COMPETITIVE CHALLENGES AND CLUSTER RESPONSES

Orchids, Cars and Electronics in East and Southeast Asia

by
Piyanit Onoparatvibool

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HOE CLUSTERS REAGEREN OP COMPETITIEVE UITDAGINGEN

ORCHIDEEËN, AUTO'S EN ELEKTRONICA
IN OOST- EN ZUIDOOST-AZIË

Thesis

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Dedication

To my beloved father and mother

Acknowledgements

A PhD was my dream when I was doing my master's degree at Chulalongkorn University in Thailand. However, at that time I had no idea why I might need a doctorate degree. When I became a government official at Thailand's Office of the National Economic and Social Development Board (NESDB), the national planning agency, I found myself wanting a better understanding of the contributions that government policy and the state bureaucracy could make to the efficient and effective development of my country – Thailand. My responsibilities at NESDB relate to competitiveness and industrial development. I have been involved in cluster policy since the initial stage of its implementation in Thailand. As such, I experienced first hand many of the problems of cluster development and policy, especially the misuse of budget due to an unclear understanding of how cluster policy could be successfully implemented. I came to realise that understanding the complex mechanisms of cluster development is crucial to drive clusters forward. A PhD study returned to my mind, but this time the goal of doing PhD research was clearer. The goal is not to receive a degree or certificate, but to enrich my knowledge so that I can contribute to developing industries in Thailand.

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Acronyms

AIT	Asian Institute of Technology, Thailand
APIC/FTI	Auto Parts Industry Club in the Federation of Thai Industries
ARDA	Agriculture Research Development Agency, Thailand
BOI	Board of Investment, Thailand
BSID	Bureau of Supporting Industries Development under Department of Industrial Promotion, Ministry of Industry, Thailand
BUILD	BOI Unit for Industrial Linkage Development, Thailand
CBU	Completely Build-Up Unit
CDA	Cluster Development Agent
CKD	Completely Knocked-down
COA	Council of Agriculture, Taiwan
DECC	Design and Engineering Consulting Service Centre, under MTEC, Thailand
DIP	Department of Industrial Promotion, Ministry of Industry, Thailand
DOA	Department of Agriculture, Thailand
DOAE	Department of Agricultural Extension, Thailand
ECEA	Electronics and Computer Employers' Association, Thailand
EEAIC	Electrical, Electronics & Allied Industry Club under Federation of Thai Industries
ERSO	Electronics Research and Service Organisation under ITRI, Taiwan
FCB	Flexible Circuit Boards
FDI	Foreign Direct Investment
FTI	Federation of Thai Industries

HDD	Hard Disk Drive
HGA	Head Gimbal Assembly
HICOM	Heavy Industry Corporation of Malaysia
HRD	Human Resource Development
HSP	Hsin-Chu Science Park
I/UCRC	Industry/University Cooperative Research Centre, Thailand
IC	Integrated Circuit
IDEMA	International Disk Drive Equipment and Manufacturer Association
ITRI	Industrial Technology Research Institute, Taiwan, Republic of China (ROC)
LCR	Local Content Requirement
MIDA	Malaysian Industrial Development Authority
MITI	Ministry of International Trade and Industry, Malaysia
MNC	Multi-National Corporation
MOEA	Ministry of Economic Affairs, Taiwan, ROC
MOI	Ministry of Industry, Thailand
MTEC	National Metal and Material Technology Centre, Thailand
NCC	National Competitiveness Committee, Thailand
NCTU	National Chiao-Tung University, Taiwan
NECTEC	National Electronics and Computer Technology Centre, Thailand
NESDB	Office of the National Economic and Social Development Board, Thailand
NSC	National Science Council, Taiwan, ROC
NSTDA	National Science and Technology Development Agency, Thailand
NTHU	National Tsing-Hua University, Taiwan
NTU	National Taiwan University
OEM	Original Equipment Manufacturer
OIE	Office of Industrial Economics, Ministry of Industry, Thailand
PDC	Penang Development Corporation, Malaysia
PSDC	Penang Skill Development Centre, Malaysia

R&D	Research and Development
REM	Replacement Equipment Manufacturer
S&T	Science and Technology
SMEA	Small and Medium Enterprise Administration, under Ministry of Economic Affairs (MOEA), Taiwan
SMIDEC	Small and Medium Industry Development Corporation, Malaysia
SoC	System-on-Chips
TAI	Thai Automotive Association
TAIA	Thai Automotive Industry Association
TAPMA	Thai Auto-Parts Manufacturing Association
TFDA	Taiwan Floriculture Development Association
TFEA	Taiwan Floriculture Export Association
TOEA	Thai Orchid Exporter Association
TOGA	Taiwan Orchid Growers Association
TOGEA	Thai Orchid Garden Enterprise Association
TOP	Taiwan Orchid Plantation
TPA	Taiwan Potted Plant Association
TSAE	Society of Automotive Engineers Thailand
TSMC	Taiwan Semiconductor Manufacturing Corporation
UMC	United Microelectronics Corporation, Taiwan
USM	Universiti Sains Malaysia
VDP	Vendor Development Programme, Malaysia
VEC	Vocational Education Commission, Thailand

Abstract

The cluster approach continues to gain ground as a key strategy for industrial development in today's globalised era. Nevertheless, not every country and cluster achieves the desired competitiveness goal of cluster development. While many cluster studies have examined factors and conditions that influence the success or failure of cluster development, most focus on only one or two aspects. But cluster development is a complex process that involves numerous interdependent actors and institutions. To develop clusters successfully, policymakers must view cluster development as a 'process' and understand their intertwining elements and mechanisms. This study, hence, develops a holistic framework for cluster policy analysis. This framework provides a better understanding of cluster development processes and mechanisms so as to bring about more effective formulation and implementation of cluster policy. The analytical framework takes account of the interplay and interrelationships of five key elements: (1) context and external factors, (2) cluster characteristics, (3) cluster governance, (4) the institutional modality of cluster intervention and (5) the effectiveness of the institutional modality. A case study approach and a multi-dimensional comparison of clusters across national contexts and sectors were applied as the main study methodology. Seven clusters in three sectors and in three country settings were purposively selected for comparative analysis. These include the Thai hard disk drive (HDD) cluster, the Taiwanese semiconductor cluster, the Malaysian electronics cluster, the Thai and Malaysian automotive and auto-parts clusters, and the Thai and Taiwanese orchid clusters.

