

# Ergonomics Contributions to Company Strategies

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# **Ergonomics Contributions to Company Strategies**

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### **Abstract**

Managers usually associate ergonomics with occupational health and safety and related legislation, not with business performance. In many companies, these decision makers seem not to be positively motivated to apply ergonomics for reasons of improving health and safety. In order to strengthen the position of ergonomics and ergonomists in the business and management world, we discuss company strategies and business goals to which ergonomics could contribute. Conceptual models are presented and examples are given to illustrate: 1) the present situation in which ergonomics is not part of regular planning and control cycles in organizations to ensure business performance, and 2) the desired situation in which ergonomics is an integrated part of strategy formulation and implementation. In order to realize the desired situation, considerable changes must take place within the ergonomics research, education and practice community by moving from a health ergonomics paradigm to a business ergonomics paradigm, without losing the health and safety goals.

### **Keywords**

Corporate strategy, system performance, paradigm shift

## 1. Introduction

The value of ergonomics extends beyond health and safety. This discussion paper emphasizes how --while maintaining health and safety of consumers and workers-- ergonomics can support a company's business strategy to stay competitive. For this discussion we employ the broad definition of ergonomics, proposed by the International Ergonomics Association (IEA):

*“Ergonomics (or human factors) is ... concerned with the understanding of interactions among humans and other elements of a system, ...in order to optimize human well-being and overall system performance.”* (IEA Council, 2000).

The definition implies that ergonomics has both a social goal (well-being) and an economic goal (total system performance); that ergonomics considers both physical and psychological human aspects; and that ergonomics is looking for solutions in both technical and organizational domains. Performance aspects could include output volume, lead time, production flexibility, quality levels and operating cost among others.

### 1.1. The Problem of Ergonomics

During the past 25 years, several authors have emphasized that ergonomics has had a problem being accepted by business managers. In an essay in the *Administrative Science Quarterly*, Perrow (1983) argued that the problem of ergonomics is that too few ergonomists work in companies; that they have no control over budgets and people; and that they are seen solely as protectors of workers, rather than builders of systems - for example by not blaming human errors on workers but on designers and managers instead. Hal Hendrick, the former president of the International Ergonomics Association (IEA), wondered *“Why it is ... that more organizations, with their strong need to obtain employee commitment, reduce expenses, and increase productivity, are not banging down our doors for help...”* (Hendrick, 1996, p 2). He suggested that there are too many examples of bad ergonomics, that ergonomists --wrongly-- presume that others are convinced of the importance of ergonomics, and that the benefits of ergonomics are not well documented.

Another major concern among ergonomists is that ergonomics is considered too late in the design process (Breedveld and Dul, 2005; Helander, 1999; Imbeau, 2001; Jensen, 2002). Once strategic design decisions about products or processes have been made, the majority of resources are already committed so that the cost for any change increases dramatically (Miles and Swift, 1998). Under these circumstances, only minor 'ergonomic' adaptations and corrections can be made and ergonomics is experienced as a time-consuming and costly activity. In such situations, the potential of ergonomics to contribute positively to the design is limited.

Managers generally do not associate ergonomics with organizational effectiveness, but rather with health issues (Jenkins and Rickards, 2001) and related costs of sickness absence and disorders, although even the contribution of ergonomics to health and safety is not always recognized. Managers are not to be blamed for that. It appears that ergonomists hardly ever write articles on ergonomics in business and management journals (Dul 2003a), limiting the possibilities to expand the management community's perception of the many benefits available via ergonomics. The few articles that refer to ergonomics confirmed to readers that ergonomics has a limited scope (physical ergonomics). Furthermore, in many countries, ergonomics is closely linked to occupational health and safety legislation. Discussions in the USA on OSHA's 'Ergonomics Rule' gave the general public and managers the impression that ergonomics is about work-related musculoskeletal disorders; and that prevention of these disorders is a heavy financial burden for companies, resulting in debates on the costs of ergonomics and the validity of ergonomics knowledge, and in explicit negative publications denouncing ergonomics (e.g. Scalia, 2001). Applying ergonomics solely to fulfil health and safety or legislative objectives may be only a 'negative' motivator for managers: that is, fear of negative consequences such as sick leave, accidents and associated costs. Then, managers often outsource the responsibility for healthy employees and safe work to a health and safety consultant or department. Indeed, most often ergonomists themselves work on the basis of a health and safety paradigm and focus on workplace hazards (Whysall et al, 2004).

