of value creation and Montalvo's measures of the will and incentives to change ideas moved the firms' heart and spirit, Willard's economic models helped manufacture the business case.

In summary, all of the methods discussed had their utility; nothing was found ineffectual. But, it was clear that the owners must be intrigued, and then the will to change had to be engaged by linking financial value creation to investments in sustainability, and then the whole process must be reinforced through success. Effective policy and consumer recognized, third-party quality certifications were also helpful.

When the system failed to produce ready success in the transformation of Burlington Chemical from a general textile chemical company into a specialty green surfactants and lubricants company, faith was lost in the effort and key stakeholders reverted to old behaviors and were seduced back to investing in the incumbent models. This was a failure of strategy development that is less likely to occur today.

4. *What are the directions for future research in this area?*

The anticipated research to follow will focus on three primary areas:

- **Networks** — continued efforts to better understand how the structure of networks affects efficiency and stakeholder connections, using the Internet as a model. The rise of social media such as Facebook and Twitter will have an effect on speed and efficiency of feedback loops within business networks. Because this is being accomplished on the Internet, it should be possible to better understand how these networks perform and how competitive advantages can be gained to serve all types of stakeholders in new ways. As the world becomes better connected, a better model of how distance and cultural differences will affect boundary effects and feedback loops should be enabled.
- **The Importance of Specialized Local Economies versus Commodity Global Production in Regional Economies.** Recent conversations with highly successful global retail brands indicate that these companies do not think they can survive as inter-generational enterprises without some strong regional network supply chains that include SMEs. These firms are concerned that they will not be seen as a stakeholder in local economies and, therefore, not valued by SMEs and consumers over the longer term. Once the global labor dividend has been exhausted and environmental and social boundaries are more equitable globally, there should be a resurgence and emergence of local and/or regional supply chains. For example, in *Scream Crash Boom*, Gilding (Gilding 2005) outlines a scenario of a global flu pandemic that shuts down global shipping; and one thing retail brands understand is that you cannot sell what you do not have on the shelves. These firms are looking for economic and supply chain models that are more robust and engaged in local communities. As suppliers to these firms, SMEs and especially SME networks could resolve this dilemma.

There is an excellent opportunity for future research to explore how sustainable SME networks might provide goods and services that reconnect global retailers to local markets and re-establish historical connections, which were disrupted by rapid globalization based on inequity.

- **Self Sufficiency in Regional Economies based on Sustainability Principles.** Consumers in the USA are tired of their economic stability being decided in other countries and by institutions that have a single economic dimension as their sole value proposition. The recent banking crisis and the political upheaval that occurred in the US will define a new banking industry. Research is necessary to make the case against making profits and acceleration of

the decline of regional economies through the use of “short selling” where many stakeholders suffer (especially SMEs) as a result of banking practices. A case needs to be made for supporting SME firms through difficult times, rather than making profits by acceleration of their demise. It remains to be seen, however, whether or not a quantitative tool to help small business analyze existing or potential networks will emerge.

10.5 Final thoughts

Sustainability as a primary driver of enterprise strategy, for both small and large firms, is here to stay. Population continues to increase and consumerism follows in parallel. The purpose of the corporation is to “create the customer through innovation and marketing” (Drucker 1954). Despite efforts to do away with capitalism or find some hybrid between capitalism and socialism, capitalism remains strong and growing. Ecotopia, while highly desired by many, has not influenced consumer behavior. This author’s recent travels to India and the Far East proved to him that the poor of the world want to be like the west. They want the consumer goods that make western life desirable.

Globalization has provided economic hope to many that had little reason to believe they could ever emerge from their “underclass” status. However, as with all major economic shifts, globalization has had unintended consequences beyond lowering the price for consumer goods in the West. Whole sections of the USA have been deserted as steel, textiles and automotive industries have moved to chase lower costs. Communities are disrupted and destroyed. Are the costs and the loss of regional enterprises and their tax base truly reflected in the economic balance sheets of our communities — or only in the profit and loss statements of global firms such as Wal-Mart? Do low prices really equate to value creation over the long term? The paradox of modern economics, the artificial difference in calculation of price versus value that encompasses sustainability for future generation can no longer be ignored. Realignment must be possible.

These last seven years of research and effort suggest, as environmental and social norms are threatened, consumers will react to create opportunities for firms that will protect the opportunities for generations to come. The consumer is very powerful, more powerful than the media gives it credit for. Having the opportunity to work with large multinational firms through York University’s “sustainable enterprise academy” while also working with these three SME firms, has shown me that there is passion for sustainability at both ends of the size spectrum. However, smaller firms can move towards sustainability much more quickly and more efficiently. The government and the consumer must catch up with the rapidly growing cadre of green SMEs driven by the need to become more sustainable.

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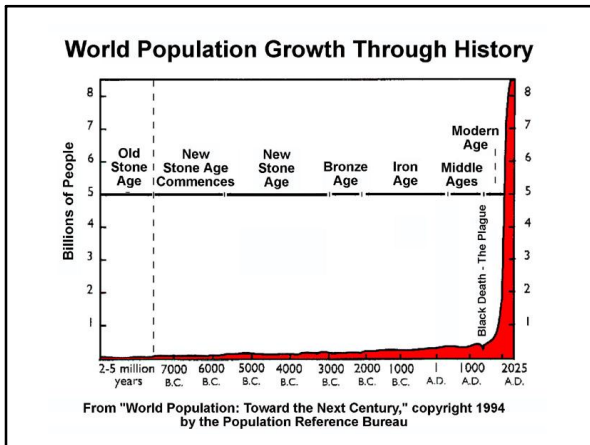
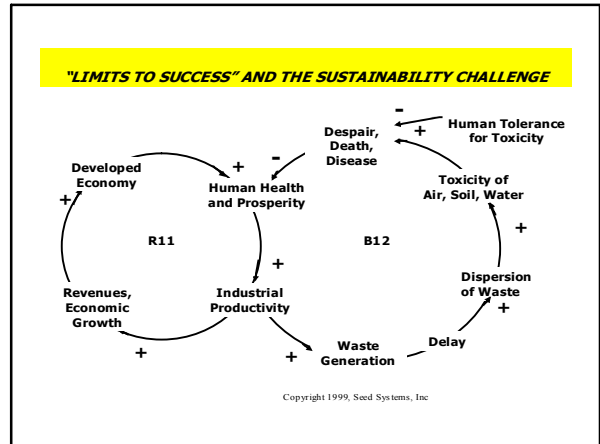
Appendix 1: Using Sustainability for Competitive Advantage

APPENDIX 1:
PowerPoint Presentation

Using Sustainability to Create Competitive Advantage

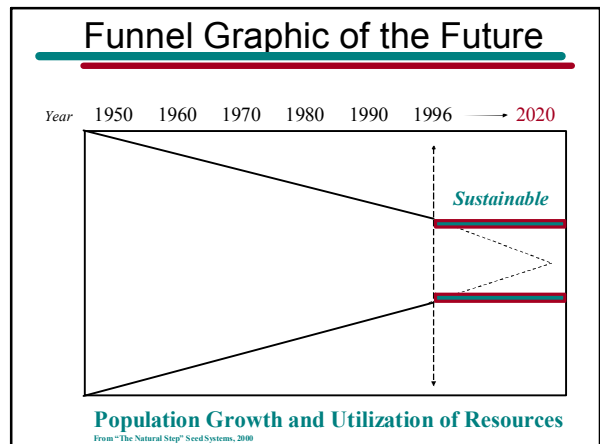
Three cases describing the opportunities and pitfalls of a sustainability lens in managing enterprises during disruptive cycles

Sam Moore
Ouroboros Holdings, LLC
sammoore1955@hotmail.com
2007

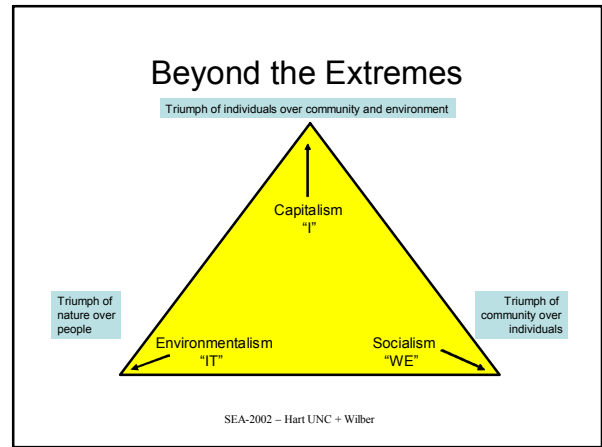
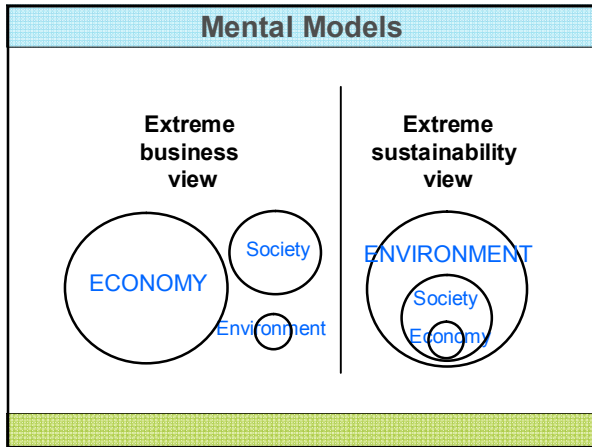
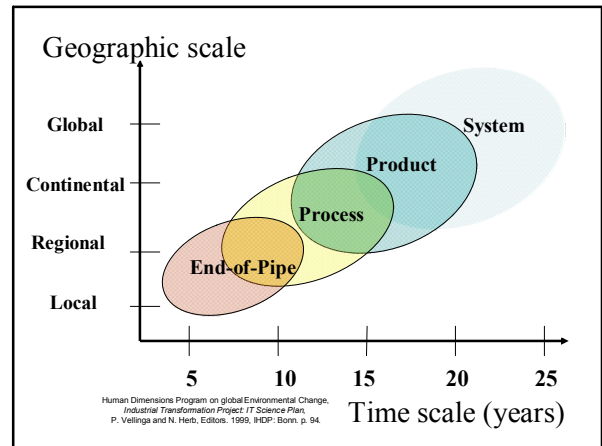
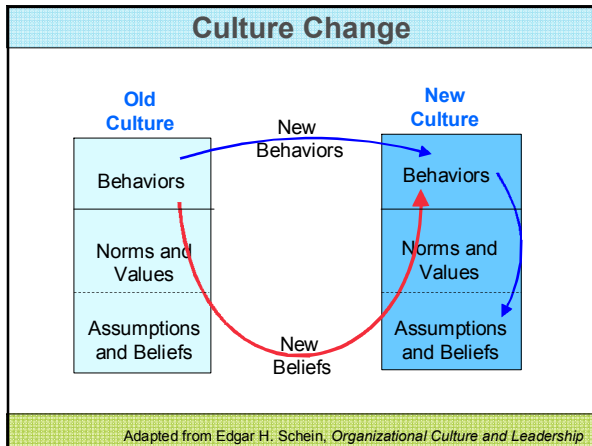


Business Defined:
"There is only one valid definition of a business purpose: to create a customer. Markets are not created by God, nature or economic forces but by businessmen... Because it is its purpose to create a customer, any business enterprise has two—and only two—basic functions: marketing and innovation." **Peter Drucker, 1954**

Civilization has arrived at an extraordinary threshold: all living systems upon which life depend are in decline, and the rate of decline is accelerating as material prosperity increases - Paul Hawken

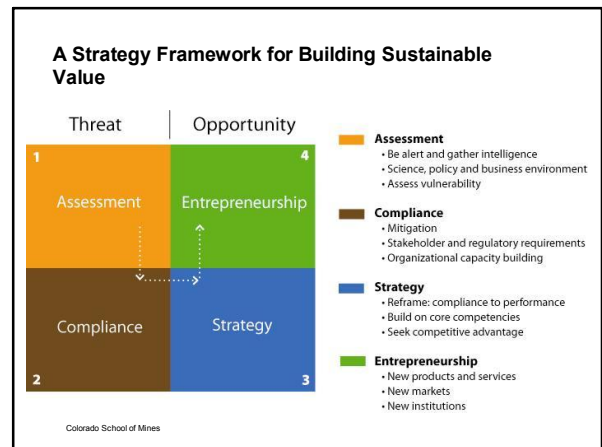


Appendix 1: Using Sustainability for Competitive Advantage

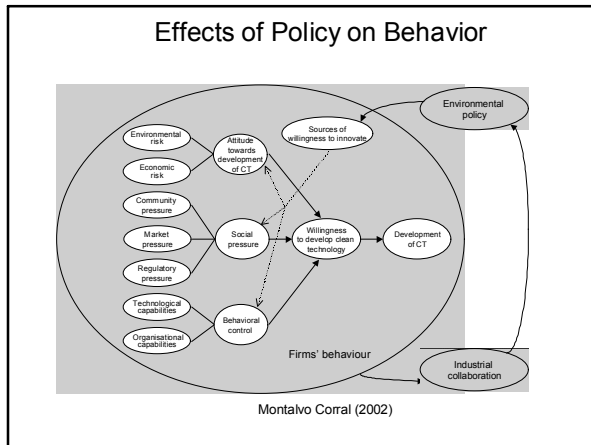
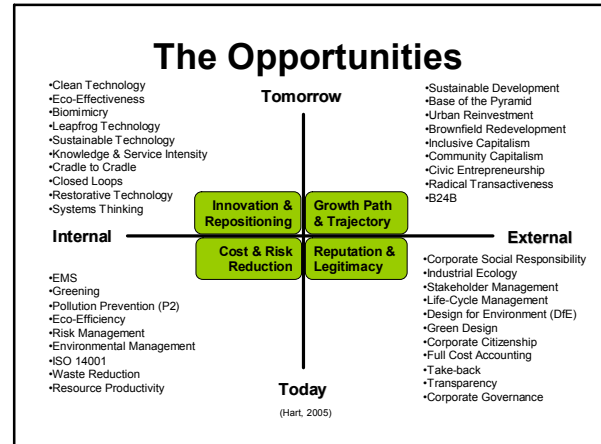
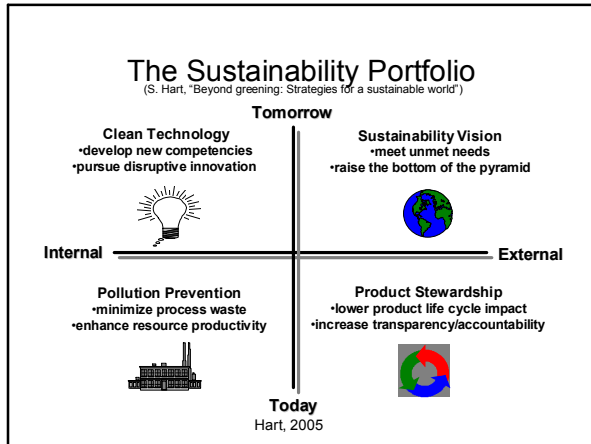


Business Redefined
Sustainable Development

*Creating economic, ecological,
 and social prosperity while
 ensuring that future generations
 have the same opportunity.*



Appendix 1: Using Sustainability for Competitive Advantage



Administration vs. Management

- Most managers are taught to administrate growth and adjust to competition within a "static equilibrium" market environment.
- With the rapid rate of technological, social, environmental and economic change, there is no equilibrium anymore.
- What we must learn to manage is rapid destruction of the inefficient, and creation of new solutions while retaining a continuity of assets.

Joseph Schumpeter (1942):

"...the problem that is usually being visualized is how capitalism administers existing (industrial) structures, whereas the relevant problem is how it creates and destroys them."

Capitalism, Socialism and Democracy, (1942)

"By 2020, more than three quarters of the S&P 500 will consist of companies we do not know today, due primarily to technologically induced disruption"

Wall Street Journal

Appendix 1: Using Sustainability for Competitive Advantage

Evolution or Revolution?

- **Evolution:** Change is not inevitable, but pragmatic and systematic in its progression- The world is made, not born -Darwin
- "A **revolution** is not a dinner party, or writing an essay, or painting a picture, or doing embroidery: it cannot be so refined, so leisurely and gentle, so temperate, kind, courteous, restrained and magnanimous. A revolution is an insurrection, an act of violence by which one class overthrows another." *Quotations from Chairman Mao Tsetung*, (Better known as *The Little Red Book*)

Continuous Improvement vs. Creative Destruction

Strategies for Greening

Focus on Existing:

products
processes
suppliers
customers
shareholders

Characteristics:

Incremental
Continuous Improvement
Rationalizes Industry

EVOLUTION

Strategies for Beyond Greening

Focus on Emerging:

technologies
markets
partners
customers
stakeholders

Characteristics:

Discontinuous
Creative Destruction
Restructures Industry

REVOLUTION

Sustainability offers at least two opportunities for development of competitive strategy

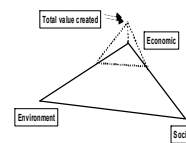
It provides:

a lens enabling a broader multidimensional approach on incumbent practices and strategy (Green tinted lens)...

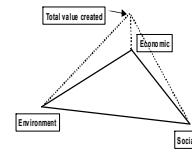
...a link to emerging markets and networks...

...a sandbox for testing emerging ideas and structures that encompass current social, economic and environmental realities requiring market-based activities. This is moving beyond visioning and greening by encouraging entrepreneurship.

Single Bottom Line:
Lost Opportunity



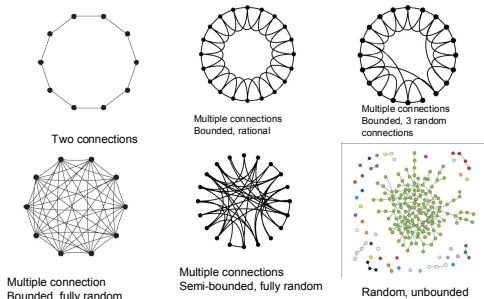
Triple Bottom Line:
Synergy Bonus



Opportunity Expansion due to Sustainability

(Hart, 2005)

Networks graphs as connections and randomness increase (Strogatz and Watts: 1998, 2003)



Background for Three Cases

- After the passage of NAFTA and GATT agreements ~ 1995, the textile, furniture and agri-business in the southeastern USA was disrupted.
- Between the three categories, over 1 million jobs were at risk in North Carolina between 1995-2005.
- The big strategic question for impacted firms was how to creatively destroy the incumbent, non- competitive segments and retool to create new opportunities, retaining the jobs and maintaining communities?

Appendix 1: Using Sustainability for Competitive Advantage

Three Cases

- **TS Designs:** A medium sized (100+ employees) apparel screen printing operation. TSD's customers were large apparel retailers such as NIKE, GAP, etc. In business 30 years. Revenues \$5 million
- **Burlington Chemical Company:** A specialty chemical manufacturer (160 employees) supplying dyes and chemicals to the textile dyeing industry. In business 50 years. Revenues \$70 million
- **Reedy Fork Farm:** A family dairy farm (10 employees) supplying milk into the domestic commodity market. In business 50 years. Revenue \$1.5 million

In all three cases, the business environments were similar

- The market was shifting towards "lower costs" due to globalization.
- The firms could not exist in their current forms as their markets were destroyed.
- A long-time stable market condition was suddenly disrupted
- Without a new vision for each firm and a transition into a new network and markets, the firms were doomed.

• Each firm was a good citizen in every aspect and in sound financial shape prior to the disruption.

• The managers and owners were smart, continuous learners.

• Each firm had dedicated facilities and expert employees the period of 1991-1995, prior to the disruption

• Each of the firms was introduced to the concepts of sustainability



TS Designs www.tsdesigns.com

TS Designs had been working on a new "green" printing process prior to the NAFTA and GATT agreements: REHANCE.

This process provided a quality, technological and sustainable (green tech, clean tech) advantage and a springboard into a new community of customers.

It was determined that the customer base that would value such a process was the emerging "green" market segment (LOHAS). Rehance should also meet the emerging international standard for "organic" textile apparel.

This was the only incumbent R+D effort that could yield entry into a completely new customer base. Without the timely maturation of Rehance technology and the granting of patents in this area, the company would have little ability to differentiate and reinvent itself.



Reedy Fork Dairy Farm

Reedy Fork Dairy farm product, "MILK" was undifferentiated within the commodity market structure for dairy in the USA.

RFD was spending \$500,000 of its revenue each year on drugs, hormones and ag-chemicals for its 125 milking cows to increase productivity for a product whose selling price was in decline.

RFD owned almost 1000 acres of prime farm and pasture land.

RFD decided to join the organic dairy cooperative, which immediately differentiated its MILK (produced 30% more revenue per pound of milk)

The transition has increased the market value of the farm land by 20%, the cows by 33% and the milk by 30%. Chemical and drug costs were reduced by 66%



Burlington Chemical Company

BCC's strategy was to ride the textile industry down, cutting expenses and retaining cash flow, while developing the new market segments in green chemistry. In 1995 business was 90% textiles and by 2005 textiles still represented 50% of the business but total sales declined from \$70 to \$25 million.

BCC had the intellectual capital necessary to make the change and the balance sheet to leverage during transition as long as expenses were reduced in tandem. Similar to RFD, the shift for BCC was within the scope of the incumbent business and was catering to a higher value added segment of the market, but the market did not develop fast enough...

Burlington Chemical (BCC) had facilities to produce bio-based lubricants and green detergent additives. However, it took until 2005 for there to be two "green" cleaning product certifications available in the USA. Demand for green products were very slow to develop.



Summary

TS Designs cut its employees from 100 to 15 in 1997 and dedicated itself to this new market of organic T-shirts with its new process. It had no balance sheet to leverage and was forced to reduce costs rapidly. Its tag line became: "Printing T-Shirts for Good". Eric Henry, the president, now lectures extensively and is a major supplier of green T-Shirts for NGOs and sustainable enterprises globally.

Reedy Fork Dairy Farm became "certified organic" (2004-2007) and joined the Organic Valley CO-OP in 2006, as a three year transition period. The farm is also now a distributor for organic farming products and George Teague, the manager, is lecturing on the value of organic agriculture. Their rebranding is complete. Revenues per cow are up 30%.