This study produced five main findings. *First,* clusters in the same sector are likely to have a similar structure due to the influence of the industry-specific context. *Second,* cluster governance is likely to be aligned with

the structure of the cluster. *Third,* country-specific context can alter the governance of clusters from the typical form shaped by the industry-specific context. It does this by intervening in the capabilities of local actors/institutions. *Fourth,* clusters facing a similar challenge and operating under a similar form of governance do not necessarily utilise the same institutional modality to cope with their competitive challenges. Rather, the modality applied depends on the composition of actors in the cluster structure and on the industry-specific context. *Fifth,* differences in the degree of effectiveness of the institutional modality of cluster intervention are attributable to (1) differences in business systems and industrial contexts, (2) characteristics of a core agency for cluster coordination, (3) the type of competitive challenge faced and (4) the presence (or absence) of specific cluster actors.

In addition, the findings of this study reveal three key lessons and policy implications for cluster policymakers and practitioners. *First,* policymakers should consider formulating cluster policy that suits the developmental stage of the cluster. *Second,* to effectively implement cluster policy, the key role of government is to strengthen capabilities of local actors and institutions. *Finally,* in evaluating cluster policy, government should focus more on 'process effectiveness' rather than on only the outputs/outcomes of cluster development policy.

Samenvatting

HOE CLUSTERS REAGEREN OP COMPETITIEVE UITDAGINGEN

Orchideeën, auto's en elektronica in Oost- en Zuidoost-Azië

De clusterbenadering speelt een steeds belangrijkere rol bij de industriële ontwikkeling in het huidige tijdperk van globalisering. Toch bereikt niet ieder land of cluster het door de ontwikkeling van clusters beoogde concurrentievermogen. Hoewel er veel onderzoek gedaan is naar factoren en omstandigheden die het welslagen van clusterontwikkeling beïnvloeden, richten de meeste studies zich op slechts een of twee aspecten. Clusterontwikkeling is echter een complex proces waarbij verschillende onderling afhankelijke actoren en instellingen betrokken zijn. Om clusters met succes te ontwikkelen, moeten beleidsmakers clusterontwikkeling zien als een 'proces' en de dwarsverbanden en onderling samenhangende mechanismen doorgronden.

In dit onderzoek wordt daarom een holistisch kader voor de beleidsanalyse van clusters ontwikkeld. Dit kader biedt een beter inzicht in de processen en mechanismen die een rol spelen bij clusterontwikkeling en verhoogt daarmee de effectiviteit van de formulering en implementatie van clusterbeleid. Het analytisch kader houdt rekening met het samenspel en de onderlinge samenhang van vijf centrale elementen: (1) context en externe factoren, (2) clusterkenmerken, (3) cluster-governance, (4) de institutionele vorm van cluster-interventie en (5) de effectiviteit van de institutionele vorm. De voornaamste onderzoeksmethoden van dit on-

derzoek zijn de casestudy en een multidimensionale vergelijking van clusters in verschillende nationale contexten en sectoren. In het onderzoek zijn zeven clusters in drie sectoren en drie landen met elkaar vergeleken. Dit zijn het Thaise Hard Disk Drive (HDD) cluster, het Taiwanese half-geleiderscluster, het Maleisische elektronicacluster, de Thaise en Maleisische automotive en auto-onderdelenclusters en de Thaise en Taiwanese orchideeënclusters.

Hier volgen de vijf belangrijkste resultaten van dit onderzoek. Ten eerste hebben clusters in dezelfde sector meestal een vergelijkbare structuur die voortvloeit uit de specifieke context van die bedrijfstak. Ten tweede is de cluster-governance veelal een afgeleide van de structuur van het cluster. Ten derde kan de specifieke context van een land leiden tot een ander type governance van clusters dan binnen die bedrijfstak gebruikelijk is. Dit gebeurt als er sprake is van interventie in wat lokale actoren/instellingen kunnen doen. Ten vierde hanteren clusters die met vergelijkbare uitdagingen en dezelfde soort governance te maken hebben niet per definitie dezelfde institutionele vorm om de uitdagingen van de competitieve markten het hoofd te bieden. De gehanteerde vorm hangt eerder af van de samenstelling van actoren in de structuur van het cluster en van de specifieke context van de bedrijfstak. Ten vijfde kunnen verschillen in de effectiviteit van de institutionele vorm van clusterinterventie toegeschreven worden aan (1) verschillen in organizatie van het bedrijfsleven en industriële context, (2) kenmerken van de centrale instantie voor de coördinatie van het cluster, (3) het soort competitieve uitdaging waarmee men te maken heeft en (4) de aan- of afwezigheid van specifieke actoren binnen clusters.

Bovendien vloeien uit dit onderzoek drie belangrijke lessen en beleidsimplicaties voort voor beleidsmakers en praktijkmensen. Ten eerste zouden beleidsmakers moeten overwegen om een clusterbeleid te formuleren dat past bij het ontwikkelingsstadium van het cluster. Ten tweede moeten regeringen de slagkracht van lokale actoren en instellingen versterken om clusterbeleid effectief te implementeren. Ten slotte moeten regeringen zich bij het evalueren van clusterbeleid meer op de 'effectiviteit van het proces' richten dan alleen op de output/resultaten van clusterontwikkelingsbeleid.