### *1.2 Direction for a Solution*

We argue that the present situation, where ergonomics is linked to health and safety should not be the only basis for applying ergonomics in organizations. We suggest that if ergonomics contributes directly to the company's strategy, and in the language of the company, it will be more accepted by business managers; it will be better embedded (internalised) in the organization; and its full potential as described in the IEA definition will be better actualized (Dul and Neumann, 2005). Also it will be easier to obtain health and safety improvements, if managers understand that the ergonomic improvements will *simultaneously* help them realise their primary strategic business goals.

Currently many managers and ergonomists may not be used to thinking in terms of the strategic objectives within the firm and the strategic opportunities provided by ergonomics to help reach core business goals. In this paper, we will explore new opportunities and challenges for ergonomics by describing possible relationships between ergonomics and company strategies. Our goal is to present a broad overview of possible business strategies to which ergonomics research, education and practice could be linked, rather than describing the links in detail. This paper also should support ergonomists in their efforts to develop their 'business' language so as to improve their ability to communicate with the business and management world.

## 2. Strategy and Ergonomics

'Strategy' may be a useful connection point through which organizations might begin to internalise ergonomics because strategy a) has top management priority and, b) is normally broadly communicated and implemented in the organization. Connecting ergonomics to the company's strategy may provide managers with a more 'positive' motivation to apply ergonomics: not only can ergonomics create opportunities for safe and healthy work, but it can also improve system performance.

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INSERT FIGURE 1 ABOUT HERE  
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We consider strategy as the combination of 'strategy concept' (the formulation of a course of action for reaching business goals) and 'strategy implementation' (realization of this concept). The upper part of Figure 1 shows a simplified relationship between the formulated strategy concept ("theory"), its implementation ("practice"), and the business outcomes. Several types of desired business outcomes can be distinguished. For this discussion, we consider three groups of business outcomes: ultimate financial business goals (e.g. turnover, profit); and two groups of intermediate business goals, effectiveness (e.g. quality) and efficiency (e.g. productivity). Firms typically use feed forward and feedback systems of dynamic planning and control cycles, including business plans, targets, evaluations, rewards, etc., to guarantee that ultimate and intermediate business outcomes will be realized.

### *2.1 Setting the Stage for Strategic Ergonomics*

Ergonomics is usually not part of the primary strategy to reach desired business outcomes and their related planning and control cycles. As argued above, ergonomics is often considered as separate from the main strategic objectives of the company and forced by legislation, which is a view that may be shared by both managers and health and safety professionals. This is shown in the lower part of Figure 1. In companies, ergonomics is typically linked to occupational health and safety (OHS) goals and to a company's obligation to fulfil OHS legislation, and therefore may be delegated to health and safety departments who are not connected to strategic decision making processes. Feedback to managers may eventually come in the form of injuries, absenteeism, and labour turn-over, or ultimately from labour inspection. This feedback typically comes with a delay, long after the design is implemented, so it may never reach design teams (Perrow 1983). Feedback delay inhibits effective management and organisational learning (Senge, 1990).

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 INSERT FIGURE 2 ABOUT HERE  
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In order to stimulate the uptake of ergonomics, without relying on OHS legislation, it seems necessary to explicitly relate ergonomics to business strategy. This is shown in Figure 2 by the



arrows from 'Ergonomics' to 'Strategy concept' and 'Strategy implementation', and business outcomes. If it can be shown that ergonomics is related to strategy, ergonomics will be considered as a tool to realize desired business outcomes as shown by the arrows from 'Strategy concept' and 'Strategy implementation' to 'Ergonomics' and from 'Ergonomics' to 'Business goals'. In order to further explore how ergonomics can be linked to strategy we first divide the general concept of strategy into strategic 'arenas' within the firm.

## *2.2 Strategy Arenas*

To be able to focus more precisely on how ergonomics can be capitalized on within an organization, we split strategy into strategy arenas and list these here in sequence of increasing scope:

- 1) **Business Function Strategies:** Each business function, such as Product Design, Operations, Marketing, Human Resource Management, or Finance will have their own strategic goals. Middle managers and employees from these business functions often have different 'languages' of their daily business. Here, ergonomics must show that it can support the chosen strategies, tactics and performance indicators of the functional field.
- 2) **Cross-functional strategies:** Cross-functional strategies involve two or more business functions; hence, several corresponding middle managers and employees from these business functions will be primary stakeholders. Total Quality Management (TQM) is an example of a cross-functional strategy affecting several business functions. Ergonomics must show here that it can add value to the cross-functional strategies and tactics.
- 3) **Corporate Strategy:** In the corporate strategy arena, the top management of the organization is involved, as well as external stakeholders including shareholders. An example of a corporate strategy is a Cost Strategy in order to compete on the basis of low costs. Here ergonomics must show that it can add value to the corporate business strategy for realizing competitive advantage.