BCC moved from 200+ employees to 39 over a 10 year period and was unable to enter into a viable market niche that was large and mature enough to maintain and support its expenses. The company was broken up into three segments and the final pieces were sold in 2007.

Appendix 1: Using Sustainability for Competitive Advantage

Strategy

- TSD creatively destroyed its incumbent business and recognized that it was futile to retain any vision or assets for the incumbent business. They did not have assets to leverage in a slow transition. The old had to be quickly destroyed for the new.
- RFD creatively destroyed its old business practices, rebranded and entered into a new emerging business community with a more sustainable and lower cost structure.
- BCC could not exit the incumbent textile business fast enough to destroy its overhead, nor could it find a new network that was as complex as its incumbent.

Results

- TSD, after five years of restructuring, is profitable, growing, and adding employees. The LOHAS niche is growing! TSD's reputation as a reliable supplier of organic T-Shirts is solid.
- RFD is entering its first year as a certified organic dairy after a three year transition. The farm is cash flow positive, but the southeast is in a severe drought and the herd may be sold due to the unavailability of organic feed and hay.
- BCC was broken up and sold. The shareholders received little return for 50 years of investment.

Lessons from the cases

- Radical transformation is a revolution. It cannot be administrated but can be intentionally managed. Timing is critical!
- Sustainability as a lens, i.e., Sustainable Value Model (SEA), becoming more valuable due to the rapid funnel effects.
- Large firms with very diversified portfolios of goods and services can "green" incumbent segments of the business while investing in entrepreneurial activities as R+D. Small firms cannot.

Lessons from the cases

- While there is great opportunity in globalization there is also much opportunity in reestablishing local markets. (BALLE) The global supply chain is fragile.
- Clean tech, Green tech, radical reconnection of local markets, BOP and LOHAS markets are all built on the value of sustainable networks.
- In two of the three cases (TSD and RFD), third party quality standards enabled the companies to rapidly qualify for entry into new business communities.
- Many emerging "sustainable" niches are currently small and will grow at their own pace. If one of these niches is to be part of an intentional creative destruction strategy, make sure the rate of incumbent leaves enough assets to weather the growth rate.

Conclusions

Population and consumption are first order factors in today's markets. Addressing population growth and consumption are important in becoming more sustainable. Ecological efficiency and social equity are second order factors. These four factors provide ample opportunity for entrepreneurship and sustainable business growth.

Any strategy for sustainable value creation will include decisions on what parts of an incumbent business must be destroyed to free capital for sustainable innovation.

The cases indicate that speed to action is critical in transformation, especially for SME.

The cases indicate that the networks that are the basis for sustainable ventures are likely to be more complex than the incumbent.

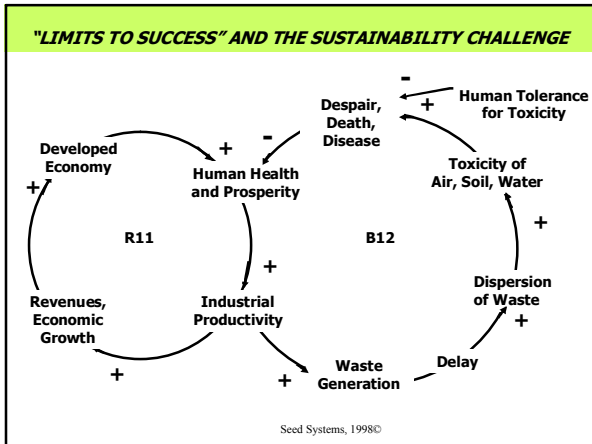
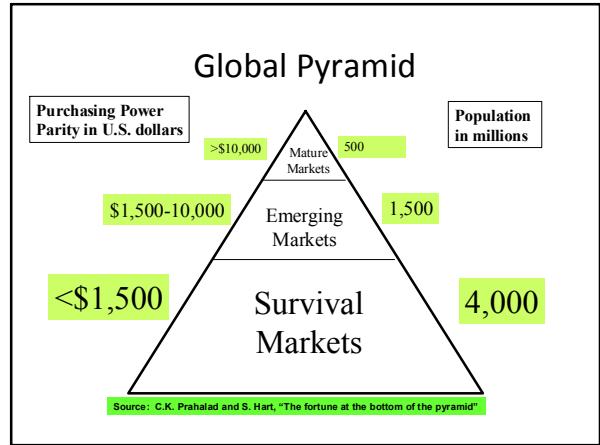
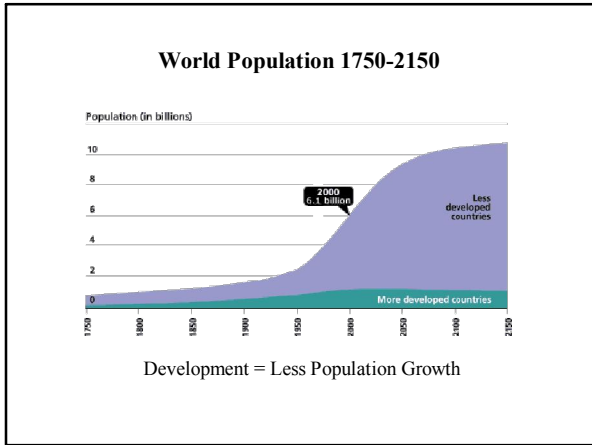
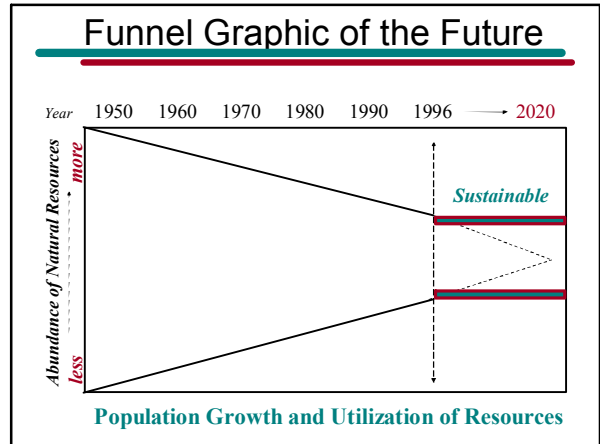
Appendix 2: Sustainable Enterprise and Disruptive Innovation

Appendix 2

Sustainable Enterprise and Disruptive Innovation

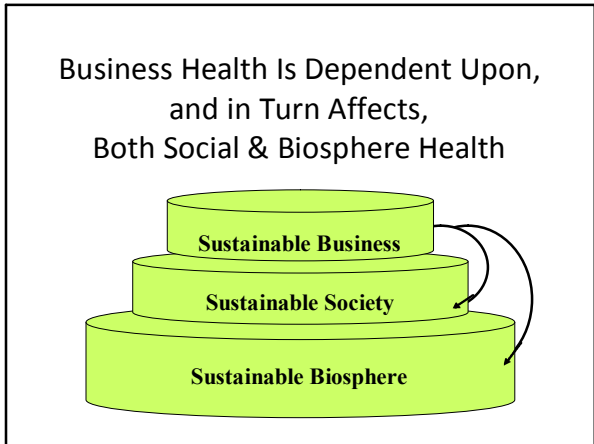
Overcoming Market Disruption Via Sustainability

...or how the textile and apparel industry might use the principles of sustainable enterprise to INCREASE business opportunities...



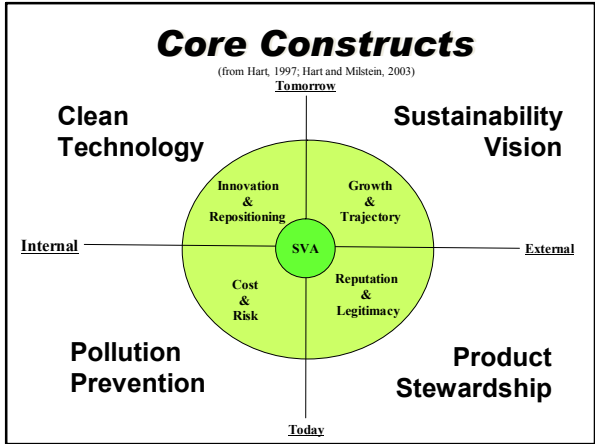
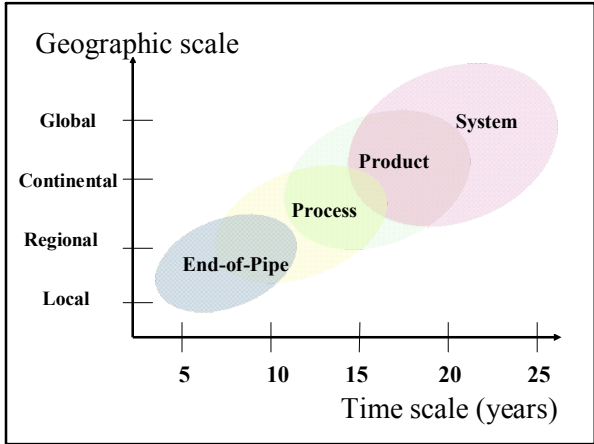
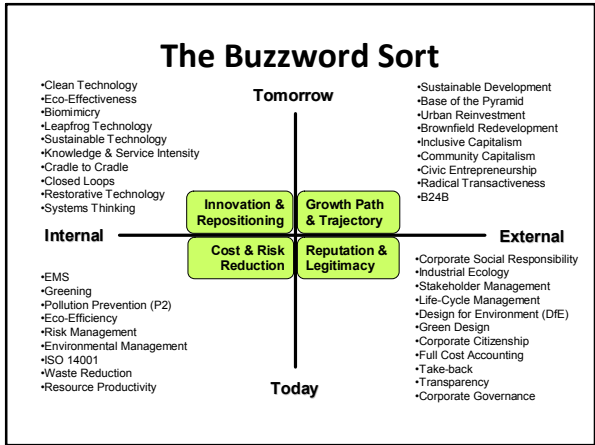
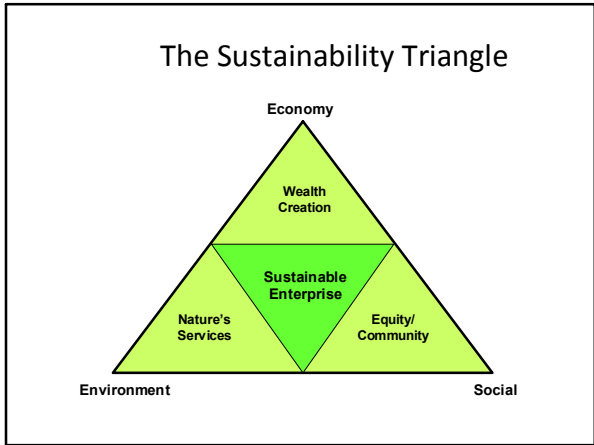
Business Defined:
 "There is only one valid definition of a business purpose: to create a customer. Markets are not created by God, nature or economic forces but by businessmen... Because it is its purpose to create a customer, any business enterprise has two—and only two—basic functions: marketing and innovation."
Peter Drucker, 1954

Appendix 2: Sustainable Enterprise and Disruptive Innovation

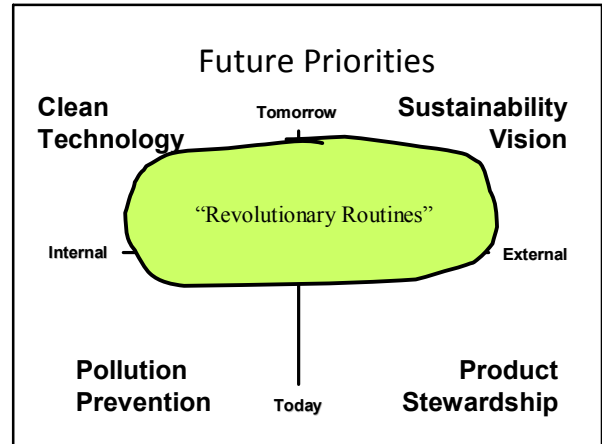
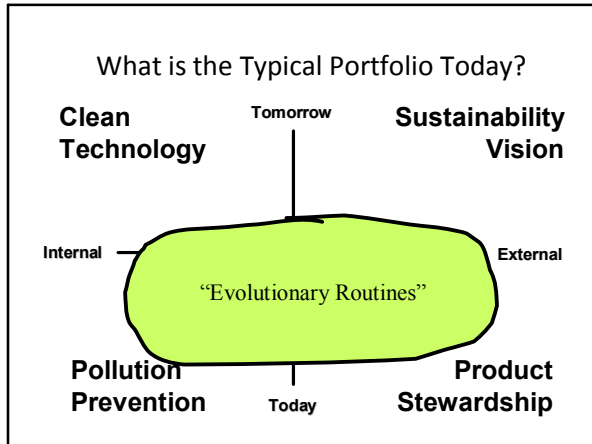


Business Redefined
Sustainable Development

Creating economic, ecological, and social prosperity while ensuring that future generations have the same opportunity.



Appendix 2: Sustainable Enterprise and Disruptive Innovation

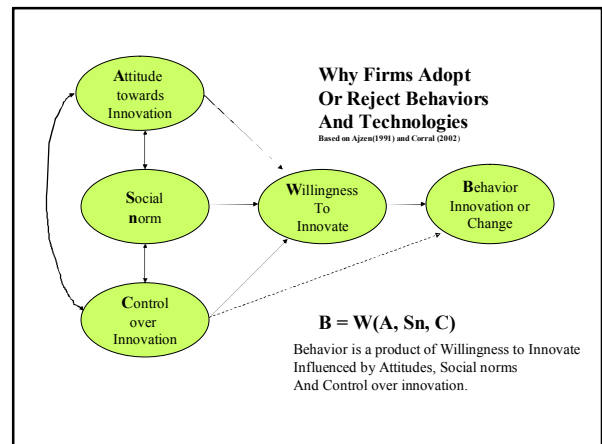


Continuous Improvement vs. Creative Destruction

<p><u>Strategies for Greening</u></p> <p>Focus on Existing:</p> <ul style="list-style-type: none"> products processes suppliers customers shareholders <p>Characteristics:</p> <ul style="list-style-type: none"> Incremental Continuous Improvement Rationalizes Industry <p style="text-align: center;">EVOLUTION</p>	<p><u>Strategies for Beyond Greening</u></p> <p>Focus on Emerging:</p> <ul style="list-style-type: none"> technologies markets partners customers stakeholders <p>Characteristics:</p> <ul style="list-style-type: none"> Discontinuous Creative Destruction Restructures Industry <p style="text-align: center;">REVOLUTION</p>
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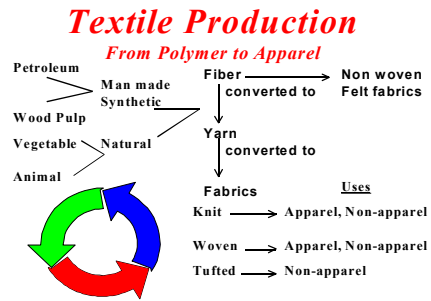
How do we get our organizations to change?

Research shows beyond a doubt that business will not change unless the change is aligned with the purpose of the business-profits!



Appendix 2: Sustainable Enterprise and Disruptive Innovation

One idea to increase apparel sales in the US using the ideas of Sustainable Enterprise.



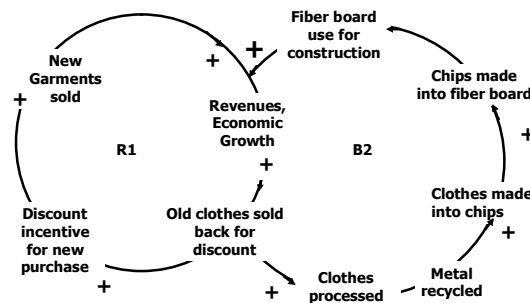
An Opportunity

- Over 1 billion pounds of used clothes exit the US each year.
- If we view “used clothes” as a raw material for a new process, i.e., fiber board laminate, and create valuable product, it becomes a disruptive technology.
- When the fabric become a valuable raw material, a new business cycle becomes possible.

Process for “Big Box”

- Each garment has a tag that can be redeemed for a 25% discount on new sales within 18 months.
- Old clothes redeemed in store.
- Clothes processed by business to remove and recycle metal.
- Clothes shredded and made into fiber board
- Clothes are removed from used clothes market, new sales are produced and a new product is produced.

Use Radical Recycling and Reuse to Increase Retail Turnover



Conclusions

- Sustainable development is necessary for continued economic growth
- The ideas of sustainable enterprise can be used to produce disruptive innovation even in commodity markets.
- Without the opportunity that comes from increased sales to the bottom of the pyramid, our economy will stagnate.

Appendix 3: The Rise of SMEs as a Result of a Schumpeterian Global Economy

APPENDIX 3: PowerPoint Presentation

The Rise of SMEs as a Result of a Schumpeterian Global Economy

...and the competitive advantages for SMEs as a result of focus on sustainable enterprise.

The “New” Economic Order

- Globalization has dramatically increased the number of smaller enterprises. (Acs, 2002)
- Information technology and technology in general has increased the efficiency and competitiveness of SMEs through networks. (Manring-Moore, 2004)
- The speed of information flow increases the rate of change. (Gates, 1997)
- Thus we are beginning to see a global “swarm” phenomena in markets. (Kelly, 2000)

R. A Fisher and then George A. Price developed biometric models defining the factors of biological ‘evolution’. This has been applied to economic systems as ‘evometrics’.

Price equation states:

Total Evolutionary Change = Selection effect + Innovation effect... or

Changes in Productivity = Variance in productivity + Innovation, Imitation, learning.

Price believes that a high rate of evolutionary change will occur when the number of firms is large, the variation in productivity between the firms is large, and the access to information (and the firm’s ability to utilize the information) is maximized.

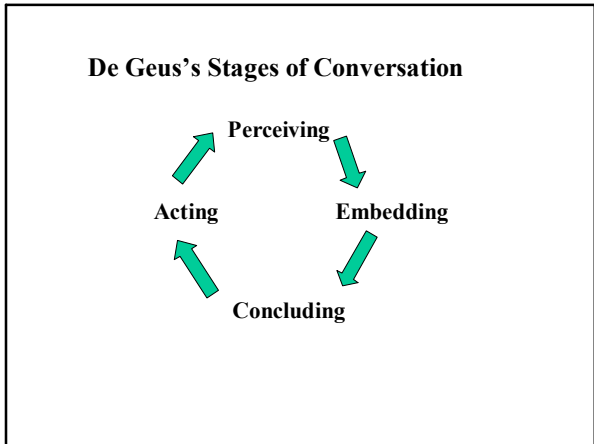
Selection Effects

- Natural selection is Darwin’s survival of the fittest. It means that discounting disruptive effects, the fit (most productive) get bigger.
- This also means that over time, if there were only selection effects, the variance in productivity within the whole population would diminish. (Monopoly)
- This is the principle of increased productivity via monopoly. A small group that co-operates increases in productivity.
- This may also explain the “Silicon Valley” effects by proximity or density.
- This is assimilation in the language of De Geus.

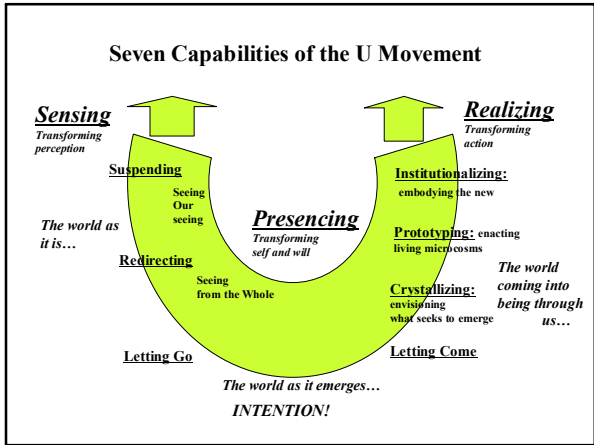
Innovation effect

- Innovation is advantage gained by learning. (remember the bird example in De Geus)
- Innovation is the “creative disruption” described by Schumpeter and advantage gained via accommodation to new paradigms (De Geus).
- As population and globalization increases, with rapid dissemination of knowledge, innovation and the speed of change becomes more important (disruptive) to selection effects based on efficiency of size.

Appendix 3: The Rise of SMEs as a Result of a Schumpeterian Global Economy



Presence: “A third type of seeing beyond external reality and beyond even seeing from within the living whole. It is seeing from within the source from which the future is emerging, peering back at the present from the future. It is *intention* that shifts from our past to a future that depends on us.”
(Senge, pg 90)

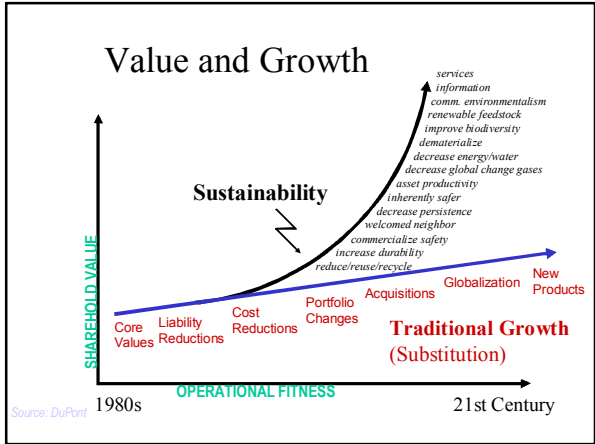


Past Ideas

- Large firms were the only ones that could “really” do productive R+D because of the expense and the dispersion effects in markets, i.e., R+D results have greater potential because larger firms have benefits that can be leveraged across market-share. Broader reach.
- Networked communications and supply chains have changed this.