BOOK

1 Prologue: Understanding the Complexity of Cluster Policy

1.1 Setting the Stage

Globalisation has gradually shifted the basis of industrial competitiveness from static price competition towards the ability to innovate and create knowledge (Malmberg and Maskell 2001). This has happened both within firms and at the national level, where rapid technological change is pressuring countries to adapt quickly. Cluster development has become an increasingly attractive way for policymakers to respond to this challenge, as seen from the growing literature on cluster development (Tilman Altenburg and Meyer-Stamer 1999, Boari 2001, M.C.J. Caniëls and H.A. Romijn 2003, England's Regional Development Agencies 2004, Enright 1998, 2000, European Commission 2003, Intarakamnerd 2005, Ketels 2003, 2004, Knorringa and Meyer-Stamer 1998, Pillai 2005, Saxenian 2003, Sölvell et al. 2003, Van der Linde and Porter 2002).

Clusters, following Porter (1990), are "geographical concentrations of interconnected companies, specialised suppliers, service providers and associated institutions (e.g. universities; standard agencies; and trade associations) in a particular field, linked by commonalities and complementarities." Firms in a cluster are both competing and cooperating. A cluster provides a potential platform for innovation and collective action, which are main ingredients, among other things, to boost national competitiveness.

The cluster approach has attracted the attention of those designing policies for economic development, and many countries have sought ways to implement it successfully. Nevertheless, formulation and implementation of cluster policy is by no means a clear-cut process, since there is no uniform model or formula to develop clusters that is valid everywhere and at any point in time (Nauwelaers 2001). Given that every cluster is unique, imitating a cluster policy that has proven to be effective

elsewhere is hardly a plausible tactic. Evidence from cluster development in various countries shows that a cluster policy implemented successfully in one country might not be suitable in another country or context.

So, what is the real challenge to successful cluster development? Is it about creating a sound business environment to attract foreign direct investment (FDI) to advance the level of technological capability? Is it about setting up a specific local institute to promote clusters for export industries? Admittedly, it is necessary for most developing countries to attract FDI to upgrade technology and promote exports, among other things. However, FDI alone cannot ensure industrial and cluster development, nor can it safeguard a cluster's long-term sustainable competitiveness. Another key ingredient to the success of cluster development – one that is often forgotten or overlooked by industrial policymakers – is the processes and mechanisms of cluster development. In fact, a cluster represents a dynamic and evolutionary process encompassing various interdependent elements, actors and institutions. Surprisingly then, few studies focus on the process and dynamics of cluster development (Chiaroni and Chiesa 2006).

Furthermore, clusters operate in different circumstances and face a great variety of challenges. Not all clusters respond successfully to these challenges. The question then is why are some clusters better able than others in quickly delivering solutions to cope with the challenges they face. The complexity of the processes and mechanisms of cluster development impacts the effectiveness of cluster policy implementation and the rate of change in development stages of clusters (Brenner and Fornahl 2003). However, most cluster studies focus merely on one or two dimensions/aspects of cluster development, such as cluster governance or cluster characteristics. In fact, cluster policy encompasses various intertwining elements, and in order to formulate and implement it effectively an integrated analysis approach is necessary. Moreover, despite the growing literature on clusters, no empirical study is yet available that provides a holistic view or holistic framework to analyse how clusters deal with their competitive challenges, why they choose particular institutional modalities to handle challenges, and what conditions are crucial for effective solutions.

Hence, this study examines the process and dynamics of cluster development from a holistic perspective. It investigates seven clusters in East and Southeast Asia, in both technology-driven and natural resource-

based sectors, including three clusters in Thailand (i.e. a hard disk drive cluster, an automotive and auto-parts cluster and an orchid cluster), two clusters in Taiwan (i.e. a semiconductor cluster and an orchid cluster) and two clusters in Malaysia (i.e. an electronics cluster and an automotive and auto-parts cluster). Though there are numerous clusters in East and Southeast Asia, experiences in cluster development in these regions reflect a lack of knowledge and understanding of how to use the cluster approach as part of industrial policy. For example, in Thailand and Malaysia, the government prioritises promoting clusters that have high export potential or are highly attractive to FDI, aiming to gain technology transfers and to upgrade the technological capabilities of local firms. This strategy is evident in the fact that key indicators for evaluating the results of cluster development in these countries mostly highlight the cluster's export performance, employment generation and success in upgrading standards and quality. However, reliance on these indicators constitutes a misconception of the cluster approach and a lack of awareness of clusters as a 'process'. A comparative study of clusters in different sectors and different countries in these regions will thus provide a better understanding of the mechanisms of cluster development and perhaps point to missing elements in cluster policy.

The results of this study unveil three interesting lessons for cluster policymakers and practitioners. *Firstly,* clusters at different stages of development need distinct types of policy support. While generic cluster policy is necessary, it is not sufficient to ensure sustainable development. Cluster strategies have to be tailored to the developmental stage of each cluster. *Secondly,* to develop clusters successfully, a foundation of local capability is crucial. Creating local capability within a nation requires strategies and processes to engage and empower capable people and to develop people's knowledge and organisational and technical skills. *Lastly,* evaluation of the effectiveness of cluster policy or interventions should focus more on process evaluation so as to better see the missing dimensions of cluster policy implementation.

This chapter presents the objectives, scope and research questions of this study. It then reviews the main analytical framework applied in analysing the case studies, followed by the key propositions discussed in the following chapters. Afterwards, the research methodology and case studies are presented. Finally, an outline of the further chapters in this book is laid out.