Each strategic arena represents a different set of stakeholders that might affect the way ergonomics is implemented (Neumann et al. 1999). The key decision makers in each area will be influenced by people, agendas, and information from both inside and outside the company. For each strategic arenas, we discuss opportunities for ergonomics.

### **3. Business Function Strategies and Ergonomics**

While there are many different business functions to which ergonomics can be linked, this paper we will focus on the link between ergonomics and Product Design and Innovation, Operations Engineering and Process Innovation, Marketing and Communication, and Human Resource Management.

#### *3.1 Product Design and Innovation*

The business function, 'product design', refers to the design of improved or new products. Companies, in particular in the western world, are increasingly aware that innovation is essential for maintaining a competitive advantage. As all innovations start with a creative idea (Amabile et al. 1996), it has been acknowledged that end users of products and services can be important resources for product design and innovation (Kristensson et al., 2002; Von Hippel, 1986). In the tradition of product ergonomics, user involvement is considered as essential for the development of user-friendly product and services, and the participatory design methods and tools that have been developed in the ergonomics could be useful for linking ergonomics with product innovation.

Ergonomics can not only be used for designing products that fit the needs of end users, but also for the design of products that are easy to produce (Broberg, 1997). Many times products are not designed to accommodate the physical or mental characteristics of the target customer (Norman, 2002). By linking CAD product design information with biomechanical models, it is possible to evaluate the physical load of the user as a design changes, for example in designing a car interior (Kuo an Chu, 2005) .

Design for Assembly (DfA) or Design for Manufacturability (DfM) (Helander and Nagamachi, 1992) is an approach by which the ergonomics of assembly is considered in the

product design stage. By considering production ergonomics in the product design phase, it is possible to avoid all costs associated with corrective ergonomics processes with little extra investment in the design phase. This objective is proving difficult to achieve, although some signs of success here have been reported (Munck-Ulfsfält et al., 2004). Ford, in its corporate ergonomics process, systematically identifies ergonomics problems observed on the floor and directs them to product design teams so the problem can be designed out of future models (Joseph, 2003). Such a feedback approach can support learning amongst the design teams. Sundin et al. (2004) have combined participatory ergonomics approaches with virtual visualization techniques to test and improve product designs for better ergonomics and efficiency in assembly. Hence, ergonomics can be linked to strategies for product design and innovation by assuring that the products fit with the end-users and are easy to produce.

### *3.2 Operations Engineering and Process Innovation*

The 'operations' business function (including production engineering and logistics), determines to a large extent how the operating system is designed. Consequently this function determines the work tasks of operators and its distribution over the working day – essentially defining the ergonomic conditions of the system (Neumann et al., 2002, 2006). There are many different strategic goals that the operations function might prioritise including: throughput time, machine or operator utilisation rates, work in process levels, capital cost, operating costs, system reliability and robustness, flexibility and variant accommodation to name a few. These strategic aims are then met through, what Brassler and Schneider (2001) call, “a bundle of interconnected measures” relating to material and information flows, division of labour, technology and layout choices.

Ergonomics can help to allocate tasks to either people or machines; and to design the system elements in such a way that production system goals are realized without adverse affects for the human operator. For example, in a recent study of 20.000 warehouse order-picks, Larco et al. (2008) showed that human well being and economic goals come together. While end-users may be 'experts' for product innovation, employees maybe 'experts' for process innovation. Employees at any level of the organization are a potential resource for

creativity and innovation (Eisenberger, 1990; Shalley et al. 2004). Employee creativity (including the creativity of designers and engineers) can be enhanced by stimulating organizational and physical work environments. Production ergonomics, with its focus on designing human-centered work environments, can therefore be linked to process innovation (Ceylan et al. 2008; Dul and Ceylan, 2006; Dul et al., 2007). Hence, ergonomics can be linked to strategies for operations engineering and process innovation in order to assure that both production goals and worker well-being are safeguarded.

### *3.3 Marketing and Communication*

The 'marketing and communication' business function deals, amongst other things, with branding of products and services.

Ergonomic products have characteristics like functionality, usability, safety, and comfort, which have positive associations that can be communicated to the customer. Furthermore, ergonomically produced products and services may, similar to 'fair trade' or 'green' products and production processes, target the aware consumer. Ergonomics can be presented as a part of a company's 'corporate social responsibility' and 'corporate sustainability' platforms (Hardjono and De Klein, 2004), particularly when increasing demands are placed on companies to be more than money-making organizations. Thus, the advertising of ergonomics as part of the 'sustainable product' or 'sustainable production' campaigns (Swaen and Vanhamme, 2004) can offer the potential consumer a better product, made in better working conditions, for a better world. A barrier here remains the extent to which a) consumers are prepared to differentiate products based on the working conditions of their manufacture, and b) credible information on the working environment is available. Another perspective here is communication with investors where work environment reports are being used to demonstrate commitment to long-term profitability as means to sell company shares (Goldschmidt et al., 2002). Thus, ergonomics can be linked to marketing and communication strategies by providing reasons for positive (well-being) consumer associations with the company's products and production processes.