Current Reality

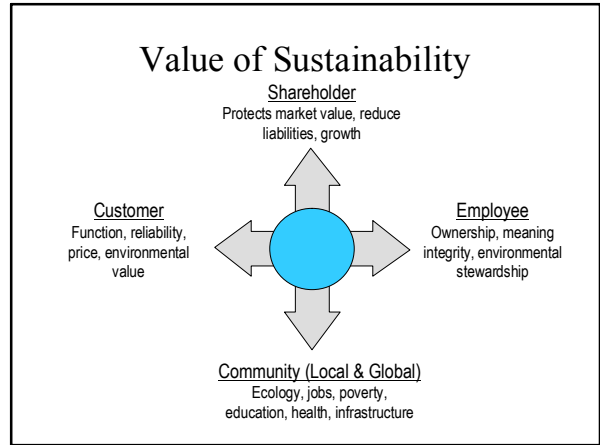
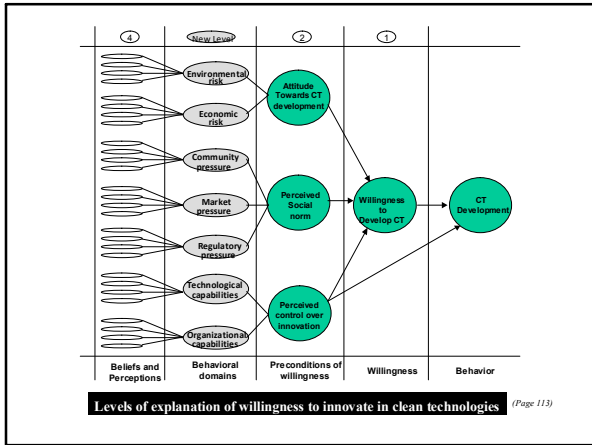
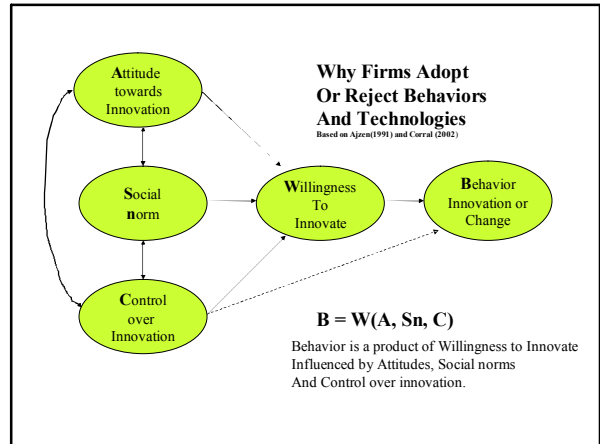
- The number of SME firms have increased dramatically since 1985 and continue to increase.
- As this population of SMEs increase with wide variations in technology and markets, the number of R+D ‘successes’ increase. (Batting average)
- With the formation of supply chain networks, dissemination of successes increase removing the advantage of the larger firms.
- The innovation variable becomes more and more important as the network efficiency grows.



Appendix 3: The Rise of SMEs as a Result of a Schumpeterian Global Economy

Innovation

- Innovation = Change
- Willingness to Change can be understood via the framework of Carlos Montalvo Corral (Ajzen).



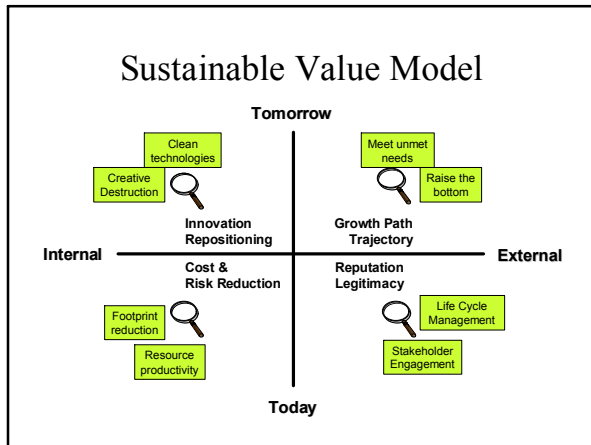
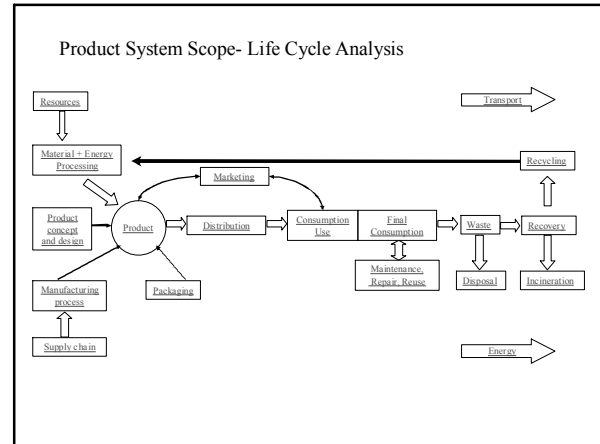
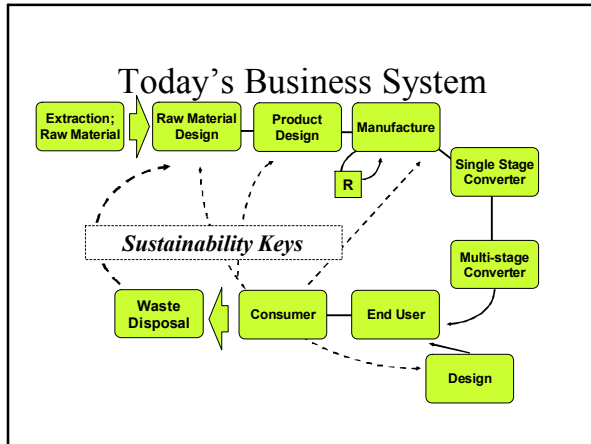
The Use of Sustainability as a Platform for Innovation

- When innovation is viewed through the lens of sustainability, providing tri-vector profitability (3-P), a large number of behavioral determinates are engaged.
- If only economic profitability is the single goal, less determinates are engaged.
- The more determinates that are engaged, the more likely there will be innovation.
- The higher the level of innovation the greater the rate of change, which continues to swing competitive advantage to SME's and perhaps producing stronger network collaborations between SMEs and MNC.

The Use of Sustainability as a Platform for Innovation

- Education of SMEs to the advantages of sustainable enterprise is a key to expanding the rate of innovation in SMEs.

Appendix 3: The Rise of SMEs as a Result of a Schumpeterian Global Economy



Conclusions

- There are two factors in the evolution of business, selection and innovation.
- If there was no innovation, the big would get bigger and there would be no controls on how much markets share one firm could get.
- Innovation is nurtured by lots of small companies (or markets) where there is a large gap in productivities (selection).
- If this theory in the evolution of markets is correct, innovation begins to play a more important role in enterprise, versus size, when large numbers of networks serve fragmented markets with ongoing waves of products and services driven by change.
- This is Schumpeterian economics or the economics of creative destruction.

Conclusions

- Globalization has produced an economy that has many Schumpeterian characteristics.
 - Many small firms with diverse levels of productivity.
- Automation has allowed the formation of networks of smaller firms.
- Networks are more efficient than larger firms.
- Because smaller firms live at the margins of the marketplace, they are in a position to innovate faster, better and cheaper.

Conclusions

- Intentional management which includes the triple bottom line increases long term productivity.
- It also increases the level of complexity while increasing efficiency.
- SMEs are fertile ground for innovation in sustainable enterprise, especially when networked with larger firms (BOP markets)
- SMEs who operate as sustainable enterprises will learn to change more efficiently than firms only focused on short term profits.



Systems thinking and green chemistry in the textile industry: concepts, technologies and benefits

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Received 7 January 2003; accepted 28 April 2003

Abstract

The textile industry led the world into the industrial revolution and is leading the movement towards global manufacturing. During the period of 1980–1995, the textile industry in the United States was flourishing. It was during these times, that increased regulatory pressures initiated aquatic toxicity testing of wastewater discharges from publicly owned treatment works. Resolution of problems identified by these tests required the development of new toxicity assessment tools, and the use of systems thinking and community/industry/regulator dialogues. The case for the beneficial use of these tools is presented as an example of how to increase productivity through greener (environmentally conservative) production induced by cooperative stakeholder actions.

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Keywords: Textile industry; Aquatic toxicity; Dyeing; Finishing; Systems thinking; Sustainable development; Globalization

1. Introduction

Since the 1995 passage of the North American Free Trade Agreements (NAFTA) and the increase of globalization, much of the United States textile industry has moved to other regions of the world. From 1996 to 2001, over 500,000 textile jobs have been eliminated from the USA, and 414 textile plants have closed. [1] The economic impacts on the textile producing regions have been great, as these communities try to adapt to the loss of their traditional industry. The losses include factories that performed the textile processes of dyeing and finishing i.e., wet processing of textiles. This has reduced the importance and the burden of textile wet processing wastewaters on public wastewater treatment systems in the USA. Consequently, environmental research on textile wastewater problems has also been declining dramatically.

The decline of *visibility* of the environmental impacts

of dyeing and finishing processes, due to the movement of this industrial segment from the developed world to less regulated regions should not lead to the assumption that these problems do not continue. It is important for textile producers, and the communities in which they operate to understand the aquatic toxicity problems associated with traditional textile wastewater. It is also essential to understand that solutions to many of these problems were found and developed as a result of regulatory pressures and industry conditions that existed in the US, Europe, and Japan prior to globalization.

This paper provides a general description of textile wet processes and the details of a cleaner production framework developed to reduce the aquatic toxicity and environmental effects of textile chemicals in the southeastern USA. Particular emphasis is placed on the situation in the State of North Carolina from 1980 to 1995. It offers evidence of how the application of the principles of dialogue and systems thinking provides a win-win situation for both the 'textile production chain' and corporate stakeholders. Throughout this paper, systems diagrams are used to describe the importance or usefulness of systems thinking towards the resolution of these problems.

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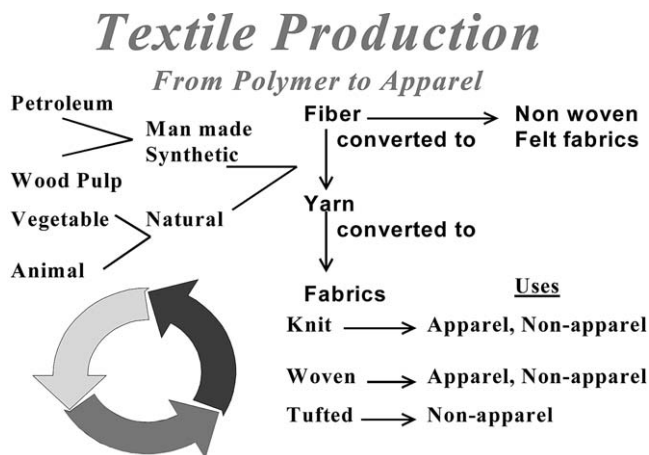


Fig. 1. Textile Production. Textile production is based on the conversion of polymers, natural or synthetic, first into fiber and then into bundles of fibers called yarn. Yarn is then converted into fabrics, a largely two-dimensional surface, where it is used for apparel, industrial, home furnishings and many other uses.

2. Textiles and the environment

Industrial development is one approach to increasing the quality of life in densely populated, less developed regions of the world. The potential benefits of development can be greater prosperity, followed by better health, and lower birth rates. However, many choose to disregard the darker side of industrial development: pollution caused by ignoring the principles of cleaner production.

The business of the textile industry is production of value-added products from fiber, often through intensive hand labor (Fig. 1). High labor costs in the USA have led to the transfer of the textile industry into the less industrially developed regions of the world, where less expensive labor and less stringent enforcement of environmental regulations results in lower production costs, at least in the short-term.

Fiber sources can be petroleum hydrocarbons (synthetic, non-renewable) or agricultural (natural, renewable). Fig. 2 lists many of the known textile fibers.

Natural	Synthetic
Cotton	Polyester
Flax	Polyamide
Silk	Rayon
	Acetate
	Acrylic

Fig. 2. Common Textile Fibers. These are the fibers that are utilized in textile production. The ‘natural’ fibers are derived from vegetable or animal sources and the ‘synthetics’ are man-made organic polymers, most from petroleum sources. The synthetic fibers are mostly named after the predominate chemistry of the polymer from which they are made.

“Textiles and their end products constitute the world’s second largest industry, ranking only below food products. At least 10% of the world’s productive energies are devoted to this activity and a huge segment of the global population earns its living and obtains its creative satisfaction from the same source” [2]. Industries including retail apparel marketing, construction, agriculture, machine tools, automobiles, petrochemical, carpet, and recreation all rely upon the textile manufacturing industry for raw materials.

Wet processing is the segment of the textile production that involves cleaning, bleaching, dyeing and finishing of textile fibers and yarns in aqueous solutions. Most fabrics, regardless of their end use, go through one or all of these wet-processing steps. There is a detailed description of the steps employed in traditional wet processing in Section 3. Wet processing is different from fiber forming and fabric forming systems, which are ‘dry’ processes that do not use water as a major processing compound.

Wet processing is an ancient craft that was automated during the industrial revolution. Modern dyeing and finishing facilities are highly mechanized and capable of producing millions of yards of fabrics per year. Despite over 100 years of process improvements, the preparation, dyeing, and finishing of textiles continues to utilize large volumes of pure, clean water.

Chemicals are added to perform a variety of functions during wet processing, however, these chemicals produce large volumes of toxic wastewater as a by-product. Textile process wastewater must be treated before it can be released safely into rivers, streams, and lakes. Therefore, the movement of the textile industry into largely under developed regions of the world with inadequate waste treatment presents the opportunity for large-scale negative environmental impact.

Because of the complexity of textile wastewater, waste treatment plant operators are faced with difficult challenges to produce clean, non-toxic effluents. They must treat and remove broad classes of wet processing wastes, including surfactants, dyes, pigments, resins, chelating agents, dispersing agents, inorganic salts, etc. Many of these chemicals are complex organic molecules with long commercial histories [3]. A listing of the dyes, pigments and chemicals used in textile wet processing can be found in the *Annual Buyers Guide*, published yearly by the American Association of Textile Chemists and Colorists. Over 1000 dyes and chemicals are listed in the Guide for the year 2001 [4].

A typical wet processing facility has a drainage system that transports wastewater from the wet processing facility (dye house) into a collection basin that equalizes pH and flow. The water flows from this collection (or equalization) basin to chemical and biological wastewater treatment facilities. There is little segregation of waste streams within the textile manufacturing oper-

ation; therefore, the wastewater contains intermingled chemicals from the preparation, dyeing, and finishing steps. The composition of the wastewater is not the same day-to-day or even hour-to-hour, for it is completely production-dependent. See Fig. 3 for a typical schematic.

The textile wastewater treated by North Carolina's publicly owned waste treatment plants, (POTWs) from 1980 to 1995 was a mixture of wastewater from both batch and continuous wet processing. Waste was present from all three textile wet processes: preparation, dyeing and finishing. Cotton was the single largest type of fiber processed by volume, but all fiber types were represented. The chemical composition of the wastewater was dependent on fiber and fabric type, dye types, and finishing materials used.

Current trends indicate that the US textile industry is moving into the Far East, South America and Africa. Lower labor costs in those regions are important in low cost textile production. These regions commonly lack extensive industrial wastewater treatment infrastructure.

3. A textile wet processing primer

Wet processing methods have not changed much since ancient times. Water is used to clean, dye and apply chemical finishes to fabrics, and to rinse the treated fibers or fabrics.

An explanation of the preparation, dyeing, finishing and rinsing steps follows:

Preparation is the step where unwanted impurities, either natural or man-made, are removed from the fabric prior to dyeing. The fabric may simply be cleaned with aqueous alkaline substances and detergent, or impurities may be removed with enzymes. Many fabrics are then bleached with hydrogen peroxide or chlorine-containing compounds to whiten them. Optical brightening agents

are often added if the fabrics are to be sold white rather than dyed.

Dyeing is the aqueous application of color, mostly with synthetic organic dyes, to fiber, yarn or fabric. In this process, dye and auxiliary processing chemicals are introduced to the textile to obtain a uniform depth of coloration with color fastness properties suitable to the end use. Different fastness requirements may apply depending on the intended end use of the textile. Examples might include swimsuits that must not bleed in water and automotive fabrics that should not fade following prolonged exposure to sunlight. Different types of dyes and chemical additives are used to obtain these properties.

Dyes can be applied to textiles by various forms of continuous pad applications, or exhaust dyed in batch processing equipment. Knit fabrics are dyed by exhaust techniques in batch equipment and woven fabrics are most often dyed continuously.

While there is renewed interest in rediscovering and improving vegetable-based dyeing of fabrics, vegetable dyes are not an important factor in the world's textile market. All essential classes of textile dyes are made from petroleum sources. In fact, textile dyes were the first important class of synthetic organic chemicals and were the prototypes of the modern industrial chemical complex.

Finishing involves application of chemical treatments to enhance the value of the fabric. Permanent press treatments, waterproofing, softening, antistatic protection, soil resistance, stain release, and microbial/fungal protection are all examples of fabric treatments applied in finishing.

Preparation, dyeing and finishing can all occur as either continuous or batch processes. In continuous processing, heat and steam are applied to long rolls of fabric through a series of concentrated chemical solutions. The fabric, in the dyeing and finishing steps, retains the majority of the chemicals while rinsing removes most of the preparation chemicals. Each time fabric is drawn through the solutions; an amount of water equivalent to the weight of the fabric must be used. See Fig. 4 for an example of a continuous dyeing range.

In batch processing, a 'batch' or roll of fabric, is processed in the presence of diluted chemicals in a closed machine such as a kier, kettle, beam, jet, or beck. See Fig. 5 for an example of a jet batch dye machine. Rather than being drawn through various baths through a long series of equipment segments, fabric stays on one piece of machinery, which is alternately filled with and drained of water at each step in the process. Each time the fabric is exposed to a separate bath, it uses five to ten times the fabric's weight in water. Batch processing a polyester/knit fabric uses a minimum of six machine

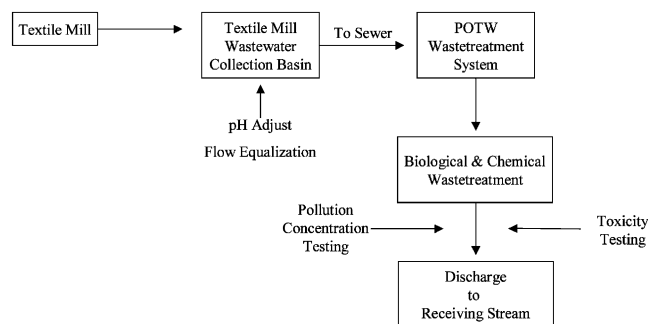


Fig. 3. A "typical" flow diagram through a Textile Mill. Wastewater is generated by the processes of dyeing and finishing, collected via a piped collection system to a basin, where it can be pretreated before discharging to a treatment system. Generally, testing of the wastewater for regulatory purposes is done after treatment and before discharging to the environment.

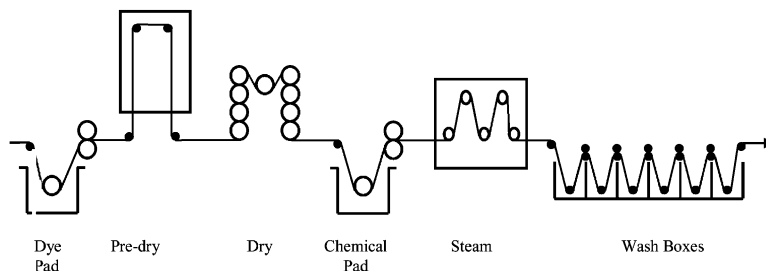


Fig. 4. Continuous Processing of Textile Fabrics. In continuous dyeing and finishing, the fabric is pulled through various processes or chemical treatments from the beginning, to the end. The fabric begins on a roll as un-dyed fabric and a roll of dyed fabric is the result. These production lines run 'continuously' as there is no starting and stopping of the process.

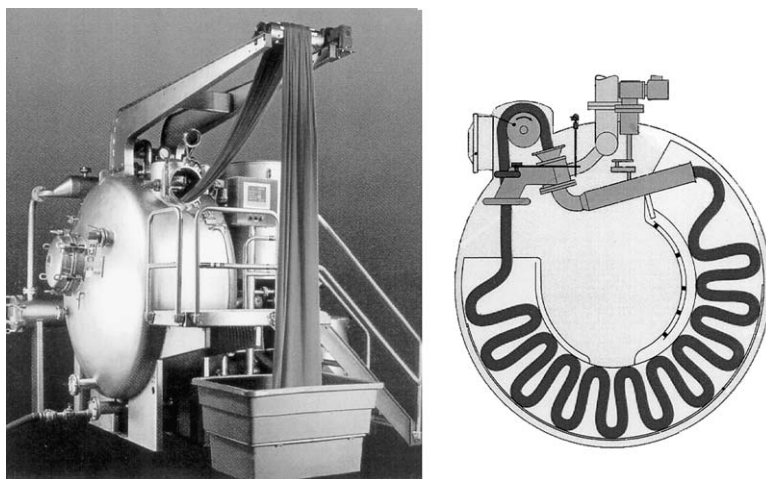


Fig. 5. Batch Processing Dyeing Machine. In batch processing, the undyed fabric is loaded into the dye machine, sewn together and a loop is created. The machine is then filled with water and various chemicals and the fabric loop is processed as a 'batch'. The dyeing process has a beginning and an end to the cycle.

loads of water for each of the following steps: preparation, rinses, dye, soap, rinse, and finish.

Wet processing of textiles, whether continuous or batch, produces large volumes of chemical-laden wastewater that became important sources of problems as regulators began to focus on industrial activity as a point source of pollutants.

4. Markets and environmental pressures stimulate change

The period of 1985–1995 was one of profitable growth and investment for US textile wet-processors [5]. See Fig. 6 for Gross Domestic Production information from 1987 to 2000. It was also a period of refinement and focus on the environmental effects of textile wastewaters by environmental regulatory authorities [6]. Regulatory actions in the United States that directly affected textile processing were driven by two stages of regulatory control. The earliest regulations dealt with reduction of 'conventional' pollutants and forced reductions of wastewater solids and loads of oxygen-demanding substances.