1.2   Objectives and Scope of the Study

1.2.1   Study Objectives

This study aims to understand the complexity of cluster policy by investigating and analysing the interplay and relationships among major elements, actors and institutions in cluster policy and cluster development. It presents a comparative analysis of the dynamics of cluster development in selected nations, where different institutional modalities have been implemented. Based on the concept of the 'cluster as a process', the main analytical method is not a 'deductive' approach, which applies techniques of mathematic modelling to explain economic phenomena and to predict the consequences of policy intervention derived from analyses of linear relationships and correlations between just two variables or a small number of variables. Deductive-based analysis expects that given a set of exact conditions, the same outcomes can be generated; in other words, 'if event x then event y'. However, this approach has limitations in relation to development issues which are entwined in social realities and comprise various complex and interrelated features in non-linear forms which cannot be simply interpreted by statistical or mathematics-based analysis (T. Lawson 2003). Investigating the complex relationships between the elements, contexts and actors involved in cluster phenomena is fruitful for underpinning more effective multi-institutional strategies to foster the competitiveness of clusters and to advance the application of cluster theory in cluster policy processes.

Based on this view, this study has four general objectives:

1. to develop a more holistic framework for analysing cluster policy, contributing a better understanding of the interplay of all elements related to cluster development and policy processes;

2. to obtain a more comprehensive understanding of cluster development processes within the dynamics of global and local contexts;

3. to validate the designed framework by a comparative analysis of different types of clusters in different nations;

4. to propose recommendations and guidelines to improve policy processes for cluster development.

Following these general objectives, three specific objectives are incorporated:

1. to examine what determines/influences the choice of institutional modalities with which clusters cope with their competitive challenges;

2. to investigate the roles and interactions of key cluster actors in identifying and implementing the institutional modality that shapes outcomes of cluster development policy;

3. to analyse the contexts or conditions in which cluster mechanisms or institutional modalities of cluster intervention can be effectively implemented.

1.2.2 Scope of the Study

Timeframe

This study focuses on cluster development phenomena occurring between 2002 and 2006 for two main reasons. *Firstly*, the year 2002 is the starting point of cluster policy implementation in Thailand. Malaysia was a bit earlier than Thailand in implementing a cluster approach in its industrial policy, in 1996, the starting year of the implementation of the 2nd Industrial Master Plan (IMP2). However, after 2000 cluster development policy implementation showed significant impacts in many clusters, especially technology-based clusters. Moreover, since 2000 many protected sectors in Malaysia, e.g. the automotive sector, have been confronted with the challenge of greater liberalisation, emanating from the increasingly stringent rules of international organisations like the World Trade Organization (WTO). The Taiwanese case is different from the other two countries in that the cluster approach is not explicitly stated in Taiwan's national industry policy, though it has long been implemented in some industries, such as the semiconductor industry. In 2002, Taiwan entered the WTO, and this was a turning or starting point for some clusters, like that for orchid production. *Secondly*, since 2000 technological advances and the intense complexity of globalisation have dramatically changed global competition platforms. One major change that has shaken global competition is China's WTO entry. Many countries in East and Southeast Asia were affected by this change and are still adapting. Some clusters are struggling to adjust their strategies to maintain competitiveness and survive, while slow-moving clusters have declined or collapsed. Hence, this period is interesting in terms of providing a dynamic picture of cluster development in these regions. However, since this study views clusters from an evolutionary perspective, the histories

of cluster development in relation to current cluster policy and interventions are also taken into account, especially in the analysis of each case study.

Level of analysis

The level of analysis of this study is the cluster level or 'meso level', not the firm level. Clusters can be analysed on at least three levels (den Hertog et al. 1999, Roelandt et al. 2000). First is the *national or macro level*, which refers to an analysis of industry group linkages within an economy as a whole, focusing on specialised patterns of the national or regional economy. Second is the *branch/industry or meso level*, which focuses on inter- and intra-industry linkages at different stages of a production chain of similar end-product(s) of clusters. The smallest scope of cluster analysis is the *firm level,* or *micro level.* At this level, the focus is on core enterprises and their relationships with specialised suppliers, or so-called 'inter-firm linkages', and issues of strategic business development, value chains and collaborative projects. In some instances, the analysis of inter-firm linkages can also be regarded as meso level, such as in the industrial district literature. Mayer-Stamer (2005) and other scholars (Tilman Altenburg et al. 1998, Klaus et al. 1996) added one more level of cluster analysis, the meta level.

This study focuses on the meso level because policy at this level is crucial for remedying market failures. It covers, in addition to government activities, various activities of non-governmental actors, such as business/trade associations, individual firms and NGOs, which actively pursue meso-level policies to create an enabling business environment to develop competitiveness (Meyer-Stamer 2005).

1.3   Research Questions

In pursuit of the objectives set out earlier, this study attempts to find the answers to three core research questions and sub-questions as follows:

1. How does the interplay of context, cluster characteristics and cluster governance affect cluster development and selection of the institutional modality of cluster intervention?
   - What are the characteristics and industrial configurations (industrial structure, nature and supply chain) of selected clusters?
   - How are the contexts of the selected clusters characterised and how does context influence cluster characteristics and cluster governance?

- What are the characteristics and roles of key actors in the development of the selected cluster?

- What are key competitive challenges identified by the selected clusters, and what forces are driving those challenges?

- How does each cluster actor play its roles in identifying and dealing with the identified competitive challenges?

2. To what extent are the institutional modalities used by the clusters effective in responding to their competitive challenges, and in what contexts and conditions are such modalities effective?

3. Based on the case studies, what can be learnt from comparing choices of institutional modalities of cluster intervention and what are the differences in effectiveness of these modalities?