### *3.4 Human Resource Management*

The Human Resource Management (HRM) business function primarily deals with the selection and development of the people in the organization. HRM has long been held responsible for working conditions and employee well-being, even though this function tends to have little authority over work system design. The gap between human resources and operations management (OM) has been noted and presents a challenge for the design of work systems that are motivating and productive (Boudreau et al., 2003; Gino and Pisano, 2008).

Having good working conditions presents one strategy for attracting and retaining high-quality employees. The need to attract people to manual assembly jobs in Sweden was one of the driving forces of production system innovation away from traditional Tayloristic line production toward new more productive and attractive solutions (Ellegård et al., 1992). Ergonomics has a long tradition in assuring working conditions for human well-being.

Another HRM strategy is 'High Performance Work Systems' (HPWS), which incorporates elements of employee involvement and empowerment (Den Hartog and Verburg, 2004). HPWS can increase organizational performance (Appelbaum et al., 2000; Datta et al., 2005; Preuss, 2003; Way, 2002), but appears to operate on the HR side of the HR-OM gap. Ergonomics could help bridge this gap as it explicitly includes perspectives of both the human and the work system and carries good workplace design as one of its primary objectives (Helander, 2006). Furthermore, ergonomics can contribute to HPWS with its "participatory ergonomics" (Noro and Imada 1991) and job design approaches.

Hence, ergonomics can be linked to HRM strategies by assuring good working conditions and by engaging in participatory and job design approaches.

While this is not a complete list of all business functions that may exist in a particular organization to which ergonomics might be linked (Dul, 2003a; Dul and Neumann 2005, Ekman Philips, 1990; Neumann et al., 1999), these brief descriptions show that ergonomics can be linked to a range of business functions and hence to the objectives of its stakeholders.

#### **4. Cross-functional Strategies and Ergonomics**

We identify 'cross functional' strategies as a separate aspect of strategy due to the large scope and complex dynamics of strategic processes that span several business functions. In this

paper we examine the strategies 'Lean Production, Business Process Re-engineering, Downsizing', and Total Quality Management. For these strategies to be successful, several business functions must work together to realize an effective implementation. The potential of ergonomics to contribute to each separate business function (see above) may serve as a tool to bridge and integrate business functions.

#### *4.1 Downsizing, Lean Production, Business Process Re-engineering*

Downsizing, Lean Production and Business Process Re-engineering focuses on radical improvements of business processes in order to cut costs and serve customers better. This strategy has received attention from ergonomics because implementations of this strategy can result in reduced employee well-being. For example, Vahtera et al. (1997) have found risk of musculoskeletal disorders to increase by 5.7 times during 'corporate downsizing'. The individual's perception of the downsizing process itself also appears to affect health (Kivimäki et al., 2001; Pepper et al., 2003). Landbergis et al. (1999), in their review of available literature, noted increased negative health outcomes are often associated with the implementation of Lean Manufacturing approaches. In a longitudinal study implementation of lean production was shown to result in job depression and reductions in job control and skill utilization (Parker, 2003). While it is tempting to look at these results and say: 'Downsizing, Lean Production and Business Process Re-engineering is bad ergonomics', this is perhaps not the right conclusion. As our model (Figure 1) points out, strategy includes both a concept and its implementation. While the extent and the manner in which a strategy is realized may vary (Adler and Goldoftas, 1997; Ghobadian and Gallea, 2001; Womack, 1990); it is *the gap* between strategy and practice that may be a more important indicator of (poor) performance than the strategy itself (Rho and Yu, 2001). Conti et al. (2006) in a study of 21 different UK companies found that employee stress related to lean implementations was related to implementation and operational decisions rather than inherent problems with the Toyota Production System / 'lean' model that, according to former Toyota president Fujio Cho, strongly emphasises reducing operator burden (Liker, 2004). It is difficult therefore to determine the ergonomic consequences of strategies directly, without considering the specific implementation for each case. Hence, ergonomics

may help companies to control the negative human effects of the Downsizing, Lean Production and Business Process Re-engineering strategy in order to obtain the real benefits from this strategy.