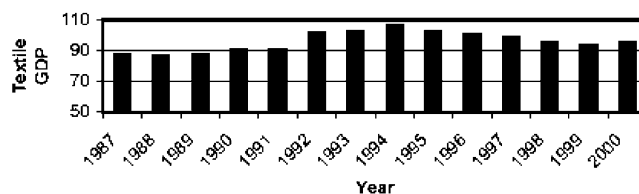


Fig. 6. Textiles, The GNP Contribution from 1987–2000. The North American Trade Agreements (NAFTA) and the formation of the WTO in 1994–1995 began the decline of the US textile market. Since 1995, over 400,000 textile jobs have been lost to globalization and over 60% of the US textile mills have closed.

The second stage, initiated by 1972 amendments to the Federal Water Pollution Control Act, focused on toxic substances. For the textile industry, specific regulatory controls on chlorine discharge (bleaches) and on whole effluent toxicity played particularly significant roles in treatment strategies. Further discussion of whole effluent toxicity measurements as a primary driver towards cleaner textile production can be found in Section 5.1.

This climate of mutual gain and the nature of WET testing produced novel solutions to the environmental problems created by wet processing operations. It

encouraged the development of new wet processing equipment that reduced the amount of water required to process fabrics, thereby reducing the volume of wastewater and production costs. Pollution control and management systems emerged from formalized quality control programs such as ISO 9000. Rather than applying the historical treatment-based approaches to wastewater, these new tools were designed to prevent environmental problems through pollution prevention and waste minimization, i.e., greener and more efficient production. The movement of regulations towards meaningful performance based standards, whole effluent toxicity, as opposed to less meaningful concentration limits demanded that the whole system of industrial production and efficient waste treatment be examined as a system, rather than as isolated unit processes [6–8].

In summary, increased regulatory pressures made older, inefficient textile processes and non-optimized chemical systems both less profitable and more susceptible to environmental enforcement [9]. It was this combination of a profitable business climate and increased regulatory pressures that created an atmosphere wherein environmental investments were encouraged, mandated, and seen as a good investment by a sound and profitable industry.

4.1. Whole effluent toxicity

The aquatic toxicity of effluents from textile-wet processes was a major focus of regional pollution reduction efforts by the United States Environmental Protection Agency (USEPA), especially in the southeastern US in the state of North Carolina.

North Carolina was one of the first states in the US to require whole effluent aquatic toxicity testing (WET) of all complex waste treatment systems discharging into its surface waters. A good explanation of the use and methods of aquatic toxicity testing can be found in a document published in 2001 by the North Carolina Division of Water Quality [10].

The initial results of this new WET testing indicated that on-site waste treatment plants handling significant volumes of textile wet process wastewater produced toxic effluents that were difficult to treat in municipal biological waste treatment plants. Initially, identification of the toxicants in these effluents was very complex, as was determining their source(s).

Predictably, when new regulations were implemented, many stakeholder disputes developed around WET issues. Some were technical arguments concerning the validity of the tests, but many were related to how to address the root causes of the toxicity. Resolution of these disputes required communities, textile companies, universities, and regulators to adopt new ways of viewing and negotiating resolutions. Good sources of information on the resolution of technical issues and conflicts

on WET can be found in the *Codification of the Federal Register*, [11] USEPA documents, [12] and Ausley et al., [13]. These approaches describe a process by which careful and deliberate investigation of the causes, as well as resolution of toxicity by the discharger are rewarded by short-term enforcement relief so that expenses can be applied to problem solving rather than punitive fines.

The disputes were based in arguments that considered nuances in the scientific relevance of WET methods and the validity of WET results versus concentration-based limits for permitting purposes. These issues were complex, but the scientific validity of WET methods was gradually proven by improvement in water quality. WET analyses, tests based on observed biological response, provided a more realistic prediction of toxicant availability than did conventional regulation of single chemical compounds. The question that was answered by the WET methods was: “What is the impact of this effluent on the life in this water body?” rather than “Was the concentration of a particular pollutant above or below a numerical limit?”.

In the mid 1980’s, whole effluent toxicity testing of NPDES (direct wastewater discharge) permittees in North Carolina indicated that 25% of facilities tested were discharging wastewater predicted acutely toxic at in-stream dilutions [14]. In 1987, North Carolina began placing whole effluent toxicity limits in NPDES discharge permits of all facilities with complex waste streams. Compliance with these limits, even using the more sensitive sub-lethal chronic endpoint of reproduction of *Ceriodaphnia dubia*, continued to improve over the next decade, to the point of current compliance rates that routinely exceed 95% of discharges tested (NC Division of Water Quality, unpublished data).

It is essential to understand the impetus for resolving the technical and regulatory disputes concerning WET methods. Resolution occurred because both the textile industry and the local environment were important to the community, and success or failure would impact each stakeholder. This is the central lesson that was learned. If any of the stakeholders had become disenfranchised with either the environmental compliance issues or the importance of a viable textile industry, the favorable result gained by the win-win consensus-based process would not have transpired [15]. Further insight into the regulatory climate can be found in Appendix A.

5. Systems thinking

During the period of 1980–1995, regulatory, marketing, and testing changes in textiles were concurrent with the development of the social disciplines of systems thinking and win-win consensus negotiation on environmental matters. Systems thinking is described by Senge [16] and applied to sustainable industrial development

by Laur and Schley [17]. By systems thinking, Senge means a discipline for seeing the ‘structures’ that underlie complex situations and discerning high from low leverage change. Systems Thinking is the shifting of a mindset from seeing parts to seeing wholes, from seeing people as helpless reactors to seeing them as active participants in shaping their reality. This was a particularly effective approach to solving aquatic toxicity problems because there was very little data to indicate a linear relationship between removal of traditional pollutants and reduction in aquatic toxicity.

The ‘Limits to Success’ systems diagram depicted in Fig. 8 are derived from the work of Senge, Laur, Schley, and Kim [16–18]. They describe the system mechanisms proposed for more sustainable development. A complete description of systems diagramming can be found in Senge’s and Kim’s work [16,18] but in brief, its purpose is to illustrate non-linear relationships in complex systems. It is clear from Fig. 8 that reduction of the volume and toxicity of textile wastes reduces the impact of pollution, which, in turn, enhances the benefits of industrial activity to a community or society [17].

Whole effluent toxicity testing measured the impact of treated wastewater on the biota of a receiving body of water, not a subjective concentration of a single pollutant. Thus, a direct correlation between the pollutant concentration and stream health was not possible. Aquatic toxicity was found to be a problem that was a sum of the effects of all the pollutants in a waste stream. This understanding promoted the application of systems thinking to the industrial processes that created the problem, rather than an end of pipe engineering solution, because the removal of one or two pollutants may not reduce the toxicity.

Susskind and Ury also describe consensual, dialogue-based, approaches to negotiating environmental disputes. These ideas also adapted and included the principals of systems thinking [15,19,20]. Such consensual problem solving approaches are characterized by envisioning favorable future outcomes that benefit all the stakeholders in a given situation. If stakeholders are identified and their interests pooled into a resolution for a given dispute, the outcome is more satisfactory for everyone involved.

This combination of a dialogue-based approach to problem solving and systems thinking applied to the problems of toxicity reduction helped both textile manufacturers and their stakeholders make improvements in the following ways.

- Greater stakeholder involvement including communities, non-governmental organizations (NGOs), regulators, and industries. All were involved in resolution of environmental problems so that the ‘whole picture’ was clear to every stakeholder.
- This created resolutions to disputes that were win-

win, with every stakeholder making some progress toward their objectives.

- Non-systematic, knee jerk reactions to problems were minimized, allowing high leverage changes in process and systems to be made.

6. Process consultation

Some important new organizational tools resulted from this process of resolving the aquatic toxicity issues:

- The development of a formalized, dialogue-based communication process that involved members of local communities, regulators at the local, state and federal levels, textile company leaders, and their suppliers.
- The application of the principals of systems thinking to analyze issues and clarify areas of dispute and of agreement. These included finding areas of common purpose, understanding, and enlightened common and self-interest, which are fundamental parts of systems thinking.
- The development by toxicologists and process engineers of standardized, reliable, and inexpensive testing and evaluation protocols for textile chemicals. This allowed environmental decisions to be made as part of the purchasing process by textile managers and their chemical suppliers.
- The development and application of environmental impact evaluation methods and standard nomenclature to allow textile mill operators to include environmental impact in their process development and chemical purchasing decisions. Prior to these developments, cost and mill performance were the only determining factors in purchasing decisions.

The first two items were related to a management framework called ‘process consultation’ [21], as opposed to scientific, regulatory or technical issues. Using dialogue as a process consultation tool, together with the establishment and utilization of an environmental testing protocol focused on toxicity reduction, fundamentally changed the stakeholders’ ability to address wastewater non-compliance situations. These tools identified that the best opportunity to reduce aquatic toxicity was by optimizing manufacturing processes and chemical usage. This was in contrast to the older belief that inadequate waste treatment was the primary key to improving water quality from textile operations, and that this was an engineering problem that was out of industries control.

This significant change in the process of solving a non-linear problem such as the cause and effect of aquatic toxicity of treated wastewaters, focused on pollution prevention and industrial ecology, rather than on engineering additional treatment. It also created an

atmosphere of communication and openness that resulted in more effective testing and management of textile chemical usage and selection. This, in turn, resulted in the reduced toxicity of the waste streams from wet processing operations and concurrent increases in textile plant production efficiency.

Fewer chemicals were used per unit of fabric produced. Lower-impact textile chemicals were found by testing. It was found that very cost effective savings could be obtained from optimization within the textile mill.

The stakeholders realized the following additional benefits of the process:

- Industry discovered cost savings from process optimizations within the textile factory. In 10 cases from 1980 to 1995, there was a 20% or more reduction in process chemical usage resulting from the toxicity reduction process.
- Communities received more effective wastewater treatment. Toxic chemicals that were previously discharged by the textile firms were adversely affecting the biological efficiency of the wastewater treatment systems. Improved treatment resulting from toxicity control through use optimization meant that toxic textile wastewater was either being eliminated, or at the very least, discharged in greatly reduced quantities.
- Better communications and alignment among industry, members of local communities and regulators towards mutually acceptable objectives built stronger inter-relationships. Success bred better communications.

7. Measuring the environmental impacts of Textile Auxiliaries (TA)

Due to their complexity and the variety of compounds in use, textile auxiliaries, (TA's) are an interesting subset of the broader category of industrial. Because TA's, as well as many other industrial chemicals, are sold, commercially, in a wide range of solution concentrations and components, one of the first steps in developing a toxicity screening protocol was to establish exactly what was being measured. In order to do this, two basic characteristics of TA's had to be determined.

- The TA must be either water-soluble or water-dispersible.
- The concentration of water in the TA must be known in order to determine the relative effects of the active ingredients (actives).

'Active ingredient' is defined as any component found in the TA aside from water. Therefore, a simple water determination could be performed on the product, where

by the percent activity was defined as the percentage, by weight, of the mixture that was made up by the compound.

Measurements of the environmental properties of the TA could be made once it was established that the TA was either water-soluble or water-dispersible, and the activity was determined. All environmental assessments were made solely based on the weight-percentage of active substances in the product, thus eliminating concentration as a variable. This allowed all TAs to be compared equally and independently of the concentration of active ingredients in the commercial product.

Standard testing protocols for determining the environmental properties of chemicals were available from the Organization for Economic Cooperation and Development (OECD) [22]. Three screening tests were chosen to be included in the model for textile chemicals. These tests determined:

- The impact of a TA on waste treatment plant biomass (ASRIT); (OECD 209).
- The rate of biodegradation; (OECD 301D).
- The acute aquatic toxicity. (OECD 202).

These tests were chosen because no elaborate laboratory equipment was required for analysis, and because they were inexpensive compared to more sophisticated testing methods.

The test results were used to develop a composite score based upon the interrelationship of these values to the aquatic toxicity of treated wastewater. These interrelationships were found to be significant to the operation of biological treatment plants and the aquatic toxicity of the effluents from these plants. As a result, the composite score for the active ingredients of any product could be compared with the composite scores of other chemicals to ascertain its relative impacts.

7.1. Analysis of the test data and development of a graphical reporting method

After conducting the individual tests on the active ingredients of a TA, a Composite Score for the tested product is determined based upon the interrelationship of the values found by the tests.

The formula used to calculate the Composite Score is based on a curve-fitting technique derived from empirical data developed in Toxicity Reduction Evaluations (TRE) over a 5-year period by Burlington Research, Inc. (BRI), a contract laboratory and consulting firm located in Burlington, NC. BRI obtained a US Patent for the software and the interrelationships between the test results [23].

The broad assumptions used in development of the algorithm were the ranking or weighting of the factors found most important in post-biological treatment

aquatic toxicity. These are biodegradation rate, followed by the ASRIT value and finally, aquatic toxicity. The significance of these determined values, Biodegradation rate, ASRIT and aquatic toxicity was to provide standardized information that encompassed over the entire universe of TA's.

$$\text{Composite Score} = \text{ASRIT Score} + \text{LC50 Score} + \text{Biodeg Score}$$

$$\text{ASRIT Score} = ((2.6) (\text{ASRIT Value}^{0.4}) - 1)$$

$$\text{LC50 Score} = ((4.5) (\text{LC50 Value}^{0.5}) - (0.05) (\text{LC50 Value}))$$

$$\text{Biodeg Score} = ((3)(\text{Biodeg Value}^{0.775}) - 2)$$

Empirical data based on extensive observations revealed that when TA's rapidly biodegraded, they had little toxic impact on the biomass and were fully treated in the POTW. This meant that the compound did not enter the environment, thus, the risk of toxicity was low. When biodegradation rates were slower, both ASRIT and the aquatic toxicity of the untreated compound became more important, as the opportunity for discharge of intact product increased. The worst case was poor biodegradability of compounds with biomass and daphnid (*Crustacea:Cladocera:Daphnidae*) toxicity. It was almost certain that products with poor ratings would negatively impact the POTW effluent toxicity (Table 1).

One of the great advantages of these biological activity measurement methods is that they allow for the assessment of the effects of degradation by-products as well as parent compounds. In cases where degradation products display greater toxicity than parents (e.g., branched chain alkyl phenol ethoxylate surfactants), chemical measurements alone tend to under-predict the biological effects of treated chemicals, assuming that treatment detoxifies the parent product.

An example of how the process is utilized in the textile dye house is found in the following example of two nylon-dyeing additives, Agent A and Agent B.

The manager of the dye house evaluated each product in production and found that each was equally capable of meeting the plant's performance expectations. The

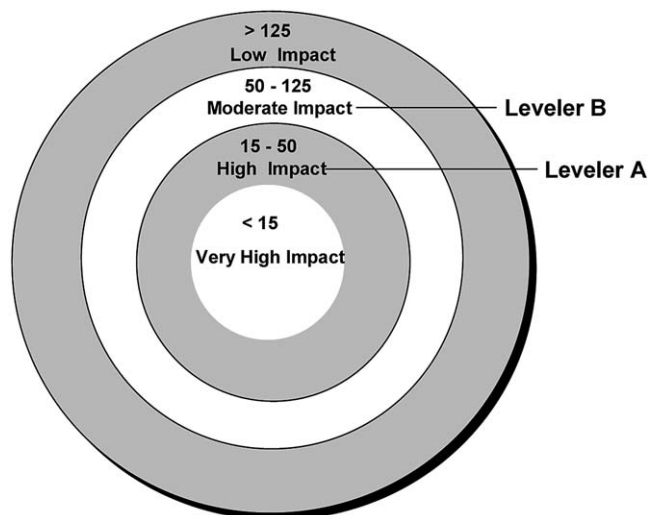


Fig. 7. Toxicity Target Graphic. This computer graphic is generated to compare the environmental performance between textile chemicals per US Patent 5,827,679. The values from Table 1 are utilized per the algorithms developed by Burlington Research Inc., and a toxicity score is calculated. This graphic enabled dye house managers to interpret complex toxicological results to less aquatic toxicity impacts.

products were used at equal concentrations in the dyeing process, and each was 40% active. Both were highly water-soluble.

- Dye Leveling Agent A was tested and found to have an ASRIT value of 34 mg/l, a daphnid LC50 of 1.0 mg/l, and a Biodegradability of 20% in 28 days. This would produce a toxicity targeting Score for Dye Leveling Agent A of '47' when calculated by the model described.
- Dye Leveling Agent B was tested and found to have an ASRIT value of >1000 mg/l, a daphnid LC50 of 62 mg/l, and a Biodegradability of 7% in 28 days. This would produce a toxicity targeting Score for Dye Leveling Agent B of '109' when calculated by this model.

The results are shown graphically as a 'Toxicity Target'. This target graphic is a simple representation of the relative response to the three OECD tests, related by the

Table 1

Test values and representative scores. These were used in the aquatic toxicity impact model, per US Patent 5,827,679, developed by Burlington Research Inc to calculate Toxicity Targeting Values. The production of the scores enables calculation of a single numeric value, which can be used to produce a toxicity target graphic such as in Fig. 7

ASRIT EC 50	Score	Daphnid LC50	Score	Biodegradability	Score
1–10 mg/l	1	<0.1 mg/l	1	<20% in 28 days	1
11–250 mg/l	5	0.1–1.0 mg/l	5	20–35% in 28 days	5
251–500 mg/l	10	1.1–10.0 mg/l	10	36–50% in 28 days	10
501–1000 mg/l	20	>10.0 mg/l	20	>51% in 28 days	20
>1000 mg/l	50	>100 mg/l	50	>60% in 28 days	50

model described (Fig. 7). This was developed to facilitate graphical comparison of zones of environmental impact, ranging from very high impact to low impact, with each zone comprising a range of composite scores. For example, the zones may be graphically represented as a circular graph with a zone indicating very high impact at the center of the graph, annular zones progressing away from the center, which indicate diminishing impact scores; the outermost zone representing lowest impact. The comparative scores, for diverse chemicals, can be positioned on the graph to visually illustrate their relative environmental impact.

8. The importance of this tool in helping to solve aquatic toxicity problems due to wet processing

Textile dye house managers are not toxicologists or wastewater engineers. The toxicity-targeting tool used standard screening tests and produced a toxicity target graphic that communicated the relative impacts of any TA. It did not require highly skilled scientists to understand the data. As a basis for documenting the available choices in TA environmental performance, it worked very well. Existing products could be tested and new products compared for performance in the textile mill and in the environment. The goal was always to move towards better mill efficiency, coupled with lower environmental impact. This tool allowed all stakeholders to understand the desired results of toxicological testing without having to be toxicologists.

9. The applications of ‘systems thinking’ and group dynamics in resolving environmental issues between the community and the textile industry

In the early 1800’s, the textile industry in the United States began in New England and led all other industries into the industrial revolution, producing wool fabrics along the numerous streams and rivers that supplied the power for production machinery.

After the US Civil War, the textile industry was moved into the southern US, benefiting from the cheap labor and proximity to the cotton fields. This was part of the reason for the infiltration of northern businessmen who exploited the newly freed slaves, as well as the depressed economic conditions that existed in the South after the Civil War.

Towns sprang up around textile operations all over the South. In fact, North Carolina towns such as Haw River and Kannapolis existed entirely due to their proximity to water for power and processing. These towns were home to the Cone Mills and Fieldcrest-Cannon corporations. In many cases, several generations of families

worked at the same textile enterprise and lived in the same town or community.

The historical link between the textile enterprises and the communities in which they operated was an important one. It established a community bond among the stakeholders. The NC Division of Water Quality (NCDWQ), the state water quality authority, was also a part of the community, due not only to its role as regulator, but also because the state provided funding for water and other community services. These stakeholders were joined together by community infrastructures such as water and sewer services, as well as job creation, property tax base, etc. The fates of the towns and the companies were intertwined. What was good or bad for one affected the other in a similar fashion. A list of common stakeholders in the debate on wet processing effluent toxicity and their ranked interests is shown in Table 2.

The common objective of all stakeholders was to comply with regulations and to do so at the lowest possible cost in order to ensure growth, or at least sustainable health, for the community and the industry. It could also be assumed that if regulatory limits were successfully met, a cleaner environment would lead to increased recreation and commerce in area rivers, streams and lakes.

Prior to the adoption of WET testing in regulatory strategies, when compliance issues were based entirely on pollutant concentrations, the common response to violations was to identify the industry that discharged the pollutant to the POTW and have the municipality develop a treatment strategy. There were clear lines of responsibility. Either the industry would have to absorb the cost of building a pretreatment facility, or the community would have to pay for an increase in the size, design or efficiency of the POTW. Historically, the treatment technologies to remove common, domestically generated pollutants were well known, but the treatment

Table 2

Textile Industry Stakeholders and Motivations. As a number of Toxicity Reduction (TRE) projects were completed, the similarities in stakeholders and their motivations became apparent. Development of the dialogue process to enable expression, validation and alignment of motivations for all stakeholders was an important step in achievement of the TRE goals

Stakeholders	Primary motivations
Local water authorities operating POTW	Compliance and costs
North Carolina Division of water quality	Compliance, improve water quality
USEPA	Compliance, improve water quality
Discharging industry	Compliance and costs
Supplier to discharging industry	Increase sales and profits
NGO	Improve water quality
Citizens	Retain industry and jobs, improve water quality

of industrial pollutants, especially textile waste, was considered an engineering specialty.

Toxicity compliance however, was rarely straightforward. Industrial wastewater pretreatment programs or enhanced POTW treatment did not always remove or reduce toxicity. The toxicants were not easily identified nor was it obvious how to modify conventional treatment facilities or processes to achieve a non-toxic effluent. In many cases, reducing toxicity using these enhanced or tertiary waste treatment methods proved very costly to the POTWs because most were designed to treat simple domestic wastes, not toxic industrial ones.

Therefore, once it could be reasonably presumed that effluent toxicity was due to industrial wastes, the burden was placed on industry to prevent these problems. It became the obligation of industry to demonstrate that their process wastes were treatable to a non-toxic state in the effluent receiving stream of the existing POTW. For the first time, industry was responsible to the municipality for the aggregate effect ‘toxicity’ of the waste it discharged for treatment, in addition to the effects of specific pollutants. This motivating factor provided the logical economic incentives for evaluating the environmental effects of textile chemicals based on their biodegradability rate and aquatic toxicity. This process provided a new approach for choosing which textile chemicals should be used, and what actions could be taken to improve effectiveness through pollution prevention (Fig. 8).