1.4   Analytical Framework

To answer the research questions, a five-part analytical framework was developed (figure 1.1). The framework sets out the elements influencing cluster development and policy as follows: (1) context and external factors, (2) cluster characteristics, (3) cluster governance, (4) institutional modality of cluster intervention and (5) effectiveness of the institutional modality. Chapter 2 explains the theoretical rationale of these elements.

Figure 1.1
Main Analytical Framework
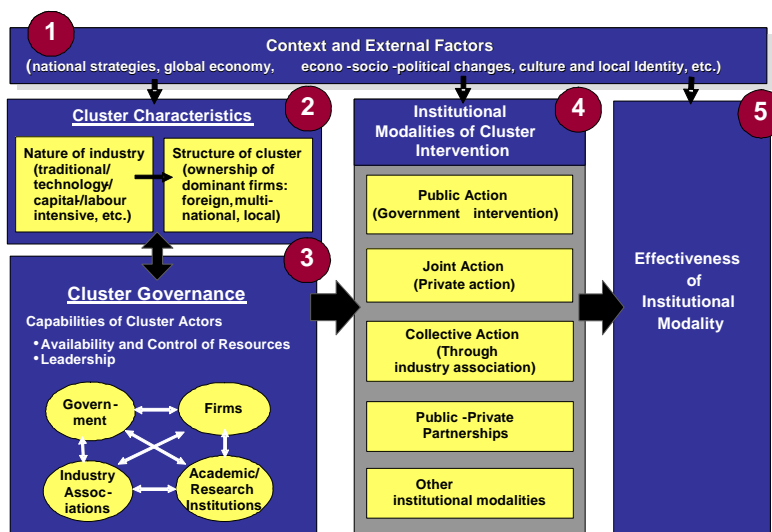
1.5   Case Studies and Research Methodology

1.5.1   Case Studies

The research questions are answered using a comparative case study approach. The case-selection method was designed to select the most suitable clusters for investigation. Clusters in East and Southeast Asia were pinpointed for two reasons. *Firstly,* the literature on clusters reflects a dearth of empirical studies and knowledge about clusters in East and Southeast Asia, where actually many fast-moving clusters have emerged in recent years, e.g. in Thailand, Vietnam, Singapore, Malaysia, Taiwan and China (Asia-Pacific Economic Cooperation (APEC) 2005, Intarakamnerd 2005, Kenan Institute Asia (KIAsia) 2006, Kuchiki and Tsuji 2005, Lecler 2002, McKendrick et al. 2000, NESDB 2005, Pillai 2005, Porter 2003, Rasiah 2005, Saxenian 2003). More importantly, many of these clusters show outstanding performance and are currently among the world's leaders, e.g. Taiwan's electronics clusters and Japan's IT clusters. These clusters are dynamic in terms of both internal dynamism and adaptation to changes in global context.

Secondly, the role of government in East and Southeast Asian countries is interesting, particularly with regard to the institutional setting and industrial policy and intervention. At first glance, cluster development seems similar across the region in that it is predominantly led by the state. However, the state-led industrial development in these countries does vary in terms of governance and the capabilities of local institutions. In the more advanced industrialised economies of East Asia, like Japan, Korea and Taiwan, government plays an aggressive role in driving industrial development through huge investments to create a good foundation to support the capabilities of local firms, i.e. in human resources and technology. Meanwhile, governments in Southeast Asia are likely to focus on creating a sound investment climate to attract FDI (Abdul Rahman 2005, Haggard et al. 1998, Hobday 1995, Lecler 2002, McKendrick et al. 2000, Rasiah 2005, Tham and Mahani 1999). Thus, it is fruitful to conduct a comparative study of cluster development in East and Southeast Asia.

Additionally, a focus in selection of the case studies was on clusters that represent different sectors with different characteristics, e.g. the advanced/high-tech sector and the traditional sector. Clusters were compared based on (1) *sectoral differences* (clusters in different sectors that op-

erate in the same national context) and (2) *national context differences* (clusters in the same sector but operating in a different national context). After systematic screening (see appendix 1 for the method), three industries in three countries were selected: the electronics, automotive and auto-parts and orchid clusters in Thailand, Taiwan and Malaysia. The electronics and automotive and auto-parts clusters represent high-tech/ technology-driven sectors, while the orchid clusters represent traditional/natural resource-based sectors (figure 1.2)

Figure 1.2
Basis of Comparison of the Seven Case Studies

Across different national contexts ⟷

Sector/ Country	Thailand	Taiwan	Malaysia
Electronics	✓ Hard disk drive (BKK and Vicinity)	✓ Semiconductor (Hsin-chu Park)	✓ Electronics (Penang)
Automotive & Auto-parts	✓ Bangkok & vicinity,Chonburi, Rayong		✓ Kuala Lumpur, Kelang
Orchid	✓ Ratchaburi	✓ Taipei, Tainan	

Within same national context

1.5.2 Methods and Strategies for Data Collection

Empirical research on the selected seven clusters was conducted in Thailand, Taiwan and Malaysia. Fieldwork was done between February 2007 and February 2008. The first phase of the field research in Thailand was conducted from February to mid-May 2007, focusing on the hard disk drive (HDD) and orchid clusters. From May to July 2007, the field research on the semiconductor and orchid clusters was conducted in Taiwan. From October to December 2007, data was collected for the auto-

motive and auto-parts cluster in Thailand. Also in this period, additional interviews were conducted and data collected related to the Thai HDD and orchid clusters. Between January and February 2008, fieldwork was conducted in Malaysia on the electronics and the automotive and auto-parts clusters. Follow-up interviews were conducted and information was gathered on the three Thai clusters in December 2008.