#### *4.2 Total Quality Management*

Total Quality Management (TQM) is a cross-functional strategy for improving business processes by incremental improvements, involving 'all' employees and 'all' business functions. For the implementation and management of this strategic concept, specific tools can be used. Many European organizations use the EFQM model (European Foundation for Quality Management), which has a Resource Based View (see below) on quality (Ruiz-Carrillo and Fernández-Ortiz, 2005). In this model, nine criteria for quality are considered, including two for people (people enablers and people results). Eskildsen and Dahlgaard (2000) showed that people enablers (e.g. HRM practices) lead indeed to people results (e.g., job satisfaction). Ergonomics can be readily applied to the people enablers of quality, in order to increase quality.

Quality has links to workplace ergonomics (Carayon et al., 1999; Drury, 2000; Eklund, 1995; Joseph, 2003; Lee, 2005). According to Drury (2000), quality is a function of technological and human factors, and is greatly influenced by ergonomics in its broadest sense. Errors in the process can result in product unreliability, poor productivity or even injury to the workforce or product user. A number of empirical studies confirm this view (e.g. Axelsson 2000; Lin et al. 2001; Sen and Yeow 2003; Yeow and Sen 2005). Thus, ergonomics may contribute to TQM by ensuring that people contribute to quality.

### **5. Corporate Strategies and Ergonomics**

#### *5.1 Differentiation Strategy*

According to Porter (1985) a differentiation strategy is one way that a company can use to create competitive advantage. With a differentiation strategy, the company produces and delivers products or services with unique features to attract consumers.

User-friendly or error-free products, created by ergonomic product design, can be such a feature (Dul, 2003b). In a report on the competitiveness of UK technology companies, the UK Department of Trade and Industry (2005) urged companies to place people-centred design at the heart of their Research and Development and innovation activities, and promote a people-centred culture throughout their organizations. For services, customer-friendly service interactions can be a feature to create competitive advantage to which ergonomics could contribute. Hence ergonomics could be linked to a company's differentiation strategy by adding user-friendly features to products and services.

### *5.2 Cost Strategy*

According to Porter (1985) another way to compete is to have a cost strategy: the company competes on the basis of the cost of the product or service.

By ergonomic design of the production system and the elimination of unhealthy or hazardous tasks, the costs per unit can be reduced and labour productivity increased (Abrahamsson, 2000; Beevis, 2003; De Looze, et al. 2003; GAO, 1997; Hendrick, 1996; Koningsveld et al. 2005). Put (2007) found that in manufacturing industries where both humans and machines are important elements of the production process, an ergonomic work environment is a necessary condition for cost leadership. The cost reductions are often larger for performance factors than from health and safety savings alone (Helander and Burri, 1995; Hendrick, 2003; Oxenburgh et al., 2004). Hence, ergonomics could be linked to a company's cost strategy by increasing labour productivity and reducing labour costs.

### *5.3 Resource-based View of the Firm*

The resource-based view (RBV) of the firm (Barney, 1991; Barney and Wright, 1998) assumes that a company can outperform other companies by the way the company combines its technical, human and other resources. The RBV attempts to reach sustained competitive advantage by choosing and developing resources that are valuable, rare, costly to imitate, and exploitable by the organization. Compared to technology resources, human resources and their intellectual capital are much more difficult to copy (Pfeffer, 1995).



When people are considered a key resource, ergonomics can contribute to the maximization of their use and to prevent their outflow. Thus ergonomics, with its ability to support employee retention, can help provide firms with a sustainable competitive advantage in the form of experienced, skilled employees who can perform their best for the company.

#### *5.4 Service Profit Chain*

Heskett et al. (1994) proposed the Service Profit Chain (SPC) model that relates employee satisfaction to customer satisfaction and further to financial performance of a service organization. This concept for service operations has been widely accepted (see for example Pugh et al., 2002) and empirical studies suggest that the relationships between employee satisfaction, customer satisfaction and business performance exist if the employee-customer contact is more important (Dean, 2004; Yee et al. 2008). Several organizational dynamics scholars have shown a renewed interest in the concept that “a happy worker is a productive worker” (Gavin and Mason, 2004; Quick and Quick, 2004; Wright et al., 2002). This concept may be particularly of interest for workers who are in contact with the customer during service delivery.

By its definition, ergonomics can contribute to worker well-being and thereby contribute to the strategy concept of the SPC (Hogenes et al., 2006). In one empirical example of the SPC, a multiple case study showed that managers in service-based warehouses chose ergonomics improvements because of the expected effect on customer satisfaction, not because of health and safety (Janssen et al., 2004). Hence, by increasing employee well-being, ergonomics can be linked to a service profit chain strategy.