Consultants found that when a POTW was in significant violation of its aquatic toxicity permit limits, the State regulatory authorities would issue a non-compliance notice. This notice instructed the community wastewater authority that operated the POTW to develop a plan to identify and remove the toxicity. The POTW would then hire a consulting firm to conduct the Toxicity Identification Evaluation (TIE) and Toxicity Reduction Evaluation (TRE) [24–26]. These were processes to identify the toxicants and their source(s) and to eliminate

the toxicant(s) via process optimization, treatment, and/or pollution.

As the aquatic toxicity experts in the TRE process, the consultant’s role was to conduct the technical portion of the Toxicity Identification Evaluation, TIE. This required sample effluent collection as well as chemical and biological analysis of the various samples. BRI also acted as the lead facilitator during the entire toxicity elimination process. Because these TREs could be expensive to the community, costing as much as \$100,000 USD per year, many functions of the TRE such as stakeholder education and conduct of the TIE occurred simultaneously.

The consultant was firmly committed to the ideals of greener production and industrial ecology in the resolution of toxicity problems for a community’s industries. The firm’s management believed that the root cause of the toxicity was industry’s uninformed choices of industrial chemicals and inefficient industrial processes. In most cases, communities had many different industries besides textile manufacturing however, the textile-wet processor traditionally was the highest volume industrial process water discharger. This is why so much focus was placed on understanding textile processes and chemical systems.

The consulting leadership believed that no additional treatment option should be considered until all waste minimization and pollution prevention options had been exhausted, unless there were known engineering-related problems at the POTW. If there were POTW engineering issues, these were resolved either before or during the toxicity reduction program. This approach was in contrast to the thinking of earlier times, when all pollution questions were answered with the construction of larger wastewater treatment facilities.

Once the State and the consultant found a toxicity problem, they would set the TRE process into motion. The first step was to work with the regulatory authority (NCDWQ) to develop relief mechanisms (consent orders) prescribed by regulation that would allow expenses to be placed in problem resolution rather than penalties. The next step was to educate all local stakeholders on what could be causing the toxicity, and to listen very carefully to the input from all the stakeholders involved. More than once, practical observations from an industry or community member allowed the problems to be readily reduced. After listening, the consultant would explain the role of each stakeholder in the process and, in particular, counsel the industrial leaders on what their company’s role might be. Industry was informed what information they would be required to gather concerning the amounts and types of chemicals discharged. In this process it was vital for there to be effective discussions among the regulators, community representatives, industrial members, and the water authority personnel. The consultant’s crucial role was to make sure

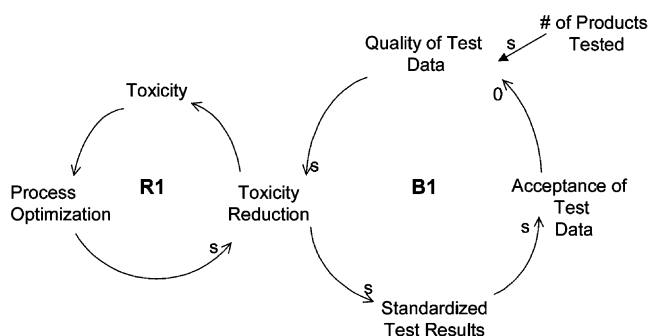


Fig. 8. Limits to Success for Toxicity Reduction by Product Substitution. Toxicity reduction requires high quality and accepted test data. Without high quality data, such as that supplied by the chemical evaluation methods, the toxicity reduction process would be severely limited. This figure shows this as a systems archetype [16].

that all stakeholders understood the obligations and responsibilities for every other stakeholder in the process. If the regulatory authority would not agree to reasonable investigative processes, punitive fines or other unreasonable enforcement actions could in fact hinder the productive process of toxicity reduction. In areas where regulators are not familiar with ecotoxicity control and reduction, significant effort should be made to educate them near the beginning of the process.

The consultant's approach was to conduct an open, transparent dialogue with all interested stakeholders in an effort to avoid common systems-archetypal problems [18]. It was the company president's opinion that previous efforts to produce compliance via waste reduction and greener production had failed because wastewater engineers had previously been the lead facilitators in resolving environmental non-compliance, and an engineer's main source of income is designing and building wastewater facilities. Consultants had no incentive other than to resolve the toxicity problem as rapidly as possible (Fig. 9).

To avoid stakeholder disputes within this process, it was very important for everyone to understand that toxicity characterization and control processes might not be simple, quick or inexpensive. It was also very important for all stakeholders to realize that if this dialogue-based process failed, regulatory enforcement actions would follow due to lack of action. The agreed-upon TRE project deadlines had to be met. Irresponsible behavior or inaction on any stakeholder's part would endanger the low-cost solution to the toxicity problem. The following questions were evaluated as possible limits within every Toxicity Reduction Evaluation:

- Are all stakeholders clear on the costs associated with solving this problem with waste minimization techniques versus building additional treatment capacity?

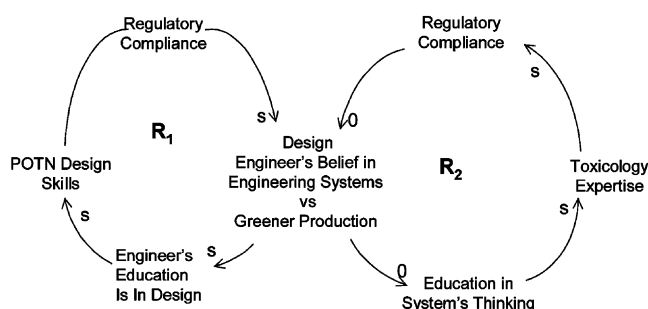


Fig. 9. Engineer Sees Non Compliance as an Opportunity to Build—Not Change Regulatory Compliance. The root motivation for engineers is to solve problems utilizing their engineering expertise. To achieve the goal of regulatory compliance, both engineering skills and education on greener and cleaner production was necessary. If engineers were in control of projects, loop R1 would grow larger as R2 shrinks relatively. Engineering alone could not solve toxicity problems as readily as the combination of greener production and engineering combined.

- Is it possible that after all waste minimization and process optimization efforts have been implemented that enhanced treatment will still be necessary?
- Is it clear to the leaders of all industries discharging to the POTW that each is responsible for producing an effluent that can be demonstrated to be treatable to a non toxic form by the existing POTW?
- Is it clear to the community that if all industries demonstrate that, their effluents are treatable and non-toxic, or if the current POTW is not operating correctly or is not sufficient, the community is then responsible for the cure?
- Does every stakeholder in the community desire the same outcome: acceptably clean water at the lowest possible cost? Is there a possibility that organizational and personal agendas could produce a 'Tragedy of the Commons' [17]?

It was imperative for an external consulting engineer to audit the POTW to determine that it was operating correctly, and that its operations did not change significantly during the TRE.

In summary, the process consultant, had to earn credibility from each stakeholder. The stakeholders had to believe not only that the consultant had the ability to determine the source of the toxicity, but also to reduce it. This credibility was achieved by using USEPA and OECD-approved test methods and procedures, coupled with absolute honesty and clarity about the test results. There were, of course, disputes of findings that required repeated demonstration of trends, but ambiguities were eliminated at every possible step to diminish any distractions from the goal: toxicity elimination in the most cost-effective and rapid fashion.

The consultant assisted each industry found to be contributing toxicity, by using the toxicity-targeting model to work with their suppliers to substitute greener alternatives. The goal was to reduce or remove the source of the toxicity without adversely affecting the profitability of the operation. In many cases, the scrutiny of process chemicals also allowed for optimization of the process itself. In almost every case, this chemical optimization procedure saved the company money. Thus, the TRE process paid for itself many times in savings to industries and to the communities. Fig. 10 shows a typical flow chart of the dialogue process.

To ensure full disclosure and cooperation with all stakeholders, it was made clear from the beginning that no industry would be publicly disclosed as the culprit unless progress was not being made in the project. This led all stakeholders to view the problem as an issue for the entire community, rather than an industry-versus-community issue. Care was taken to ensure that press information from these meetings remained positive as long as progress was being made. It was the job of the consultant to make sure that all of the stakeholders were

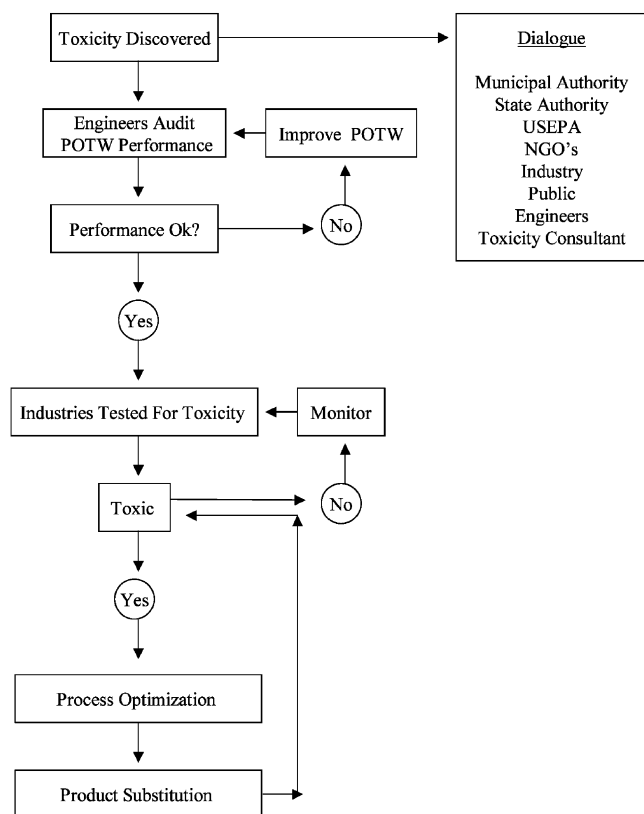


Fig. 10. Inclusive Process for Aquatic Toxicity Resolution. This flowchart depicts the methodology that was found most successful in multiple stakeholder toxicity reduction projects that involved the textile industry. This flow chart was used a great deal to benchmark progress and to document areas of concern within a diverse group of stakeholders working on the projects. The ability to flowchart the process and document it, made the dialogue based toxicity reduction process acceptable to legal and regulatory authorities. Without a standard template of the process, it was easy to be sidetracked by the diverse goals of multiple stakeholder groups.

seen in the press as leaders and forward thinkers, looking out for the welfare of the entire community.

10. The results of systems thinking, consensual dialogue and the greener production approach to reduction of aquatic toxicity for textile wet processors and their communities

In every case examined from 1985 to 1995, this dialogue-based, systematic approach to the TIE/TRE process produced positive results. The process made it clear to all that diverse stakeholders could communicate and cooperate in a highly regulated, technical environment. It demonstrated that there could be measurable improvement in aquatic toxicity and POTW treatment efficiency, driven by the goal of increased industrial productivity and reduction of aquatic toxicity by industry. This kept the stakeholders out of costly litigation while improving environmental quality.

As consultants, the textile industry, regulators, and communities gained experience in understanding how the chemistry of TAs affected their environmental performance, this information could be used earlier in subsequent TRE projects. A general knowledge base was developed on surfactant chemistries, biocides, cationic polymers, and inorganic salts. This information was integrated into the initial stages of projects, so that the time frame and the costs associated with the TREs declined.

The NC Division of Pollution Prevention and Environmental Assistance (NCDPPEA) helped manage this information. This group acted as a clearinghouse for information and provided additional consultants to aid industry and municipal governments to forward the pollution prevention process.

Even though a systematic process of dialogue, testing, and changing was developed over time, difficult facilitation problems developed. Here are a few examples:

Problem: Chemical suppliers would not conduct the necessary testing, as required by the purchasing industry, in a timely fashion. Some even refused to conduct the testing.

Result: Find a new supplier. This was not always easy to do. Local, state and regional regulatory pressures increased market incentives for suppliers to develop this information and even use it as a competitive advantage.

Problem: Industrial leaders did not follow through on voluntary testing and process optimization obligations. They ignored the benchmarks and reporting deadlines agreed to in the meetings.

Result: The POTW or State regulators fined industries or applied other enforcement tools to encourage participation and action.

Problem: The POTW operators could not resolve operational issues. There were organizational and staff training issues within the municipal organizations that “could not be resolved”.

Result: State authorities fined the POTW or applied other enforcement tools to leverage positive outcomes. New operators and engineers might receive penalties within their organizations.

Problem: Engineers wanted to build additional treatment plants as a fail-safe plan to eliminate toxicity before the greener production processes could be implemented.

Result: Careful understanding of the costs/benefits of industrial ecological solutions had to be presented and the regulators had to grant the time, without penalties, for the TRE programs to be implemented. The understanding was that additional treatment plants would be constructed if the TRE did not provide results within a year.

The primary goal of the TRE could neither be ignored

nor forgotten: achieve compliance at the lowest possible cost. This had to be discussed at every meeting.

11. Conclusions

The value of systems-thinking techniques, as well as the adoption of the principles of greener production and industrial ecology, was apparent in the 1980's, even though many of the formal terms and processes had not been fully recognized in the literature. The adoption and enforcement of new regulations was a primary motivating factor for these environmental improvements, although, these cases differed in their consensus-based, rather than their confrontational approach to all the stakeholders. The technical and legal details of a confrontational approach to toxicity reduction would have overwhelmed the budgets of the stakeholders and improvements would have been much slower, harder fought, and more expensive. The development of a cost-effective approach to toxicity reduction that improved both financial and environmental performance for industry and community provided the win-win opportunity that encouraged cooperation rather than confrontation.

The evolution of a stakeholder dialogue that addressed the problem of aquatic toxicity in wet processing effluents created a safe experimental space in which creativity was fostered. The ability to aggressively experiment within the framework of the TRE without the fear of unwarranted legal and regulatory repercussions allowed for mistakes to occur, which in turn promoted a rapid learning environment. Within this framework, establishing trust allowed all stakeholders to learn. Communication of the approaches within this space allowed the stakeholders to see different ways of addressing the root causes of the problem. Documentation of the results of the dialogues provided regulators with the information assuring them that progress was being made in resolving the toxicity issues.

In almost every case, the root toxicity problem for the textile industry was found to be process inefficiency and a poor understanding of the life cycle of textile chemicals. Improvements occurred when the industry began to use the new tests to benchmark environmental performance of the textile chemicals. The test results created the goal and the dialogue-based process was effective in engaging the textile industry, technical consulting community and regulators. It was the cooperative linkage of these groups that delivered the desired results of rapidly reducing aquatic toxicity from textile operations.

The importance of the test results and the dialogue-based process became clear very early within the first two or three projects. It was evident that this approach was very time and cost effective because the stakeholders could see the improvement in toxicity testing results from waste treatment plant as changes were made

because the process was transparent. As the knowledge base grew and the information was disseminated to the textile industry through publications and the NCDPPEA, other stakeholders began to use the information to improve product chemistries and industrial processes. The textile industry, its suppliers and the communities were truly 'learning organizations' during this time of focus on the aquatic toxicity challenge [16].

When the project was completed, a management system and process was put in place to offer long-term benefits in control and regulation of industrial discharges for the municipal authorities operating the waste treatment facilities. The systems were also used by other industries who had never approached an environmental problem in this manner before. The NCDPPEA also gained important trend information that could be communicated inside and outside the North Carolina [6]. The approach resulted in the textile industry supply chain developing greener water-soluble industrial chemicals. Therefore, the effects of this work were felt well beyond the communities where the studies were done. The whole textile wet processing industry benefited, as the results were communicated by regulators and industry trade groups [23].

The removal of aquatic toxicity by using greener chemistry and processes was very gratifying to everyone involved in the process due to purposeful stakeholder inclusion. The systematic nature of the process and the difficulty in communication of the details of technology avoided entanglement in unrelated technological and legal details, keeping the stakeholders involved. The relatively low cost of the process, as compared to building more wastewater treatment facilities, kept everyone focused on making it work. The power of consensual dialogue was demonstrated, even in an area with such complex legal and technical details as environmental regulation. The importance of technically realistic regulatory programs staffed with competent practitioners to the success of this approach cannot be over-emphasized. Regulatory programs that rely solely on punitive fines to combat non-compliance do not recognize the realities of commerce, economics, or science. Money spent effectively toward resolution of problems is money spent more wisely than in ineffectual and often prolonged litigation without realized environmental benefits.

As globalization of the wet processing industry continues, it is clear that the textile industry can continue to 'green' its processes and chemistries. The communities in which these industries relocate can work together to provide an optimum situation where industrial growth and prosperity can be maximized without a negative impact on local water quality. The best news is that it can work, not only by using sophisticated toxicological and chemical technology, but also by dialogue and commonality of purpose.

Appendix A. The regulatory environment in the USA, 1980–1995, with a focus on the State of North Carolina

Prior to 1972, most local governments or State authorities set pollution limits for wastewater treatment plants. In 1972, the US Congress enacted the Federal Water Pollution Control Act (referred to as the “Clean Water Act” or CWA). The CWA is the primary set of federal regulations that governs water quality issues in the United States. The 1972 CWA, as well as its 1977 amendments, set strict water-quality standards and instituted a system of permits for direct industrial discharges to water. These laws demanded the use of specific treatment methods to ensure water quality compliance.

The US Congress enacted changes in the CWA in the 1980’s that allowed the states greater freedom in determining compliance with standards. This was one of the factors motivating the State of North Carolina to implement the use of whole effluent toxicity tests (WET) as a primary indicator of effluent quality. These toxicity tests were sensitive indicators of real-world responses to the effects of water pollution. The adoption of these toxicity analysis methods was a major initiative for improving the water quality of North Carolina’s surface waters. These more flexible requirements resulted from the desire to improve the surface water quality of streams and rivers in the US, which were deteriorating due to growth in the industrial use of water, as well as the overall population. During the period of 1980–1995, it is estimated that 50% of the water treated by North Carolina’s POTWs came from textile wet processing operations [7].

However, WET testing was performed in addition to the large volume of physiochemical testing already legally required to limit the discharge of pollutants into surface waters. This made WET testing an additional cost to the operators of waste treatment plants. This cost was seen initially as another burden to industry.

WET methods were adopted in response to a debate among industry and environmental groups concerning the effectiveness of existing physiochemical pollutant measurements. Adopting WET methods reduced the debate over the applicability of a concentration-based limit on ultimate surface water quality. Using WET methods, if the permitted concentration limit of a pollutant was exceeded and the WET test demonstrated toxic effects, then it was clear that the toxicant was bioavailable and could impact the water body. If the concentration-based limit was exceeded and there was no impact on the test organism in the WET test, then there was room for debate with the discharger on the predictive accuracy of the concentration-based limit. Thus, the WET test became a powerful water quality indicator for the State of North Carolina.

The first toxicity tests utilized test populations of small fish (*Pimephales promelas*) and water fleas

(*Daphnia pulex*) that were exposed to multiple concentrations of treated wastewater. The endpoint of the tests was impairment or mortality of the organism after 24 or 48 hours of exposure. A variety of statistical analyses determined the LC50, or the concentration of wastewater that was lethal to 50% of the test organisms. This LC50 value was then compared to the percentage of a water body’s flow that was made up of water discharged by the POTW. For example, a discharge permit for a POTW whose water output was equal to 10% of the receiving stream’s water flow during a statistically determined low flow period, would state that there could be no mortality at a concentration of 10% treated wastewater and 90% control dilution water; therefore, it adequately represented the impact of the POTW discharge on the receiving stream [26].

The second phase of regulation occurred when the toxicity tests evolved to the point where sub lethal, chronic toxicity of the treated wastewater could be assessed. Chronic toxicity is a more sensitive measurement than acute toxicity, as it measures the test organisms’ inhibited reproduction over a longer period, generally 7 days for *Ceriodaphnia dubia*. The sensitivity of this chronic test can be significantly greater than the acute exposures of the same test organism. Thus, the WET limitation found in a discharge permit for the described POTW would allow no significant mortality or inhibition of reproduction rate at a test concentration of 10% treated waste water and 90% control dilution water [27].

Implementation of these regulations brought immediate results. Some POTW’s, which had never been in violation of their permits for metals, oxygen demand, solids, or priority pollutants, failed these new toxicity tests. There also was a strong correlation between POTW’s that contained high volumes of wet processing waste and test failure. Obviously, there were a great many possible pollutants in these effluents that were not individually controlled or measured as part of the permitting process, not to mention the combined effects of the pollutants.

These public waste treatment facilities (POTWs) were owned and operated by municipal governments, but regulated by the North Carolina Department of Environment and Natural Resources as well as the Federal EPA. Both the regulators and the municipalities wanted to know the source of toxic agents and wanted the sources eliminated as quickly as possible. An elaborate series of ‘fractionation/characterization’ and ‘treatability’ tests were devised to identify and quantify the toxicants in these treated wastewaters [24,25].

Various toxicity reduction evaluations in North Carolina, conducted between 1985–1995, found certain reoccurring compounds that were identified as the toxic agents. Many of these compounds were related to wet

processing. A short, non-exhaustive list of such toxic compounds follows in order of importance:

- Tri-butyl tin oxide (TBTO)—Used as a biocide on hosiery and fabrics.
- Nonionic surfactants—Used as detergents in textile preparation and dyeing.
- Cationic surfactants—Used in textile dyeing and finishing.
- Sodium chloride—Used in textile dyeing of cotton.
- Sodium sulfate—Used in textile dyeing of cotton.
- Copper—Used in textile dyeing of cotton and polyamide. In its elemental, non-complexed form, it is toxic.
- Cyanide—Found as an anti-caking agent in salt.

Once identified, specific, identifiable compounds such as TBTO could be removed from the discharge waste stream or replaced with less toxic alternatives. Other, non-chemically specific compounds were more difficult to trace and eliminate.

Nonionic surfactants were a particular problem. Surfactants that were slow to degrade caused acute and chronic toxicity effects. Understanding their rate of biodegradability was a key factor in their treatment, as the only available options were either longer treatment times or substituting more rapidly degradable surfactants. It is estimated that there are over 500 unique nonionic surfactants used in textile processing, and environmental fate data are scarce for these compounds.