Data for this study was derived mainly from primary and secondary sources. The major methods of primary data collection were semi-structured interviews and informal discussions. A total of 139 in-depth semi-structured interviews were conducted with key stakeholders in the targeted clusters: government agencies (37 interviews), private firms/entrepreneurs (51 interviews), industry associations (19 interviews) and academic/research/specialised institutions (32 interviews) (appendix 2).

1.6   The Chapters

This book contains two parts, which are presented in a rather novel way. Part I is contained on these printed pages, while Part II is offered in electronic format on the accompanying CD-ROM. The first part presents the comparative analysis of the seven clusters following the five-part structure of the analytical framework (see figure 1.1). Aiming to better understand the interplay of the five elements in the analytical framework, which shows the dynamics of cluster policy processes, this book uses an innovative approach to present the chapters. Chapter 3 to chapter 6 (in Part I) explain the mechanisms of each element one by one and also the interrelationships with other element(s) presented in earlier chapter(s). The dynamics of the holistic interplay of these five elements is explored in chapter 7, and a more in-depth analysis of each case study offered in Part II (on CD-ROM).

Part I: This part is composed of eight chapters. *Chapter 1* is the introductory chapter as already presented. *Chapter 2* discusses the theory and literature related to clusters, competitiveness, institutions, governance and associated concepts. This chapter also offers a more detailed explanation of each element in the main analytical framework and elaborates theoretical justifications for these elements.

Chapter 3 describes the first element in the analytical framework, i.e. national context and business systems of clusters in Thailand, Taiwan and Malaysia. Countries' historical backgrounds are reviewed as they affect the current development of the case study clusters in the three

economies. Also presented in this chapter are the overall current institutional arrangements and key policies pertaining to industrial and cluster development in the three economies, to provide a basis for further analysis in the following chapters.

Chapter 4 sheds light on the relationships between three elements of the analytical framework: context, cluster characteristics and capabilities of local actors. Country-specific and industry-specific contexts of the seven clusters are elaborated, as well as how these contexts affect cluster characteristics and the capabilities of local actors or local capabilities.

Chapter 5 continues the discussion of the relationship between the capabilities of local actors and the next element in the analytical framework, i.e. cluster governance. Three major types of cluster governance found in the empirical cases are presented.

Chapter 6 discusses the relationship between cluster governance and the institutional modalities chosen by the seven clusters for cluster intervention. It also presents key competitive challenges identified by the seven clusters and analyses the roles of key cluster actors in responding to these challenges.

Chapter 7 examines the effectiveness of the chosen institutional modalities of cluster intervention and presents the holistic dynamics of all elements in the main analytical framework. Key issues are pointed out regarding the influence of other elements of the analytical framework on the effectiveness of institutional modalities.

The last chapter, *chapter 8*, summarises key findings from the study, drawing out theoretical reflections and discussing lessons learnt and implications for cluster policy and cluster development, particularly in developing countries.

Part II: This part shows the application of the main analytical framework of this study in analysing cluster policy by presenting an in-depth analysis of the seven cluster case studies. Case 1 is the Thai HDD cluster and case 2 is that of the Taiwanese semiconductor industry. The analysis of the Malaysia electronics cluster is discussed as case 3. Case 4 and 5 are the Thai and Malaysian automotive and auto-part clusters, respectively. The Thai orchid cluster is case 6. Finally, case 7 is that of the orchid industry in Taiwan. Again, the seven case studies of Part II are found on the accompanying CD-ROM.

2   Framework

2.1   Introduction

The dawn of the 21st century was marked by a shift in the focus of economic policy. Emphasis on macroeconomic stability to foster national growth and prosperity was gradually replaced by an emphasis on enhancing microeconomic conditions to build a foundation for sustainable economic development. This transformation can be attributed to the rise of globalisation, the rapid pace of technological advancement and intense global competition. These factors are challenging governments around the world to seek new policy instruments to lift economic performance and fuel national prosperity. In this context, the concept of competitiveness has become a key item on national agendas. This has led to heightened interest in the role of government in creating a sound environment for local businesses to grow productively and competitively. Countries aiming to achieve sustainable competitiveness are moving away from reliance on comparative advantages (e.g. abundance of natural resources, cheap labour and locational advantages) towards stimulating creation of competitive advantages (e.g. increased productivity, knowledge creation and innovation).

Nonetheless, not all countries can achieve the desired development goals. The obvious question, then, is why are some countries better developed than others and why do nations succeed only in a particular industry and not in all. Sound macroeconomic conditions and well functioning markets are necessary but not sufficient conditions for successful economic development (Meyer-Stamer 2005, Porter 1990, p.185). Perhaps more insight into this dilemma could be gained by improving our understanding of competitiveness as a system, or 'systemic competitiveness' (Tilman Altenburg et al. 1998, Meyer-Stamer 2005). This concept emphasises the importance of the meso level of analysis and meso pol-

icy, which links macroeconomic and microeconomic development per-
spectives in policy analysis.

Cluster development is a meso-level-focused approach that has re-
ceived widespread attention and been implemented in many countries. It
tends to be viewed as a key means to enhance national competitiveness
and prosperity and to enable firms to overcome competitive constraints
in the global arena. Evidence shows that the cluster policies implemented
in some countries are effective and successful, while they are ineffective
or failed in other nations. Porter's cluster theory (1998) emphasises the
role of institutional processes in cluster development in bolstering na-
tional competitiveness, yet it does not clearly explain why and under
what conditions clusters decide to apply a particular institutional modal-
ity to deal with critical issues they face. This is vital for effective imple-
mentation of cluster policy, and leads to two interesting questions: What
conditions and contexts contribute to successful cluster policy? What
mechanisms drive the successful implementation of cluster policy?