### **6. Conceptual Model of Strategy-Ergonomics Relations**

The previous sections show that there are opportunities to link ergonomics to strategy concepts and strategy implementations, though the evidence is still very limited, and not much experience has been reported in the literature on how to realize the link.

We do not see ergonomics, in and of itself, as a strategy. However, since attention to ergonomics can contribute to many different strategies and business outcomes, we see

ergonomics as an important feature of the strategy formulation and implementation process. Thus, strategically speaking, attention to ergonomics can be an important *element* of how a company realizes its competitive advantage. It lies neither on the side of other strategies, nor is it sufficiently aggregated that it can be managed with a separate 'ergonomics process'. In these terms, ergonomics becomes a tool, or a means, rather than an 'end' in and of itself. Capturing the full benefits of ergonomics therefore will require the deliberate integration of ergonomics into core strategy arenas of the organization. This is shown in Figure 3, which is our final model where ergonomics and related OHS goals are partially integrated and embedded in the planning and control cycles of an organization. Here, ergonomics has gained a position on the 'positive' side of the business and contributes directly to the primary business outcomes.

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The scale of application of ergonomics suggested here implies the engagement of many groups and individuals in the organisation. It will take a long time before the situation depicted in Figure 3 is understood and realized on a large scale. However, we believe that explicit linking of ergonomics to the strategy and desired business outcomes is a promising way to realize sustainable growth for firms without the high social costs due to work-related ill health. We see this approach as a way to improve the impact of the ergonomics discipline and its ergonomists in the world of business.

## 7. Implications for the Ergonomist

The question arises of how the ergonomics field can move from the present situation shown in Figure 1 (isolated) to the desired situation shown in Figure 3 (embedded). We believe that ergonomists in research, education and practice (both internal ergonomists that are part of the organization and external consultants), who accept the broad definition of ergonomics presented in the introduction have a crucial role in a) developing the possible links between ergonomics and company's strategies, b) finding evidence for these links, and c)

communicating the links to the business stakeholders who are involved in strategy formulation and implementation. The experience of Volvo's senior ergonomist illustrates this challenge:

*"The ergonomics work is not a separate entity, but is based on the strategy. It was much easier to get the management and other employees to understand, realise, accept and become involved in ergonomics work when they saw the link with the ... strategy."* (Munck-Ulfsfält et al., 2003).

Although our models suggest static links between ergonomics and strategy, in reality the situation can be more dynamic. The ergonomist must consider the dynamic context of the firm and understand the different strategic objectives of stakeholders. Some stakeholders can address health and safety ergonomics based on legislation while simultaneously others pursuing system performance applications. The ergonomist can use a flexible approach to study, teach and practice the integration of ergonomics in organizations and use different languages for different goals. This implies a need for ergonomists to learn to speak new languages with different stakeholders – a task some ergonomists find challenging (Laring et al. 2007; Neumann 2004). This paper provides a conceptual framework to help ergonomists in research, education and practice to understand how to support the strategic objectives of a company.

The exploration of the links between ergonomics and strategy could start with reading business and management magazines and journals; visiting management and business conferences; reading business documents such as the company's annual report and other strategic documents; and engaging with business and management's internal and external networks. Finding evidence for the links between strategy and ergonomics can be done by looking at variables that are directly linked to the business strategy and business goals during the analysis and design of an environment. Engaging senior managers and other stakeholders in discussions surrounding their strategic objectives and how ergonomics applications could support these objectives is both a good way to understand the manager's goals and thinking, and also to demonstrate that the ergonomist's attention is beyond health and safety. The link between ergonomics and strategy must be widely communicated to business managers, and in their own language, rather than the language of health and safety ergonomics. By learning the

'language' of the various strategy stakeholders, the ergonomists will be better equipped to communicate the potential contribution ergonomics can make in each strategic arena. Furthermore, ergonomists can influence strategy by being more than ergonomics experts. The ergonomist can also act as a 'Political Reflective Navigator', who is networking to convince stakeholders about the value of ergonomics (Broberg and Hermund 2004), both in their respective functions and in cross-functional co-operations.

The successful ergonomist in research, education or practice is aware of business strategies and desired business outcomes; knows who are main stakeholders; knows what the benefits of ergonomics may be for these stakeholders; knows how ergonomics can be implemented to realize these benefits; and can communicate with the stakeholders in their own language and networks. By understanding stakeholders' needs and goals and supporting them with good ergonomics, the ergonomists can become indispensable. In other words the ergonomist should become a real partner in the business and management world. In itself, the idea of linking ergonomics to business goals is not new. In the tradition of the ergonomics field, 'system performance' has always been part of the field. The contribution of our paper is that we show what 'system performance' can mean in the context of companies. We indicate how ergonomics can become part of to the core decision processes in a company, by focusing on the possible links between ergonomics and different levels and types of strategies that can co-exist in a company.