Sodium chloride and sodium sulfate, which are used in dyeing cotton, also presented a particular problem. These inorganic salts were toxic to fresh water organisms at effluent concentrations exceeding the test organisms' thresholds. These substances were particularly problematic in areas where the natural flows in the receiving streams were very small in relation to the discharge flows of the POTW. There still remains no practical treatment to remove these salts from textile wastewaters and thus far, the only way to resolve the issue has been to dilute these two compounds.

Copper was found in many blue and black dyes with the 'free', non-complexed copper acting as the immediate toxic agent. The screening and development of copper free dyes was encouraged because of these findings.

After many specific toxic compounds were found and eliminated, there still remained a large group of textile chemicals called wet processing auxiliaries. These 'name brand' products are composed of complex mixtures of surfactants, softening agents, solvents, chelating agents and water-based polymers. Most of these products are mixtures designed to perform a certain task in the preparation, dyeing or finishing of textiles. Because of both the huge variety and different concentrations of chemicals that can be used in these products, there were significant difficulties in identifying the components of

these mixtures. This problem was exacerbated by the producers' insistence upon keeping the ingredients a trade secret. The lingering question was how to determine the relative environmental impacts of these products so that the end user, the textile industry, could choose greener products and improve the environmental quality of the water being discharged from the textile facility.

The implementation of aquatic toxicity based discharge limits, as well as the process that developed to deal with those issues, led to development of a toxicity targeting model. This model used the biodegradation rate, biomass toxicity (microbial respiration inhibition), and aquatic toxicity test results to determine the relative effects of one textile chemical as compared to any other. Both the tests and the model were designed so that the results were independent of chemical composition or concentration of the textile chemical.

Appendix B. Toxicity targeting test descriptions

The following description briefly summarizes these tests. The full test procedures are readily available from the OECD.

The Activated Sludge Respiration Inhibition (ASRIT) Test, OECD Guideline for Testing of Chemicals 209, adopted Apr. 4, 1984, indicates the quantity of chemical that can be received by a treatment plant without impacting the viability of the plant's biomass. The method described in this guideline assesses the effect of a test substance on microorganisms by measuring their respiration rate in the presence of different concentrations of the test substance. The method is based on methods described by ETAD (Ecological and Toxicological Association of the Dyestuffs Manufacturing Industry), in which activated sludge obtained from a sewage treatment plant is used as the microbial source. The purpose of this test is to provide a rapid screening method of the substances that may adversely affect aerobic microbial treatment plants. This test can also be used to identify and indicate suitable, non-inhibitory concentrations of test substances to be used in biodegradability tests. The respiration rate is the oxygen consumption of aerobic sludge or wastewater microorganisms generally expressed as mg O₂ per liter per h.

In the test, the respiration rate of activated sludge fed with a standard amount of synthetic sewage nutrient medium is measured after a contact time of 30 mins, 3 hrs, or both. The respiration rate of the same activated sludge in the presence of various concentrations of the test substance under otherwise identical conditions is also measured. The inhibitory effect of the test substance at a particular concentration is expressed as a percentage of the mean respiration rates of two controls. An EC50

value is calculated from determinations at different concentrations. Laboratory-bred daphnids, not more than 24 h old at the beginning of the test and apparently healthy and with a known history (breeding method, pretreatment) are used in this test.

The Acute Immobilization Test and Reproduction Test, OECD Guideline for Testing of Chemicals 202, Part I, adopted Apr. 4, 1984, is used to indicate the effect of untreated chemicals on the fish and small crustaceans inhabiting natural freshwater ecosystems. Effects measured include survivability and inhibition of reproduction or growth. *Ceriodaphnia dubia* and *Daphnia pulex* are the preferred species for testing, as they are the daphnid species most prevalently used in NPDES permit effluent acute toxicity monitoring. Twenty-four hour EC50 is the concentration estimated to immobilize 50% of the daphnids after 24 h of exposure.

In the acute immobilization test, a range of substance concentrations exerts different degrees of toxic effects on the swimming capability of daphnids under otherwise identical test conditions. Certain concentrations result in certain percentages of daphnids losing the ability to swim at 24 h. The test can be extended to 48 hrs if desired.

The Ready Biodegradability Test, OECD Guideline for Testing of Chemicals 301D, adopted Jul. 17, 1992, is used to determine the biodegradability of chemicals. In this procedure, a dissolved or suspended test substance in a mineral medium is inoculated and incubated under aerobic conditions either in the dark or in diffuse light. Allowance is made for the endogenous impact of the inocula by running parallel blanks with inocula minus a test substance, although the endogenous impact of cells in the presence of a chemical will not exactly match that in the endogenous control. A reference compound is run in parallel to check the operation of the procedures.

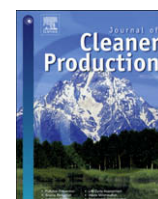
In general, indicator parameters such as Dissolved Oxygen concentration (DO), CO₂ production and oxygen uptake help predict degradation efficacy. Measurements are taken at sufficiently frequent intervals to allow the identification of the beginning and end of biodegradation. Automatic respirometers allow for continuous measurements. Dissolved organic carbon (DOC) is sometimes measured in addition to other parameters, but usually only at the beginning and end of the test. Specific chemical analyses can also be used to assess primary degradation of the test substance, as well as to determine the concentration of any intermediate substances formed. Normally the biodegradation test lasts for 28 days, but the tests could be ended sooner if the biodegradation curve had already reached a plateau for at least three determinations. Tests may also be prolonged beyond 28 days when the curve shows that biodegradation has started but that the plateau has not been reached by day 28. In such cases, the chemical would not be classed as readily biodegradable.

In the test, a solution of the chemical in a mineral medium, usually at 2–5 mg/l, is inoculated with a relatively small number of microorganisms from a mixed population and kept in completely full, closed bottles in the dark at constant temperature. Degradation is followed by an analysis of dissolved oxygen over the 28-day period. The amount of oxygen used by the microbial population during biodegradation of the chemical, corrected for uptake by the blank inocula run in parallel, is expressed as a percentage of ThOD [Theoretical Oxygen Demand (mg), i.e., the total amount of oxygen required to completely oxidize a chemical, expressed as mg oxygen required per mg test compound] or, less satisfactorily, COD [chemical oxygen demand (mg), i.e., the amount of oxygen consumed during oxidation of a test compound with hot, acidic dichromate, expressed as mg oxygen consumed per mg test compound]. All chemical mixtures in the foregoing procedures were tested on a percent actives basis. If the product is not amenable to Karl Fisher, percent actives can be conducted based on a total solids determination (USEPA Method 160.3).

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Strategy development in small and medium sized enterprises for sustainability and increased value creation

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ARTICLE INFO

Article history:

Received 18 June 2008

Accepted 18 June 2008

Available online 9 August 2008

Keywords:

Sustainability

Small and medium sized enterprises (SMEs)

Sustainable supply chain management

Resilience

Industrial ecology

ABSTRACT

Sustainability strategies create many synergistic effects for SMEs working collaboratively, as well as systemic benefits for the commons. After setting forth the business case for sustainable SMEs, and considering SME sustainability advantages in contrast to MNEs, this paper discusses several different incentives for SMEs to optimize sustainability: (1) becoming valuable sustainable investment targets for larger firms; (2) creating highly competitive networks of sustainable SMEs in market spaces where large enterprises are less successful; (3) becoming highly efficient suppliers in global supply chains through sustainable practices.

While several successful models of the sustainable SME are evolving, it may be that networks of SMEs will become essential for addressing the systemic problems that underlie industrial ecology, enterprise resilience, and global supply chain sustainability. SMEs represent the majority of all enterprises, and rapidly evolving communication technologies allow for various routes of network formation.

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1. Introduction

Since the 1990s, environmental and social factors have become increasingly important strategic considerations for enterprises of any size. Emerging 21st century market conditions are now creating truly new lenses through which the world must be viewed [1]. By ignoring the “hidden connection” between business and the environment, business is missing many new sustainable development (SD) opportunities that may prevent the threat of an inevitable collapse of society [2]. As more companies recognize our “Common Journey” [3], which underscores the necessity of creating sustainable development, firms worldwide are intentionally developing strategic plans to make their companies competitive sustainably. Hart and Milstein have insisted that creating a sustainable enterprise should be viewed as just another factor in the modern business environment and should be addressed as such within the planning process by 21st century business strategists [4]. However, even this view may no longer be adequate.

Modern business plans should include both “the limits and opportunities” presented by changes in global social and environmental circumstances, as limitations of future growth may occur if the global and environmental perspectives for sustainable societies

are ignored. Paradoxically, the global economy grows more rapidly as companies become more resource efficient. Ecological footprint analysis indicates that with this “rebound effect” [5], humanity’s ecological demands already exceed what nature can supply [6]. This “ecological overshoot” means that we are depleting the stock of natural environmental capital rather than “living off the interest” [6]. In spite of limits to growth, just as is true for all living organisms, business enterprises need to grow at least enough to keep pace with the economy, but defining growth and the ways and means of “growth” need to change [7]. Sustainable enterprise resilience is the “capacity for an enterprise to survive, adapt, and grow in the face of turbulent change,” and at the same time, “to increase shareholder value without increasing material throughput” [5]. Sustainable enterprise resilience within the framework of *industrial ecology* creates multiple business opportunities through green technologies, reduction of raw material and energy use, and “discovering innovative pathways for recovery and reuse of waste streams in place of virgin resources” [5]. This redefines growth in a more sustainable context, a context that is not foreign to SMEs, who have been operating for centuries within the context of limited local markets, and adapting to those conditions successfully [8].

The strategy of a sustainable enterprise has been defined as “the process of aligning an enterprise with the business environment to maintain a dynamic balance” [9]. By adding a sustainability lens within the framework of SME strategic planning, SME development seeks to balance resilience and growth so as to align the creation of abundance: economically, environmentally, and socially, and to

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conserve that value for future generations [10]. Integrating sustainability into their competitive strategy, and thereby obtaining greater profitability for SMEs through adoption of intentional sustainable strategies, can help them to optimize their rate of sustainable change.

“It is becoming apparent that voluntary, incremental environmental improvements by individual companies will be inadequate to significantly offset the growth of the global economy, and that the rapid growth of China, India, and other Asian economies will likely exacerbate this problem” [5].

Sustainability strategies create many synergistic effects for SMEs working collaboratively, as well as systemic benefits for the commons. After setting forth the business case for sustainable SMEs, and considering SMEs sustainability advantages in contrast to MNEs, this paper discusses several different scenarios for SMEs to optimize and use sustainability to create competitive advantages rather than simply focusing on *reducing unsustainability* [5]:

- become valuable sustainable investment targets for larger firms;
- create networked SMEs in sustainable market spaces where MNEs are less successful;
- become sustainable suppliers in global supply chains.

Through this exploration, there is a critical underlying question, which will require fuller investigations; which of these scenarios, or combinations of scenarios, can provide the best alignment for SMEs with the principles of industrial ecology, enterprise resilience, and global sustainability?

2. Why do SMEs need to articulate and use SD business plans for integrating factors of globalization within social and ecological limits to growth?

Ignoring the possibilities offered by sustainability can produce an artificially narrow vision, with even small firms being constrained as they attempt to operate in a global marketplace, if an expanding vision of sustainability is not included in planning and benchmarking performance [11,12]. SMEs have a vital role to play in managing limited global environmental and social resources. A broad, multidimensional, multi-stakeholder perspective that is formed based on emerging ideas and trends should be the basis of a system approach towards an intentional, proactive situational analysis. A thoughtful, situational analysis, as the basis for developing enterprise strategy, must incorporate new global stakeholders and should not be stagnant or reactionary [13]. Such analyses can culminate in development of scenarios leading to sound strategic plans, based on foreshortened learning cycles that benefit from the time and efforts spent in the planning process [14].

Recognition of the use of sustainability to promote expeditious planning dialogues to create competitive advantages are described by Senge et al. [15]:

People creating together work in different ways. They are anchored in the future rather than in the past, drawn forward by images of what they truly want to see exist in the world. They learn how to work with a distinctive source of energy that animates the creative process, the creative tension that exists whenever a genuine vision exists in concert with people telling the truth about what exists now. They learn how to let go of having to have everything worked out in advance and to step forth with boldness into immense uncertainty... The organizations that truly lead in the profound (sustainable) changes starting now to unfold around the world, who do not get stranded in just being “less bad”, will be those who

convert sustainability challenges into compelling strategic opportunities.

A number of forces underscore the emerging opportunities [16,17] for SMEs to become proactively involved in sustainable practices:

- accelerating cycles of technological innovation;
- rapid globalization of networked communications;
- extended and interconnected supply chains;
- rapidly changing markets.

A further important factor to bear in mind is the fact that at least 80% of all global enterprises are considered SMEs, having less than 250 employees [18]; SMEs constitute 85+% of USA business [16]; 99% of the European Union business [19]; over 99% of enterprises in the UK [20]; and SMEs account for at least 70% of the world’s production [21]. Possible scenarios of the future should be part of any lens for incorporating sustainable development within a planning process [13,22–25]. Such lenses have led to the conception of “sustainable enterprises” [26]: i.e., enterprises that are robust and resilient in face of anticipated and unanticipated economic, environmental and social challenges [27]. Scenarios anticipating future market conditions predict that a sustainable enterprise growth will be enhanced by: (a) adapting to and diminishing the risk of exceeding social and environmental limits, and (b) meeting currently unmet market needs for the 2+ billion potential consumers that do not currently participate in the global marketplace [28–34].

3. Differences between large and small firms that result in sustainability advantages to SMEs

A major facet of corporate planning among leading manufacturers in every industrial sector is the emphasis on sustainability in “internal business processes, external stakeholders and investor relations, and customer value propositions” [5]. It appears that global multinational enterprises are taking actions towards becoming more sustainable and they feel strongly enough about the importance of their efforts to report on their progress through various avenues [29]. An entire lexicon and specific techniques have been developed to define and measure “sustainability” [35].

The following indicators of MNE’s strategic plans and actions towards sustainability reveal that the concept of the sustainable enterprise as a successful business paradigm has become a reality:

- The development of the World Business Council for Sustainable Development (WBCSD) [26], the Sustainable Enterprise Academy (SEA) [36], and other consulting organizations whose purpose is to train and inform business leaders on sustainable enterprise.
- The creation of sustainable stock indexes such as the Dow Jones Sustainability Index (DJSI), which are designed to measure the economic performance of sustainable enterprises, enabling comparison to indexes which do not measure any aspect of sustainability.
- The growing number of paid advertisements and web sites encouraging and reporting on sustainable efforts as a competitive advantage.
- The audited sustainability reports of hundreds of leading firms that have utilized the Global Reporting Initiative (GRI) as their guide in preparing their reports.

The benefits of sustainable strategic plans for SMEs are different from those offered to MNEs. With their large asset bases, MNEs can invest and spread the costs of product development over a large and diversified global market. For large firms, if a strategic plan or

product introduction is not successful in one region, then perhaps, in some market half way around the globe, it will be. This realization of greater returns from R + D has generally been perceived as an advantage for larger firms, as they are incumbent in global markets. The limits and advantages of smaller firms are well described by Ács [37], in particular the limitations which are based on a historically defined, geographically limited market scope for non-networked SMEs; however, SMEs are also able to act more nimbly to fill local or specialized market and technology niche markets [15,37,38] through being less encumbered by existing organizational structures that predate sustainability as a factor in enterprise performance:

Industries that are capital-intensive, concentrated, and advertising intensive, tend to promote the innovation advantage in large firms. The small firm innovation advantage, however, tends to occur in industries in the early stages of the life cycle, where total innovation and the use of skilled labor play a large role, and where large firms comprise a high share of the market [15].

An organization's resilience and ability to "integrate, build, and reconfigure internal and external competences to address rapidly changing environments" are critical success factors in coping with shifting markets and for responding to disruptive innovations and change [39]. Rothaermel and Hess [40] suggest that the antecedents to build these organizational capabilities can be found at the individual, organizational, and network level. At the organizational level, two major hurdles to effectively manage disruptive innovations and change are higher in larger firms and lower in smaller firms.

3.1. Streamlined organizational processes and business models

One hurdle for larger organizations to surmount is that while they usually have adequate human capital assets and other resources, they are often caught facing the challenges of disruptive change with inappropriate and ineffective organizational processes and business models [41]. An organization's capacity to meet the challenges of disruptive change is affected by its resources, processes, and values. Initially, organizational resources determine the firm's capabilities. As the firm matures, organizational processes become well-defined, and once the firm's business model becomes clearly defined, organizational values are articulated. These factors – resources, processes, and values – are the building blocks of the organization's culture. Christensen and Overdorf [41] argue that changing a company's processes, business models, values, and ultimately its culture is difficult, if not impossible, for large, established companies; and yet, this is precisely what must happen in order for a firm to deal with disruptive innovations and major changes. Smaller organizations can leverage their capacities for entrepreneurial innovations and organizational change, thereby, learning to achieve advantages over larger organizations [42].

3.2. SMEs exposure to competitive forces

A second hurdle is that while larger organizations may do well initially with technological developments, their capability to ameliorate competitive constraints insulates them so that they are likely to become weaker competitors over time, compared with smaller organizations that cannot escape the rigors of technology survival contests [43]. When disruptive innovation and change are driven by competition contests, larger organizations tend to have significant survival and competitive advantages [43,44]. However, when a larger organization succeeds in neutralizing the constraints of competition, the organization's perceived invulnerability serves as insulation from critical sources of continuous organizational development. Hence, strategies that isolate organizations from

competition may actually backfire, such that larger organizations become weaker competitors in the long run [43]. These implications suggest that since smaller firms cannot effectively constrain competitive forces nor shield themselves from these external forces, the organizational development processes of smaller firms may also constitute a built-in engine for addressing the challenges of disruptive innovation and change.

4. SMEs as a laboratory-sandbox for developing sustainable strategies and technologies which are then integrated into MNEs via acquisition

SMEs have traditionally been entrepreneurial businesses that grow through internal financing. The leap to external financing or acquisition becomes necessary when growth outpaces the ability of the SME to finance that growth, or if an SME's technology or market segment becomes of special interest to investors [8]. Small firms can fulfill the desire to grow larger by raising capital in public markets, or they can become attractive acquisition targets for larger firms [37]. Large firms seeking investments or acquisitions in small to medium sized enterprises typically use traditional strategies to improve profitability by:

- acquiring SME technology and market share [45];
- achieving "roll-up" efficiencies through elimination of redundant expenses [46];
- de-fragmenting markets through consolidation of SME competitors [47].

The benefits that SMEs bring to larger firms may be otherwise unreachable by larger organizations. However, there are hurdles in seeking to integrate smaller firms into larger organizations. Roughly 50–80% of mergers and acquisitions, depending on whose research is cited, fail to deliver anticipated benefits [48]. Regardless of whether the focus of an acquisition is on the issue of strategic fit, or organizational fit, or the acquisition process itself, failure rates remain consistently high [49]. Two meta-analyses of empirical studies called for a "greater recognition of the process and organizational dimensions of acquisitions" that are increasingly recognized in the behavioral literature [50,51]; for example, inappropriate decision-making, negotiation and integration processes can lead to inferior acquisition outcomes [52–54]. Additional industrial ecology criteria [5] for gauging the success of an SME acquisition should be whether the acquired SME helps an MNE reduce its degrees of unsustainability, or increases MNE capabilities to fundamentally strengthen the systemic underpinnings of sustainability [55].

Despite the risks for larger firms, being acquired is an interesting option for SMEs, financially and organizationally, since acquisition can free the founding entrepreneurs and their capital, to continue to develop new firms and to pursue other synergistic alternatives.

5. Network advantages for SMEs utilizing the effects of creative destruction and information technology

One of the apparent reasons for the increasing number of smaller firms globally is the acceleration of "creative destruction" effects caused by rapid technology transitions within global markets [41,56]. This factor has persisted despite the breadth of advantages inherent to larger firms [31,57]. Moreover, globalization of communication technology is facilitating the formation of SME networks. These inter-organizational networks, which are strategic partnerships or alliances among SME stakeholders, introduce a new organizational form into Ács' assumptions [37], as networked SMEs can behave in the marketplace as a single larger firm, thereby achieving market penetration through synchronized competency building [58–60].

Smaller firms may also be more nimble and creative in leveraging the “force multiplier” advantages of stakeholder networking [61]. The continuous updating of organizational learning and knowledge bases through networking is a significant way for SMEs to achieve both positional and performance advantages in the face of disruptive innovations and change. The involvement of former and new business, government, and NGO collaborators creates communities of sustainable-knowledge networks similar to the open-source participation model that is “lumpy with small groups and clustered with coalitions” [60], rather than clearly defined roles with linear reporting hierarchies [20]. For these many reasons, SMEs are evolving to play a significant role within the modern global economy. If judged solely by the percentage of all employees working in them, it may be said smaller firms are really the backbone of the modern market. Therefore, SME’s behaviors and characteristics are important in the evolution towards resilient, sustainable enterprises. If over 95% of all global enterprises are SMEs, and there is a growing mandate to create sustainable enterprises, then developing and implementing strategies for promoting SME investments in sustainable business practices is paramount in making progress towards sustainability [62]. The growing competitiveness and importance of SMEs in the general economy are linked to the growing influence of networking these firms to meet the demands of growing populations participating in global markets [57,63,64].

Axelrod indicated that the results from experimental game theory, where games are developed that mimic market behavior, show that linking individuals through networks develops interdependence, and that interdependence makes cooperation much more efficient than adversity and conflict [65]. Comparing the role and influence of large trans-national enterprises and SMEs in the world of the 21st century is, in reality, comparing the influence of fluid and nimble decentralized networks of numerous SMEs seeking mutually efficient transactions, vs. fewer (albeit mega-sized) global multinational firms, seeking monopoly. It is very similar to comparing mainframe computers to networked PCs [66].

6. The end game of the comparison of large and small firms is the triple bottomline

Kerr concludes that SMEs should develop strategies that incorporate sustainable development, and that the resulting skills would guide them to act in a sustainable way [62]. Acting and leading in sustainable ways that acknowledge the global commons are premised on multiple ethical, social, and environmental imperatives. However, significant research findings which cannot be ignored indicate that a primary survival driver for SMEs (or for any size firm) to invest in sustainability must increase opportunity for profits and/or to avoid threats to profitable growth [1,11,33,67]; i.e., firms will not value a global commons unless a connection to profitability is made.