This chapter discusses the relevant concepts and the study's main
analytical framework, which provides ground to find the answers to the
questions formulated later on. The chapter comprises two parts. The *first
part* begins with a discussion of the global context and national competi-
tiveness, which are related to the processes and goals of cluster devel-
opment. This provides the basis for the analytical framework of this
study. The discussion then moves on to the roles of cluster policy in
economic development, including cluster concepts from various per-
spectives and differences among cluster and industrial policies. The *second
part* sets out the main analytical framework of this study. Concepts and
theories used in the framework are explained, including that of the busi-
ness system, cluster governance and local capabilities. Then, the final sec-
tion summarises key issues arising from a review of the literature and the
main part of the chapter.

2.2   Global Context and National Competitiveness

2.2.1   Competition in the Global Arena

Progressive globalisation is transforming the nature of industrial devel-
opment, affecting all countries. Viewed simply, globalisation is merely
the rise of economic activity across the boundaries of nations. Yet, it can
also refer to a process of increasing economic openness, interdepend-

ence and integration among countries in the world economy (Nayyar 2002). This process is significant in shifting global competition and transforming the competitiveness paradigm.

As the world becomes more integrated, knowledge and technological progress become more central to national economic prosperity (Wignaraja 2003). These changes have forced many countries to modify their macroeconomic development policies, while also leading to micro-level shifts, as firms' behaviours are profoundly influenced by changes in the business environment, e.g. new production processes, product inno-vation, changing forms of supply chain relationships, more sophisticated demand conditions, and new rules of competition and standard plat-forms. The new context has brought about unequal opportunities and risks for industrialisation in developing countries. While globalisation has enabled local firms in small-market countries to explore markets beyond their national borders, it has also allowed firms in other far away loca-tions to enter to markets in their countries. Globalisation has enabled small firms to access resources (e.g. skills and technologies) by linking them with foreign buyers and multinational corporations (MNCs) (Clark et al. 2004). This creates intense competition within the developing world for export markets, for foreign investments and to utilise and lev-erage resources. Redefining the role of the state and market in economic and industrial development are increasingly emphasised, aimed at making the most of complementarities between actors for more efficient eco-nomic development (Nayyar 2002, Rodrik 2007).

2.2.2 National Competitiveness: A New Policy Agenda in the Globalised World

Globalisation blurs the world's borders. Changes happening in one country rapidly affect many other countries. Nations, hence, strive to elevate their economic prosperity by enhancing their competitiveness. The concept of 'competitiveness', however, remains elusive. The notion became fashionable in the 1990s, particularly after Michael E. Porter in-troduced the idea of competitive advantages of nations in 1990 (Ernst 2003). Many of Porter's works highlight competitiveness as a main goal of cluster development. However, scholars have debated what competi-tiveness really means. Certainly the term's meaning depends on the level of which one is speaking, i.e. firm, industrial, regional or national. The idea of the competitiveness of a nation is especially vague (Krugman

1994, Porter 1990, Wignaraja 2003), while the notion is clearer with regard to firms (Krugman 1994, Porter 1990). Briefly, at the firm level, competitiveness refers to ability to sustain a profitable market position (Tilman Altenburg et al. 1998). However, the link between national and firm competitiveness remains ambiguous (Wignaraja 2003).

Wignaraja (2003) explained competitiveness from the perspective of three disciplines, i.e. macroeconomics, business strategy, and technology and innovation. Traditionally from the macroeconomic perspective, national competitiveness is similar to international competitiveness. Here, competitiveness policy and exchange rate policy are largely synonymous. This implies that the exchange rate is a strategic factor determining whether a country can create sound macroeconomic conditions for local businesses to be competitive internationally. Nevertheless, this perspective has some critical pitfalls. It disregards non-price factors, such as technological and innovation capabilities. However, these are actually crucial in today's globalised and knowledge-based era. Another pitfall is its narrow scope for economic development policy. Nations cannot rely on a single instrument, i.e. the exchange rate, to increase their level of competitiveness (Wignaraja 2003). This idea is in line with Porter's concept of national competitiveness (Porter 1990).

In sum, at the national level, countries compete by providing a sound business environment for their nation's firms to increase productivity, and this is called 'national competitiveness' (Porter 1990a, 1998). Of all concepts of competitiveness, Porter's notion is perhaps best recognised, and it has been adopted implicitly or explicitly by many scholars, such as Paul Krugman, and by influential organisations including the Institute for Management Development (IMD) and the World Economic Forum (WEF). Since Porter reinforces his notion of competitiveness by linking it with innovative capability and prosperity, his concept of competitiveness has gained high interest among policymakers. Often it has led to attempts to seek new development approaches to successfully lift a country's prosperity in the current era. Hence, this study uses Porter's concept of national competitiveness to understand how governments view cluster policy. This usage is due not only to the worldwide recognition of Porter's concept, but also to the sound rationale it provides for cluster policymaking.

2.3 Clusters and Economic Development

Policy has evolved from promoting economic growth, greater equality, and productivity improvements to the present period, which is marked by a focus on technological advances to increase national productivity (Nagel 2002). Industrial development policy, as part of economic policy, has become a highly prioritised issue on the agenda of most countries. In the past, economic policymakers focused on developing the supply side of the economy with so-called 'market incentive' policies aimed, for example, to induce the private sector to improve its economic performance and cooperate with government in economic development (Hall and Soskice 2004). However, the focus of economic policy has gradually shifted towards more 'coordination-oriented policies' to leverage the different competencies of multiple actors in an economy.