## **8. Conclusions**

Ergonomics can contribute to many different company strategies and support the objectives of different business functions and of the organisation as a whole. The proposed linking of ergonomics explicitly to specific business strategies and desired business outcomes, as suggested by the IEA description of ergonomics, remains a great challenge for the ergonomics discipline. For many ergonomists in research, education and practice, it means a paradigm shift, which requires a re-positioning from a primary health ergonomics approach to a more business-oriented ergonomics approach. We argue that, by contributing to the shared goals of business

performance, ergonomists will also be better able to reach their traditional health and safety objectives.

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## Figures

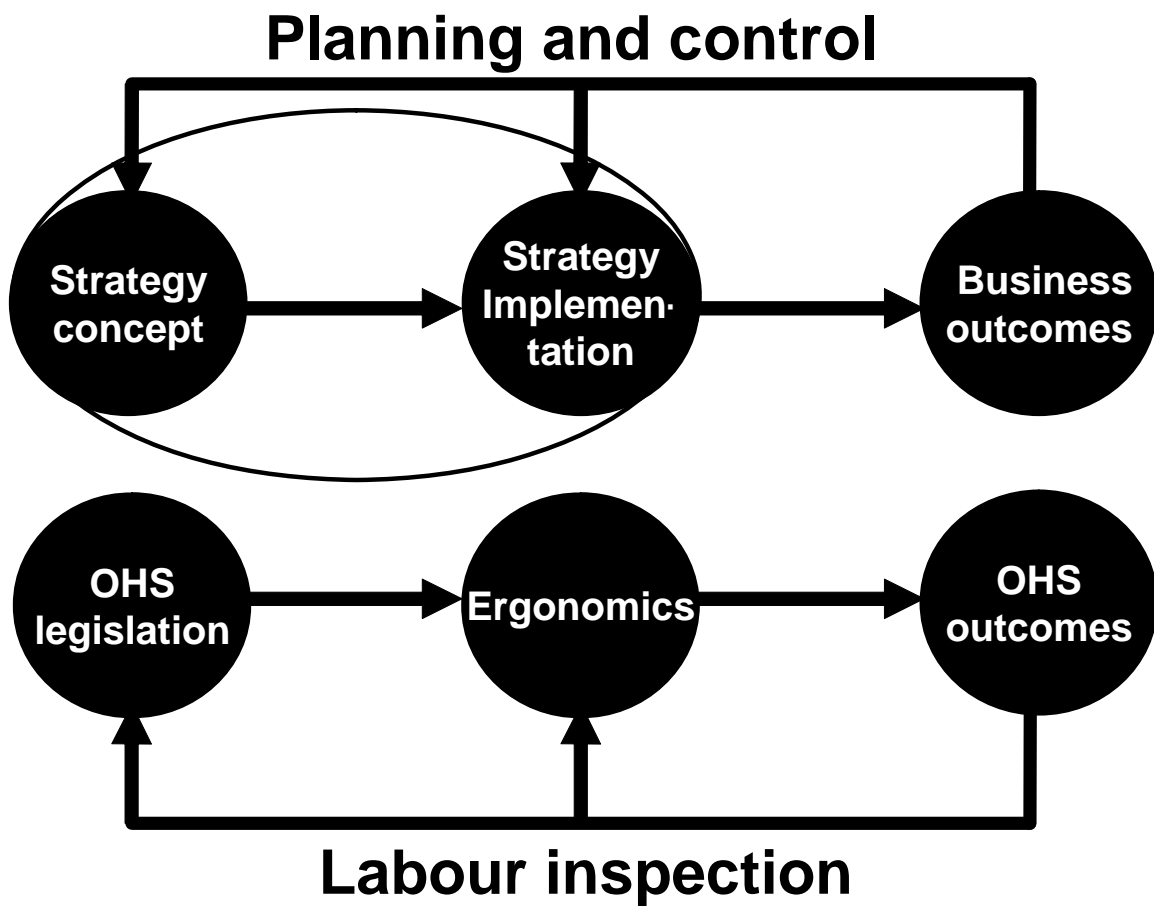


Figure 1

Upper part: The relationship between strategy, strategy concept and strategy implementation) and business outcomes. Lower part: The present isolated position of ergonomics. OHS = Occupational Health and Safety.