Will larger firms or networked SMEs produce the most rapid returns on investment in a global market scenario where sustainable development must occur? Will the highest returns from investments in sustainability be achieved within a rapid transition to networks of sustainability driven SMEs, or through an evolution of MNEs transitioning towards sustainable behavior? Inevitably, whichever avenue produces the most rapid returns on investment, this will depend on situational market environments and organizational capabilities, will yield improved competitive advantage, and will become the preferred structure for a particular situation.

In situations that require long term, very large financial investments in infrastructure and R&D, MNEs with large market capitalizations may remain the most efficient organizational form. Their diversified sources of income and ability to efficiently penetrate global markets should maximize their returns. However, as

SMEs become more firmly networked and investors become comfortable with networked structures, combining assets of networks could provide equal sources of market capital and access. There is also the additional evidence that the market capital of MNEs will most likely be utilized for investments that are aligned with incumbent MNE activities, rather than unaligned opportunities that are disruptive to existing business activities [57]. Herein is another advantage for SMEs: the ability to connect unaligned opportunities by becoming sustainable suppliers in global supply chains.

7. SMEs as sustainable suppliers in global supply chains

Firms of all size are increasingly being confronted by multiple external stakeholders to demonstrate a commitment to corporate social and environmental responsibility (CSR/CER). One response is “supplier management for risks and performance” that takes a minimalist approach to incorporate environmental and social criteria to complement what are essentially economic-based supplier evaluations [16]. The second strategy, “supply chain management for sustainable products” goes beyond mere compliance with legislation and regulations; it demands the “definition of life cycle based standards for the environmental and social performance of products” that are implemented by certified companies upstream and downstream in the supply chain [16,68,69]. For example, one of the “leading-edge efforts to incorporate sustainable systems thinking into the design and development of new energy and mobility solutions is *Well-to-wheels life cycle modeling*” [5]. Vachon and Mao established a link between sustainability indicators and supply chain strength (defined as the availability, quality, and interactions among organizations in the supply chain) at the country level [70]. Their findings indicate that no trade-off exists between sustainability and economic development and wealth creation; i.e., “a positive link between supply chain strength and natural environment is possible” [68].

While SMEs may acknowledge their often significant environmental impacts (in the UK, for instance, SMEs could be responsible for up to 70% of all industrial pollution) [20], SMEs may tend to focus their CSR/CER behaviors on internal stakeholders, rather than on stakeholders in the supply chain [19]. The high costs and resource demands make it difficult for SMEs to adopt CSR/CER practices and monitor their transfer along the supply chain. Meeting these demands is all the more difficult for SMEs operating in developing countries, and it is generally pressure from customers or supply chain partners in developed countries that is the primary driver for SMEs in developing countries to adopt CSR/CER behaviors [19]. Much of the literature to date considers the role of SMEs primarily as suppliers of larger companies. When SMEs produce unique sustainability technologies or processes, they can use their innovation potential to move their customers in the supply chain towards more sustainable directions [20]. SMEs need also to be considered as buyers from upstream suppliers, and by acting as buyers, SMEs can exert more pressure for “sustainable supply chain management,” defined as the “management of SCs where all the three dimensions of sustainability, namely the economic, environmental, and social ones, are taken into account” [19]. Ultimately, what determines the success of SMEs in sustainable SCM is a combination of their relative unique product positioning in niche markets and the personal CSR/CER values of the owner/entrepreneur [19]. This is precisely the commitment that is needed to evolve towards a systems approach to sustainability.

8. SME sustainability and resilience

It seems that rapid growth and disruptive innovations are being achieved by SMEs from core competencies derived from a focus on entrepreneurial sustainability. Why are small firms innovating in

these new, exciting areas, while large global firms are not? The reason for this differential may be due to the nature of sustainability itself. Hart and Milstein [4] introduced a strategy framework which describes how firms can analyze investments through the lens of “sustainable enterprise” with the goal of increasing profitability synergized through increasing sustainability. Their framework directs investments that profitably resolve tensions created by the following global conditions:

- increasing human population;
- approaching the limits of the available environmental commons;
- apparent limitations to growth due to limited availability of energy and raw materials;
- globalization of trade and economic development;
- social issues (war and terrorism) that disrupt global trade.

Hart and Milstein’s framework is shown in a 2×2 matrix that analyzes returns on investments in sustainability which can produce “present” and “future” value within internal operations of the firm and externally in the broader market (see Fig. 1). While larger firms seek paths to increased profits through innovations within an existing “sustainability space,” the appreciation in value for MNEs is largely achieved through maximizing opportunities found in lower quadrants of Hart’s strategic matrix, i.e., incremental improvement in existing operations through pollution prevention and by finding sustainable efficiencies. Larger, incumbent firms first must “fix” perceived challenges in present operations, before they begin experimenting in new markets [31].

A review of business cases indicates that SMEs can bring skill sets to bear on disruptive opportunities quickly and more competitively than existing MNE firms [17,28,33,71]. These cases, ranging from health care and communications to apparel and manufacturing, all have similar narratives: SMEs, founded and structured using a lens of sustainability, can focus on new innovations without the distractions of having to “fix” existing operations. These SMEs, focused on sustainable opportunities, do not have an existing history of “compliance only” investment and infrastructure to overcome. SMEs can invest in leading edge efforts in sustainable enterprise, without risking or dealing with entrenched expectations internally or externally to the firm. Initially, entrepreneurial firms such as

Seventh Generation (“green” cleaning products), Plug Power (hydrogen fuel cells), Zip Cars (transportation services), Grameen Bank (micro-credit), etc., produced strategies working throughout all quadrants of the Hart–Milstein matrix, but most of the value (growth) has occurred in the upper half of the matrix. These are the areas of innovation and repositioning for green technology development, efficient resource utilization, socially aligned business, and meeting the needs of the base of the economic pyramid [33].

9. Conclusions

As SMEs succeed in integrating social and environmental sustainability performance into financial projections and strategic business goals, they will expand opportunities for innovation by increasing their opportunities for rapid learning. This paper has made the business case for SMEs investing in sustainability while exploring various scenarios: being acquired by an MNE; becoming networked with other SMEs; playing a major role in creating and maintaining sustainable supply chain management.

Whether larger firms wishing to venture into new sustainable business segments will find it less expensive to enter these markets through investment or acquisition of adroit SMEs, or whether they will build capability internally, is still an unanswered question and may relate to the perceived importance of sustainability within the existing management of MNE firms. As “new” business units attempt to compete for resources within larger firms, organizational hurdles arise, if these new units compete with or are in conflict with incumbent activities. As rates of change are accelerated by global environmental and social conditions, new disruptive paths will be necessary to answer these challenges, even if they are not in alignment with current missions. Disruptive “skunk works” may be forced to develop outside MNE structures. Such a situation is documented in “The NIKE World Shoe Case” where NIKE was unsuccessful with an inexpensive, sustainable “world shoe” that was designed for developing markets, because it was in conflict with existing brands and company missions [72].

Smaller firms can often develop without such competitive friction and expectations. Therefore, MNEs may find that by adopting new sustainable strategies, through SMEs, they can more quickly evolve technologies and markets that are disruptive, rather than fighting through frustrating organizational conflicts. This strategy

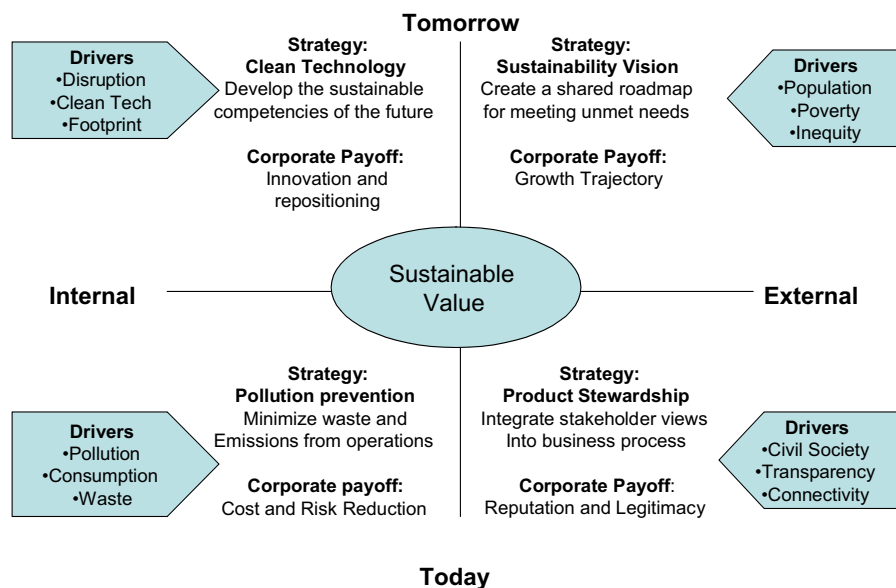


Fig. 1. The Hart–Milstein matrix for assessing the value of sustainability within an organization’s strategic plan, from Hart and Milstein [4].

may move MNEs towards a new paradigm that addresses and strengthens an open-system approach to global sustainability [5].

Networked SMEs provide much financial and organizational efficiency that enable development of technologies and markets essential to achieve “sustainable development.” Many of these developments are new and disruptive. While larger firms have organizational barriers that may slow innovation in more revolutionary technology and market spaces, SMEs are not as large and therefore, do not have as many organizational inertia effects. Exactly how important individual SMEs will be to a sustainability driven local or global marketplace and how disruptive their accelerating rate of entry and exit into and out of markets could be on their economies, may depend upon their speed and efficiency of networking so they can act in congress [59]. Networking should mitigate the disruptive influences generated by individual SMEs and should help to produce progress towards sustainable development. This can only occur if cooperation on the challenges facing society and ecology clearly favor the competitiveness of the networked companies and if stable business communities are formed [65,73]. The connection to Corral’s insights should be clear [67]: to be sustainable, SMEs must network in order to obtain the size and efficiencies needed to compete. Through the success of such networks, the individual SMEs must believe that the success of the whole is paramount to individual SME successes.

Developing networked SME strategies for sustainable supply chain management also seems to offer opportunities for better economic performance in market spaces that are foreign to MNEs. As creative destruction effects accelerate within an increasing global marketplace, the gravitational effects from existing incumbent operations may not allow large firms to take full advantage of clean technologies, resource efficiencies, including raw materials and new energy sources, and the needs of emerging populations of consumers. SMEs have demonstrated the ability to thrive in these new spaces. Perhaps, new networked organizational structures, including sustainable supply chains involving SMEs and MNEs, will emerge, with MNEs supplying much needed infrastructure and capital, and SMEs providing the sustainability driven innovation engine that MNEs desire. While more than one successful model of the sustainable enterprise is evolving, collaboration, with the ‘force multiplier’ of networks will remain essential for addressing the systemic problems that underlie industrial ecology, enterprise resilience, and global sustainability. Real and lasting systemic changes can only be achieved through coordinated global efforts, and this will necessitate collaborative participation from public, private, and non-governmental organizations.

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Creating and managing a virtual inter-organizational learning network for greener production: a conceptual model and case study

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Received 1 August 2005; accepted 1 November 2005

Available online 2 March 2006

Abstract

The utility of applying a virtual learning network model for illustrating successful triple bottom line transitions—one that integrates the ecological, economic, and social dimensions of cleaner production—is illustrated by a successful approach to promote “green chemistry” in the North Carolina textile wet-processing industry. This case is unique in demonstrating the quality of this process to develop cleaner production methods; it shows how reducing aquatic toxicity and harmful environmental effects in a “real world” situation depends on successful efforts to build, manage, and maintain an inter-organizational network of multiple stakeholders. This network included industries in the textile production chain, their local and provincial communities, regulators and policy makers. The utilization of cases such as this in the business school pedagogy expands understanding of the role of sustainable practices in enterprise management. The value of this specific case in promoting the understanding of such networks was demonstrated in a recent MBA experience when students trained in these areas linked diverse stakeholders and applied the triple bottom line perspective in traditional business simulation exercises in an MBA capstone course. Such cases can also effectively prepare students for actual challenges facing managers in the rapidly changing business environment.

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Keywords: Stakeholder management; Networks; Learning organizations

1. Introduction

Effective sustainable industrial development requires the building, managing, and maintaining of inter-organizational networks. These networks are comprised of the diverse stakeholders that are necessary for a triple bottom line approach to development. This includes the use of techniques that create economic success for business enterprises by meeting social and environmental objectives. Adopting sustainable business practices generally involve changing institutional visions and operations on many levels. These changes include

coordination and formation of networks of organizations (public, corporate, and environmental) to act as strategic stakeholders representing specific issues.

Given the number of institutional and administrative challenges associated with sustainable industrial development and production methods, there is an ongoing need for conceptual models that increase understanding and clarity about the various forms of inter-organizational collaborative partnerships among stakeholders (Hawken [1]). A number of researchers have referred to the network phenomena in public administration since as early as 1978 in terms of: issue networks (e.g., Hecl [2]; implementation structures (e.g., Hjern and Porter [3], Trist [4]; inter-organizational policy systems (e.g., Milward and Wamsley [5]); advocacy coalitions (e.g., Sabatier and Jenkins-Smith [6]); policy formation and implementation (e.g., Rainey and Milward [7], Mandell [8], Marin

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and Mayntz [9], Bressers, O'Toole, and Richardson [10], Agranoff [11], O'Toole [12]); and self-governing institutional arrangements (e.g., Ostrom, Gardner, and Walker [13]). There is emerging evidence that the application of network structures and learning organizational models, when placed within the broader context of sustainable development and production, can be very productive (Wheeler [14]). Wheeler noted the case of Shell in Nigeria, where the inability to form productive networks among diverse stakeholders dramatically slowed oil production and cost the lives of many people.

The differences between “traditional” and network-based structures can be shown graphically as depicted in Fig. 1. In this figure, “A” is a traditional organizational structure. The “dots” symbolize departments, units of operation, factories, shareholders or even stakeholders, all within a traditional organization. Notice that these units are enclosed and aligned by the framework or structure of their organization. They may be connected but they can connect only within their organizational framework (inside the box), and unless the size of the framework is increased, there is a barrier that must be overcome to include units that are not inside the box. Metaphorically, this framework creates alignment inside, but can also be seen as a barrier to units trying to work outside the framework, or to units outside the framework trying to connect inside. In this manner, traditional organizational structures inhibit diverse connections.

There are significant costs associated with developing and maintaining organizational structure overhead (it requires energy to build and maintain a wall), as well as the costs for connecting outside of the box (you have to dig under, climb over, drill through or destroy the wall). These are the challenges of traditional organizational structures in a dynamic global economy that is driven by the forces of “creative destruction” and rapid change (Hart and Milstein [15]).

“B” in Fig. 1 graphically represents a connected network structure. The links or edges between the units or vertices are forged as needed. There is no expenditure for maintenance of an organizational structure and thus, no barriers to entry or

exit. The only energy required is to find connections to the network. In the dynamic global economy, removing the barriers to swift change is clearly a major asset.

This paper demonstrates the utility of applying an inter-organizational network (ION) model that incorporates dimensions of a *network structure* with a *virtual Web organization*. As the network acquires the properties of a *learning organization*, by generating multiple *feedback loops* to the stakeholders, the emerging shared perspective enables increased productivity through the adoption of sustainable development and production methods. The challenges of a networked structure, which are addressed in this paper, include how to forge the connections and achieve alignment among those connections (Dorogovtsev and Mendes [16]).

The model presented here is practically illustrated by an analysis of the process that promoted “green chemistry,” to reduce aquatic toxicity and harmful environmental effects, in the North Carolina textile dyeing and finishing (wet processing) industry during the late 1980s. This case illustrates that an ION structure provided a framework that was flexible enough to involve diverse stakeholders as resources in problem solving, even inside of traditional business enterprises. This occurred because the traditional business organizations were treated as a single member of the network and the network provided the governance and structure to the dialogue and process, not the businesses. The ION was also effective in enabling stakeholders to resolve environmental regulatory non-compliance issues at minimal economic cost to the stakeholders involved.

2. Background on North Carolina's aquatic toxicity situation²

The wastewaters discharged into the rivers of North Carolina are regulated by federal (USEPA), State (NCDWQ), and local Publicly Owned Treatment Works (POTW) authorities as a tiered regulatory approach under the Federal Clean Water Act (CWA). The treated wastewaters are tested to ensure that the levels of organic and inorganic pollutants fall within a compliance limit that is based on the characteristics and “best use” of the water body receiving the treated wastewaters. Since the advent of the CWA, wastewater treatment facilities have been under increasing pressure by stakeholders of the common resource to lower the concentrations and toxicity of the treated wastewater being discharged.

In 1982, the USEPA and the NCDWQ implemented a change in water quality testing that, for the first time, was based on aquatic bioassays. Bioassays take the treated wastewater and test it for acute toxicity and reproductive inhibition. During this period of 1985–1995, over 50% of the wastewater being treated by POTW facilities in North Carolina came from textile dyeing and finishing operations. As the NCDWQ began to test POTW discharges that contained large amounts of textile dyeing and finishing process waters, it found a large

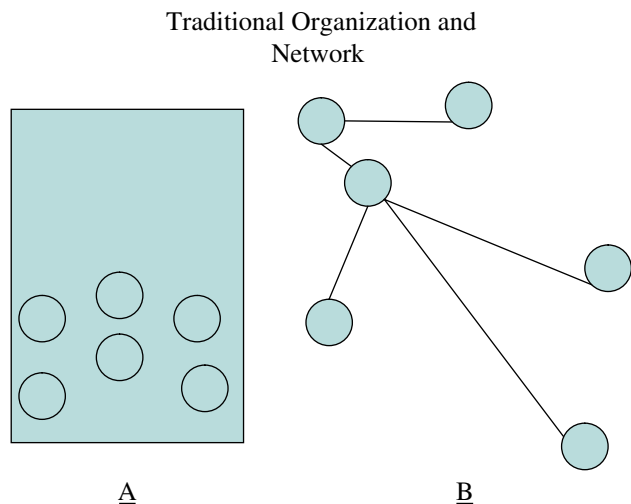


Fig. 1. Traditional organizational and emerging network structures.

² A complete description of this case can be found in [17].

portion of them were acutely toxic and an even larger portion produced discharges that were not suitable for reproduction of aquatic life (Ausley [17]).

When the POTWs were found to have failed the toxicity compliance test, engineering firms were called in to give estimates on what changes in treatment plant design would be necessary to achieve a compliant, non-toxic wastewater. Costs to improve treatment plant designs were very large, estimated in the tens of millions of dollars, and it was unclear if the design changes could produce nontoxic treated effluents. Since budgetary constraints dictated that new treatment facilities were too costly, it was obvious that another approach was necessary. It was also clear that these engineers, working within the mental models dictated by the framework of corporations, did not have the answers to resolving these challenges.

Because of the nature of environmental regulations, NCDWQ was required to send notices of violation to the POTWs, with fines levied. To avoid the fines, the POTW had to produce an action plan, which when accepted by the technical compliance branches of NCDWQ, produced a period of grace for the POTW while it resolved the problems, either by plant construction or by some other method. Since plant construction was not a viable economic option for many communities, “some other method” had to be devised. This resulted in opening dialogues with stakeholder groups, biologists and chemists, which were outside of the “normal” engineering based waste treatment conversations.

Historically, the implementation of the 1974 Clean Water Act resulted in the engineering of additional filters on waste treatment facilities. These filters were costly to develop, produce and maintain and importantly, were not economically productive investments. As integrated approaches to pollution management matured, it became apparent that there was an alternative to additional treatment for industrial waste streams, “Pollution Prevention.” Pollution Prevention (P-2) is the concept and approach that emphasizes rather than use wastewater filters, it is more prudent to redesign industrial processes to prevent the production of pollutants at their sources, in the first place. With the advent of environmental management systems in the mid 1990s, P-2 efforts became formalized and recognized as additional tools for pollution abatement and were also called “Cleaner Production.” An example of the evolution of policy, P-2, and globalization can be found in an associated case of the textile industry in Denmark. This case demonstrated the effects of reengineering processes, factories, and the chemicals used in textiles and the invention of new waste treatment methods. The case also demonstrated, sadly, that some of the industry left Denmark and moved into less regulated countries to avoid environmental costs of any kind (Sondergard [18]).

In the parallel North Carolina situation, historically and up to the mid-1990s, the textile industry was very important to the economic well being of the area. The challenge was to design an ad hoc inter-organizational network structure that included all the stakeholders to operate and supervise the P-2 effort and retain the industry as a viable economic force in the state. The network had to be designed to include controls and benchmarks that would allow NCDWQ to convince USEPA that

a “grace period” could be allowed while the alliance of industry, POTW, NCDWQ, consultants, and stakeholders diagnosed the problem and developed the environmental management system. This involved elevating the level of confidence in a closely monitored dialogue-based process to the same level of respect given to the construction of additional waste treatment facilities.

3. The nature of the inter-organizational network in promoting sustainable development

An inter-organizational network (ION), such as the one required for North Carolina’s Toxicity Prevention program, is a strategic partnership or alliance among the stakeholders who come together to collaboratively address and resolve mutual concerns regarding sustainable development and production methods. The ION is both larger and greater than the individual stakeholder organizations that comprise it, and the structure and processes of this superordinate entity directly impact stakeholder collaboration and consensus building efforts. For instance, the network that connected the various institutional stakeholders to NC’s P-2 program had no hierarchical power and authority; it was a loosely coupled, dynamic political system, rather than a tightly bonded, homogeneous, hierarchically controlled system, however, critical stakeholders included the USEPA, NCDWQ, the local POTWs, NGOs, the public, the textile industry, and the textile industry supply chain.

Inter-organizational networks such as this one behave more as a group of affiliates than a traditional supply chain network. They are like an organizational sandbox, where shifting roles and structures can be experimental. Furthermore, effective negotiations within IONs require the relaxing of stakeholder organizational boundaries, as the power structures are more democratic. Of the three types of networks (internal, stable, and dynamic) identified by Miles and Snow [19], the institutional arrangement among the stakeholders for sustainable development is most like a dynamic network, i.e., an ad hoc alliance among the strategic stakeholders. Each stakeholder organization is independent and collaborates on a specific project or opportunity, based on its skills and expertise (Van Alstyne [20]). While it exists, this network is a “highly decentralized and densely integrated social system that maximizes mutual influence and communication” (Bovasso [21]). It may also act like a matrix structure utilized in many research and development settings, where resources are used as needs emerge, toward the achievement of a common goal (Susskind [22]).

The inter-organizational arrangements required for NC’s sustainable textile industry production shared the key principles of networked organizations (Lipnack and Stamps [23], Surowiecki [24]).

3.1. Unifying purpose

The stakeholder organizations became networked when there was a consensus about the value and goal of

collaboration on sustainable industrial development and production practices and pollution prevention.

3.2. Independent members

Each member of the network, whether an individual or a stakeholder organization, could stand on its own while benefiting from being part of the whole.

3.3. Voluntary links

The links that connected sustainable development stakeholders in various combinations were far more profuse and omni-directional than in other types of organizations. As communication pathways increased, the links continued to grow and develop.

3.4. Multiple leaders

The inter-organizational network tended to be leaderful, rather than leaderless. Each person or group (stakeholder) in the network had something unique to contribute. With more than one leader, the network, as a whole, had great resilience.

3.5. Integrated levels

The NC textile industry sustainable development ION was multileveled rather than flat. Hence, the network tended to be lumpy with small groups and clustered with coalitions across the various stakeholder organizations.

All stakeholders had crucial roles to play. Each was necessary to provide the advocacy and skill set to solve the toxicity problem, but these groups knew little about the intricacies of each other's operations and did not trust each other. These dynamics are explored in the following discussion of the inter-organizational network as a "Virtual Web." The analogy to the World Wide Web (WWW) is intentional. When the WWW is accessed, the user trusts that the connection will be made to the information source. The source is used, the information retained or discarded, and the link saved or discarded. A similar dynamic was developed in the North Carolina situation: the network was developed, the links were forged and data flow occurred. Thus, the network functioned as intended.

4. The sustainable development network as a "Virtual Web"

Since introduction of the term, "virtual organization" (Moshowitz [25]), there have been many definitions to describe this form of network organization (Goldman and Nagel [26]; Hardwick et al. [27]; Upton and McAfee [28]). Translated in terms of an ION, "virtualness" (Venkatraman and Henderson [29]) is the ability of the network to involve multiple stakeholders in value-adding shared learning processes, in order to create integrated solutions to complex sustainable industrial development and production issues.

Franke's concept of the "virtual Web" [30], developed in the context of computer networks, has been borrowed and adapted to further clarify the dimensions of a sustainable development network. While not an actual organizational entity, the virtual web is a dynamic sort of network among the stakeholders. The virtual web is created when a pool of independent stakeholders agrees in principle to form an alliance or partnership to collaborate around effective sustainable industrial development and production practices. This can be further described as the development of domains in which a set of organized stakeholders act as "routers" forming network connections. The three requirements for the success of a virtual web were, similarly, prerequisites for the success of NC's textile industry ION: (1) participation by all relevant stakeholders, (2) sound decision-making processes based on clear common objectives, and (3) strong legitimacy, derived from the stakeholders (Franke [30]).

Two concepts from the computer science field: "multiplexing" and "virtual memory" explain the interrelation between the words virtual and organization (Savage [31]) and illustrate the power of looking at a sustainable development network as a virtual web. Multiplexing refers to the parallel transmission of more than one message over a single line. Individuals within various stakeholder organizations of the NC textile industry ION learned to multiplex by simultaneously and in parallel grasping their stakeholder-specific interests and recognizing the larger, virtual web perspective. Furthermore, if any of the stakeholders decided not to participate or communicate, the work of the network could continue as only that one connection was severed. A decentralized multi-stakeholder network, when combined with multiplexing communication and a firm plan for data storage and external communication (creation of loops), also offers a powerful structure that can lend equity: the communication infrastructure is not owned by any one node but is dependent on all nodes for value (Senge [32]).

The concept of virtual memory enables computer systems to run much larger programs than their physical memory would allow by swapping blocks of information into and out of random access memory as needed. Similarly, by swapping blocks of information among stakeholder organizations, the NC textile industry ION was able to create a virtual memory bank that could be retained and therefore operate a much larger sustainable development program, i.e., comprehend a systemic view of the issues and use retained learning. This volume of shared learning, made possible through the virtual web, created a "conceptual infrastructure" (Manring et al. [33]) for addressing textile industry-related aquatic toxicity issues, with built-in requirements for disclosure, accountability, and reconciliation.

There are multiple links in the virtual web that connect the stakeholder organizations in a sustainable development network. These links continue to grow, develop, or dissolve and produce value-added processes as communication pathways increase and trust strengthens among the stakeholders. The "spiral of trust" (Franke [30]) that subsequently develops within a network was a key property and sensibility developed

within the North Carolina sustainable development network. The commitment to the partnership offered both a forum of stability and a high level of motivation for all collaborating organizations.

In the case of the NC textile industry ION, the NCDWQ firmly believed in the positive nature of Pollution Prevention. It had formed its own P-2 group, which was a separate entity from its enforcement branch, and which acted as an independent consultant to industry. Therefore, when this opportunity to solve the aquatic toxicity problems presented itself, one of the key stakeholders in the first ION was the NC P-2 group, who acted as the feedback loop of the NCDWQ. This immediately produced credibility for the effort. The NC P-2 documented and published the results of the toxicity reduction evaluation (TRE), thereby making the information available to the statewide network of consultants via the Internet. This allowed the network to grow and spread information quickly, which is another attribute of networks.

5. Leadership and learning in a sustainable development network

Dynamic networks tend to be managed by what Miles and Snow [19] called a “net-broker” and what the World Wide Web calls “routers” (Surowiecki [24]). The function of the broker, or router, of a dynamic network is not necessarily part of a single organization. On the macro-organizational level, the net-broker (router) manages the network and may also serve as facilitator, coordinator, and moderator among stakeholder members of the ION. In the case of the NC textile industry ION, credible and transparent leadership was a key to success. The duties of the net-broker, articulated by Franke [30], have been adapted for the management of a sustainable development network, with examples from the NC textile industry ION.

5.1. Initiation and preparation of the network

When the first NC textile industry ION was formed, it was decided that a consultant would be hired by the POTW to lead local efforts to organize the stakeholders. This was very important to the textile industries that discharged to the treatment system, as they wanted an impartial “expert” to communicate with NCDWQ and to act as a quality supervisor to the process. In this preparation phase, a primary task of the consultant, serving as the net-broker (router), was to create a common bond and to promote mutual trust. The net-broker also became a trust bridge: stakeholders trusted the consultant before they really knew or trusted each other. By trusting the consultant, the stakeholders allowed the formation of connections among themselves, routed by the net-broker-consultant.

5.2. Maintaining and improving the network collaboration

The consultant facilitated the processes that promoted negotiations of the problem definition, standardized practices,

and sped up the partnering among network members. Since the textile industry had been determined to be a primary cause of the aquatic toxicity, it was felt that the consultant should understand textile operations, the bioassay testing, and be active in the areas of aquatic toxicity identification and reduction evaluation. The consultant would devise and supervise the project design and implementation, run the stakeholder meetings, and provide the progress reports to all stakeholders.

5.3. Promoting the partnership concept

This managerial function of promoting the partnership concept has been described as “caretaker” (Snow et al. [34]). Once the consultant was hired, all of the industries in the town and any other interested stakeholders were invited to a meeting hosted at the local municipal building. The NCDWQ was present and endorsed the process. The process that was to take place was made transparent, and every person or group who wanted to speak was given the opportunity.

5.4. Monitoring and continuously improving network performance

The NCDWQ accepted the ION’s proposal to identify and then eliminate the toxic agents responsible for the aquatic toxicity. During the one year initial time period of toxicity reduction evaluation (TRE), no fines were assessed, but adherence to action plans with timelines and progress reports were absolutely necessary. NCDWQ made clear the penalties and fines that would be levied against the POTW, if full cooperation was not obtained from every stakeholder involved. The carrot was the vast amount of potential savings to the POTW and industries by avoiding POTW construction. The stick was the huge fines and increased costs to everyone if the problem had to be resolved by building additional treatment facilities.

5.5. Responding to opportunities

As architect, the net-broker identifies individual activities for stakeholders that respond to opportunities in the internal and external environment of the network (Snow et al. [34]). One such step the broker may take is to create a “virtual value chain” Franke [30]. For instance, the net-broker in a sustainable development network knows the resources and competencies of the stakeholders and designs a virtual value chain that coordinates and integrates stakeholder contributions and responses to internal and external opportunities. Similar to Franke’s description of an entrepreneur [30], the most valuable asset of the net-broker in an ecosystem management network is social capital, and the core competence is social contracting.

In the case of the NC textile industry ION, there was a complex matrix of resources available for the consultant’s use (see Fig. 2). The POTW provided sampling services and records of treatment plant operations on an hourly basis. The textile industry supplied chemical and production data with ecotoxicity data on each chemical used in production, including water treatment chemicals and janitorial chemicals (Ausley

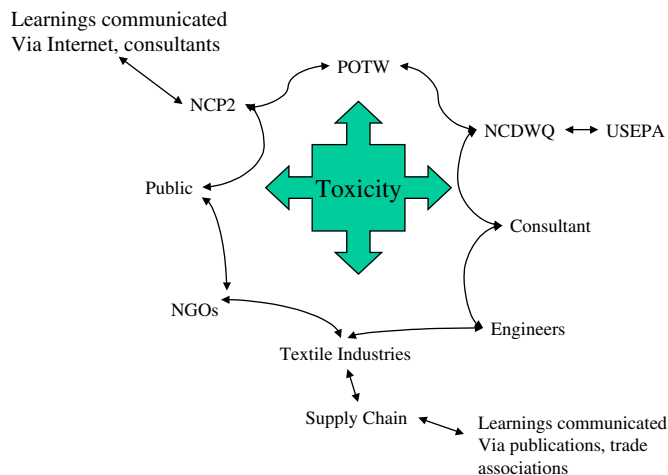


Fig. 2. North Carolina textile industry ION structure.

[17]). The NCDWQ, through its P-2 branch, provided process optimization and pollution prevention consulting services and experts from North Carolina State University and other University of North Carolina system resources. The consultant's laboratories ran the necessary bioassays and flow studies to measure the response from the process changes.

When the NC textile industry ION became more of an intentional learning community, it began to create its own culture Franke [30]. This phenomenon can be understood more clearly by looking at the ION as a virtual learning organization.

6. The sustainable development network as a virtual learning organization

Sustainable development practices and organizational learning theory have an important objective in common: to achieve a state of generativeness of the system or organization, as opposed to a mere survival of the system or organization. Achieving this state of generative learning requires a new paradigm of consensus building through collaboration among stakeholders. According to Senge, "In an increasingly dynamic, interdependent, and unpredictable world, it is simply no longer possible for anyone to 'figure it all out at the top.' The old model, 'the top thinks and the local acts,' must now give way to integrating thinking and acting at all levels" (Senge [32]). The partnerships that form to address sustainable industrial development and production cannot achieve their goals by using mechanical, linear forms of thinking that assume there is a convergent problem with a right answer. These partnerships must intentionally become a learning organization that effectively incorporates systems thinking, collaborative learning, and consensus-based decision making in order to deal with complex problems for which there are no simple answers. Together the stakeholders in the sustainable development network engage in a continuous learning process as they create a virtual learning organization in a conceptual space that did not exist until they joined to develop their collaboration processes (Manring et al. [33]).

Fifteen years ago, the learning organization was described as a "consummately adaptive enterprise" (Damaine [35]). A single organization might still be tempted to use adaptive, "single-loop" learning as a means of coping more effectively with environmental change (Argyris and Schon [36]). However, by its essence, a sustainable development network of stakeholder organizations provides the multiplicity of perspectives necessary for divergent, generative learning, which is about creating, rather than adapting. Generative learning is a "double-loop," self-questioning mode (Argyris and Schon [36]). While the starting point for the stakeholders would be their own organization's norms, assumptions, perspectives, and goals, the network's collaborative, generative learning processes would result in essentially new ways of looking at sustainable development and production issues (triple-loop learning) (Flood and Romm [37]). Ultimately, the network would produce systemic solutions that transcend individual stakeholder boundaries and views. This is the product of network learning; the capacity to think together. The core technologies of a sustainable development network are generative learning and consensus building through collaboration (Manring et al. [33]).

In the case of the NC textile industry ION, the network meetings from the outset were much more collaborative than contentious. It became evident to everyone that all could cooperate and improve with a relatively small expense. Therefore, the textile industry people immediately began to contact their suppliers and add them as a resource to the network. They made it clear that the chemical suppliers must become active in the ION, and if the current products were not satisfactory, cooperative vendors (competitors) would be given the opportunity to supply biodegradable and less toxic alternatives. Once the textile industry understood how the concentrations and the toxicity of certain chemicals would affect the POTW operations, market forces took over and a flood of "greener" chemistries began to appear. This market phenomenon was also reported in the Danish textile industry (Sondergard [18]).

Monthly progress reports were sent to all parties. The ION stakeholders agreed and approved the quarterly reports that had to be sent to NCDWQ. As the process moved forward, several industries had suppliers that did not have the resources to provide the necessary data on their chemical products, so other vendors were found. This provided an incentive for a competitive market in greener chemistries. The longest delays were caused by the lack of data and the time it took to obtain the data on the various textile chemicals which had not been tested in this fashion before (Ausley [17]).

The five essential disciplines for a learning organization (Senge [38]) had direct relevance for the NC textile industry ION.

6.1. Building a shared vision—the practice of unearthing shared pictures of the future that foster genuine commitment

The purpose of the ION was to be generative, i.e., to be creative in finding sustainable solutions that satisfied multiple

stakeholder interests. This process depended on the abilities of the people who comprised the network to build commitment to a shared vision that transcended their individual organizational boundaries. The essential point here is what the vision did, not what the vision was (Fulmer and Keys [39]). The ION had to build the conceptual underpinnings and network infrastructure that supported the systemic, sustainable perspective.

6.2. Personal mastery—becoming increasingly self-aware and honing the skill of continually clarifying and deepening one's personal vision

The process of committing to the “green chemistry” vision required transformation on the parts of the individual members, whether they were individual persons or organizations. While individuals joined the network to represent their organization's interests, in order to be part of the generative process of creating systemic solutions, these individuals had to share their mental models and stretch to transcend their personal and organizational worldviews.

6.3. Surfacing and testing mental models—the ability to unearth one's internal pictures of the world, to scrutinize them, and to make them open to the influence of others; the willingness to discard old ways of thinking and standard problem-solving routines

The stakeholders of the ION shared in creating a “community of commitment,” to resolving the toxicity problem while retaining the industry in North Carolina, which is at the heart of an effective sustainable development network (Kofman and Senge [40]). Over time, commitment became increasingly focused on generative learning about sustainable textile industrial development and production methods, not on a specific solution. The nature of the commitment required to build a sustainable development network went beyond the stakeholders' commitments to their own organizations. It encompassed a commitment to the changes needed in managing sustainable approaches to textile production and to seeing one's organization as one (but only one) of the essential vehicles for bringing about such changes. Building the network and forging the links between stakeholders became a large part of the ION's purpose.

6.4. Team learning—the capacity to think together which is gained by mastering the practice of dialogue and discussion

As the ION stakeholders collaborated in creating a systemic, sustainable perspective, they shifted their thinking from the primacy of their individual stakeholder organization's view, to the primacy of the whole: from the absolute truths derived from their individual stakeholder organization's goals and assumptions, to coherent interpretations based on new collaborative, transformational ways of looking at sustainable development.

This new conceptual perspective by the sustainable development network is analogous to what Senge calls holographic thinking [32]). He explains, “If you cut a photograph in half, each half shows only part of the whole image. But if you divide a hologram (a three-dimensional image created by interacting light sources) each part, no matter how small, shows the whole image intact. Likewise, when a group of people comes to share a vision for an organization, each person sees an individual picture of the organization at its best. Each shares responsibility for the whole, not just for one piece. But the component pieces of the hologram are not identical. Each represents the whole image from a different point of view” (Senge [32]).

6.5. Systems thinking—the discipline that integrates other perspectives, fusing them into a coherent body of knowledge

When the pieces of a hologram are added up, something interesting happens: “The image becomes more intense, more lifelike. When more people come to share a vision, the vision becomes more real in the sense of a mental reality that people can truly imagine achieving. They now have partners, co-creators” (Senge [32]). This is the product of network learning—the capacity to think together. Hence, with its capacity for multiplexing and virtual memory, a sustainable development network can build consensus around a systemic view of sustainable development that transcends individual stakeholder organizations' overemphasis on competition, and reactivity (the primacy of the pieces) and create a holographic image that reflects the primacy of the whole.

7. Results of the North Carolina P-2 Project

In the case of the NC textile industry ION, the results were better than expected. Within three months of beginning projects, significant improvements occurred from suggested process changes and chemical substitutions. In some cases, poor POTW operations were found. In others, the sporadic use of a toxic chemical had to be uncovered. In still other cases, toxic surfactants and textile products were discovered. Background levels of pesticides, not from any specific industry, were also found to be contributory factors. In every case, however, the toxicants were identified and efficiencies were gained in waste treatment and in textile mill operations, with the end result of improved water quality and the ability to pass the bioassay monitoring tests.

A side benefit to this process was that the POTW and industry personnel learned more about each other's challenges. Efficiencies resulted from new levels of cooperation. The textile industry and the NCDWQ P-2 group published its findings. Problem chemicals disappeared from the marketplace and were replaced with the “greener” products and processes that evolved from the experiences of these groups. Over 10 toxicity investigations and reduction efforts were performed during the period of 1985–1995 in NC, and only one or two remain unsatisfactorily resolved. Globalization unfortunately

intervened in these efforts. Since 1995 and the advent of the WTO and NAFTA, the textile industry has essentially left NC, mirroring, in many ways, the Danish case. The industry leaving North Carolina diminished the impact of the textile industry on the State's surface waters, so long term records of the ION's operations and influence are not available.

The lasting legacies of this NC P-2 project are the demonstration that aquatic pollution prevention is possible and the cleaner water that results from pollution prevention. Initially, the USEPA had said that the P-2 process would not work. At that time, the standard operating procedure of the USEPA was to regulate through fines, based solely on numerical limits to toxicity levels that might or might not relate to the biology of the receiving waters. The state of NC proved that pollution prevention and sustainable development was not so much a matter of diagnostics and technology as it was using policy management with performance-based standards and an inter-organizational network of mutually committed stakeholders.

8. Discussion and conclusions

This paper contributes interdisciplinary perspectives of networks, virtual webs, and learning organizations to sustainable industrial development and production. It is intended to deepen understanding and appreciation of the superordinate entity, the inter-organizational network that provides a context for stakeholder collaboration. The model provides useful knowledge and language for heightening awareness about the structure and dynamics of the virtual entity created by the processes of dialogue, exchanges of information, record keeping, and learnings among multiple stakeholders. Once the dimensions (activities) of this virtual network are actually perceived and acknowledged, it can be more effectively managed.

Large public challenges, such as environmental issues and achieving the goals of sustainable development and production, require increasingly efficient multi-stakeholder dialogues (Weizsäcker [41]). It is the nature of IONs to come together to solve problems and then disband. This is facilitated by the existence of multiple communication lines and no physical structures. Inter-organizational networks provide a very efficient means of organizing and utilizing disparate resources, without burdensome organizational structure (Capra [42]), but their lack of physical structure also hurts their credibility with enterprises seeking security in problem solving. These concerns may disappear as more enterprises, based on independent networks, develop credible economic success.

Sustainable development is redefining the purpose of business enterprises to encompass a triple bottom line of People, Planet and Profits; hence, the number of stakeholders impacted by the growing global economy becomes almost universal. Creating inter-organizational network structures that utilize divergent resources toward achieving broad common goals is becoming a necessity, as the number and diversity of stakeholders increase. The NC textile industry case study demonstrates how the use of a conceptual framework can serve as an educational tool that guides the creation of institutional

arrangements, coordinates the intentional, systematic development of all stakeholders in an inter-organizational network, and integrates the ecological, economic, and social dimensions of cleaner production.

The availability of cases illustrating the evolution of sustainable enterprises through networking has deep ramifications for business school pedagogy. The set of skills required by business graduates who will be managing in a globalized marketplace that is increasingly influenced by civil society and the push for sustainable enterprise, is much different than the skill set required to operate within the corporate box where alignment is dictated by the organization itself. This need for new and diverse skills is not going unnoticed by the marketplace or the media (Pink [43]; Nussbaum and Tiplady [44]). Traditional MBA graduates have the skills to navigate within a corporate structure and speak the language of strategy, finance and operations management, but today's business schools much ensure that graduates can effectively negotiate outside the corporate box with diverse stakeholders that increasingly hold sway over corporate strategy and profits.

The value of understanding networks and linking stakeholders was recently demonstrated in an MBA experience. Students who had been introduced previously to the concepts of networking and sustainability, through analysis of this case and other materials, took these new perspectives to traditional business simulation exercises and offered completely different viewpoints than had ever been presented before in an MBA capstone class. Incorporating the dimensions of social and environmental responsibility changed the dynamics of the decisions that the students made. As the groups with training in sustainable enterprise examined the dimensions of the traditional business simulation exercise, they raised different kinds of questions such as: How would our business decisions affect the local environment and community? Will our decisions affect relations with employees and suppliers? What do the local distribution and supply channels offer local customers, vs. a globalized supply chain?

Using cases such as this one as pedagogical tools can help prepare students for the actual challenges facing managers in the rapidly changing business environment, for example: (a) developing inter-organizational dialogue skills; (b) utilizing the efficiencies of network vs. traditional organizational structures; (c) valuing diversity in networks; and (d) forming links among stakeholders to develop a network. These are key lessons and skills for future business leaders who must develop new mental models for effective management in the 21st century as globalization occurs and the small world phenomena accelerate.

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