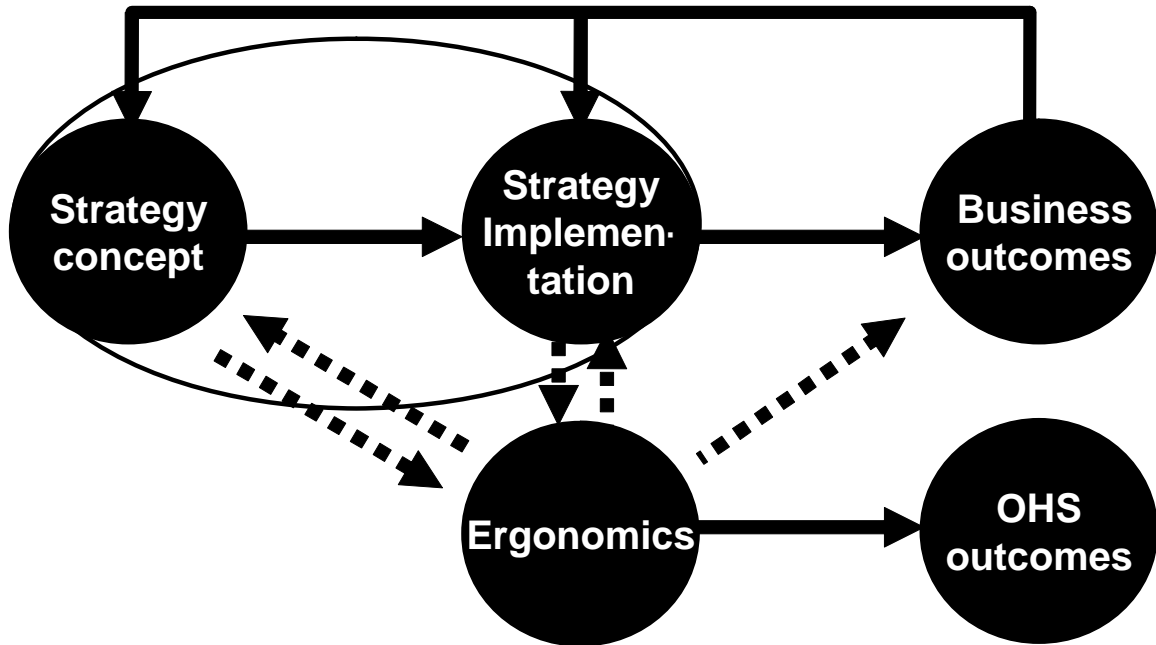


Figure 2

First step of linking ergonomics to strategy and business outcomes involves consideration of the relationships between ergonomics and strategic concepts, implementation, and business outcomes.

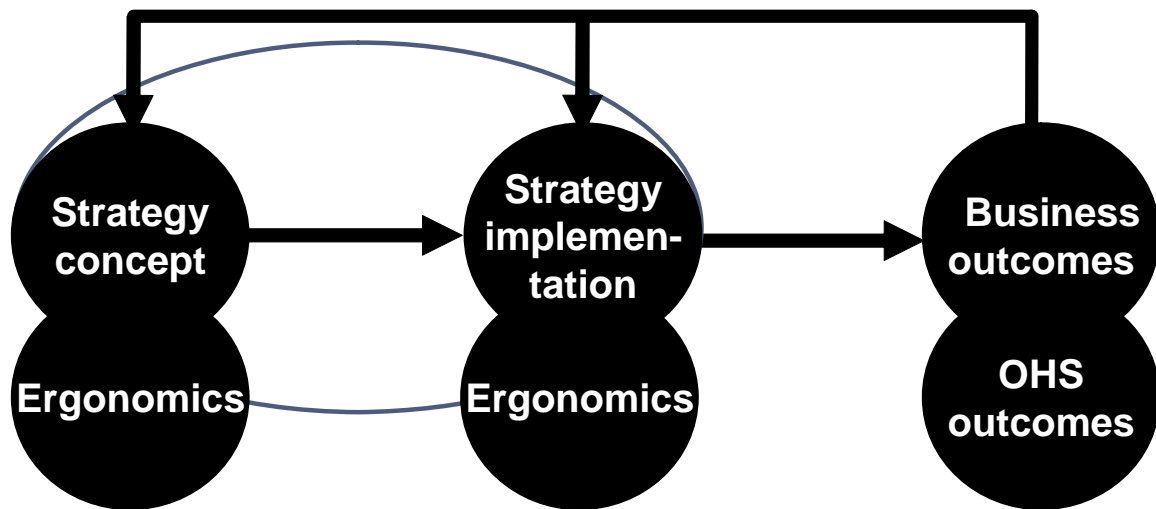


Figure 3

Final model of linking ergonomics to strategy and business outcomes.

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