The role of government is changing towards coordinating the endeavours of economic actors to create national prosperity and secure better coordination among private actors (Hall and Soskice 2004). Nevertheless, many governments face difficulties in enhancing non-market coordination. A government cannot simply tell economic actors what to do or lead them to do it. This is not only because of the complexity and uncertainty of outcomes, but also due to the inadequacy of information for formulating effective economic development strategies. In this regard, cluster development has a role to play as an alternative approach to economic development. It enables the creation of platforms for public-private dialogue and collaboration, and provides alternatives for government in formulating integrated and specific policies for industrial development.

2.3.1 The Cluster Concept: Various Perspectives

Over decades, the concept of cluster development has gained massive attention from scholars in disciplines ranging from economics and economic geography to business administration and management, social science, regional science and national innovation systems. Michael E. Porter introduced the cluster concept in his 1990 book 'The Competitive Advantage of Nations'. Since then, discourses and debates on the concept and its benefits to economic development have been widely undertaken among academicians, policymakers and practitioners. This section aims to provide a basic understanding of the concept. It draws on various per-

spectives or schools of thought to define the term 'cluster' as it will be used in the remainder of this study.

In the school of thought of business administration and strategy, Porter's definition of cluster is a classic one widely used in cluster literature:

> A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities….Clusters take varying forms depending on their depth and sophistication, but most include end-product or service companies; suppliers of specialized inputs, components, machinery, and services; financial institutions; and firms in related industries. Clusters also often include firms in downstream industries (that is, channels or customers); producers of completary products; specialized infrastructure providers; government and other instiutions providing specialized training, education, information, research, and technical support (such as universities, think tanks, and vocational training providers); and standard-setting agencies Government agencies that significantly influence a cluster can be considered part of it. Finally, many clusters include trade associations and other collective private sector bodies that support cluster members (Porter 1998, p.199).

The OECD's 1999 definition of clusters puts more emphasis on knowledge-based activities and collective learning:

> Clusters are networks of interdependent firms, knowledge-producing institutions, bridging institutions and customers, linked in a production chain which creates added value. The concept of cluster goes beyond that of firm networking, as its captures all forms of knowledge sharing and exchange… and it also goes beyond traditional sectoral analysis. (quoted in Tödtling 2001).

The discipline of economic geography highlights aspects of geographical concentration, agglomeration, spatial proximity and benefits derived from increased scale (Belussi 2004, Gordon and McCann 2000). The concept in this school of thought is rooted in the Marshallian concept of the industrial district. Belussi (2004) differentiated a cluster from an industrial district by viewing a 'cluster' as a vague spatial system and an 'industrial district' as a more socio-economically involved system. However, some scholars view 'cluster' as nearly synonymous with 'industrial district' (Asheim and Isaksen 2002, Belussi 2004, Cooke and Huggins 2003, Maskell 2001). For instance, Maskell (2001) distinguished two categories of agglomeration economies linked to the cluster concept. The

first type is called 'urbanisation economies', which accrue from a geographical proximity of industries and services. The second type, 'locational economies', is described as similar to 'clusters'. 'Locational economies' embrace the economies arising from a geographical agglomeration of related economic activities in a locality:

> The term cluster is used synonymously in the literature together with industrial agglomeration or localisation, while the term industrial district… is often applied when wishing explicitly to emphasise values and norms shared by co-localised firms (Maskell 2001).

According to Malmberg (2003), Porter's cluster concept makes genuine contributions to the analysis of key issues in economic geography since it provides a way to describe the systemic nature of an economy (i.e. how various types of industrial activity are interrelated). Cooke and Huggins (2003) argue, however, that Porter's cluster concept gives a static sense that contradicts the very dynamic environment that clusters face in reality. They hence incorporated the ideas of cluster dynamics, development processes and governance into Porter's definition:

> [Clusters are] geographically proximate firms in vertical and horizontal relationships, involving a localised enterprise support infrastructure with a shared developmental vision for business growth, based on competition and co-operation in a specific market field (Cooke and Huggins 2003, p.52).

Andersson et al. (2004) described the features of clusters more clearly in 'The Cluster Policies Whitebook'. Clusters are characterised by seven elements: (1) geographical concentration, (2) specialisation, (3) multiple actors, (4) competition and cooperation, (5) critical mass, (6) the cluster lifecycle and (7) innovation. Enrico and Grandi (2005) suggested adding one more critical attribute to the list: 'cultural homogeneity and historical tradition'. Culture is recognised as an asset for development of a dynamic cluster, but it is not always taken into consideration in cluster development policy.

Definition of 'Cluster' Used in this Study

Based on the various typical definitions of cluster stated above, a cluster is viewed here as having four key characteristics, namely (1) geographic proximity or co-location of firms and related businesses, (2) interdependencies or linkages of activities of firms in a value chain with other

related/supporting industries and agencies, (3) specialisation based on knowledge sharing and spillover and (4) shared norms, values and visions.

Nevertheless, until today, exact delimitation of clusters continues to be a matter of scientific debate. However, cluster policymakers and practitioners cannot wait until this debate is completely concluded, as is evident by the many countries pursuing cluster development and the impact of the cluster dynamics and competitiveness on nations. Hence, to reflect the policy reality, this study finds it more fruitful to understand the dynamic processes and mechanisms of cluster development and cluster policy, rather than to dig into the details to find the exact definition and delimitation of a cluster. Thus, the term 'cluster' is defined for this study as *'a group of related businesses and the associated government agencies and educational institutions that gather together through learning processes and interdependencies to manage common meso-economic problems in order to achieve higher economic performance and long-term competitiveness'*. In this light, clusters are characterised by two features: (1) relations among firms/businesses along a supply chain, also called 'production linkages' among firms in an industry and (2) 'cooperation linkages' among firms within an industry and with other related industries, supporting institutions and public agencies. Firms in a cluster not only cooperate, but also compete to improve their productivity and quality. Moreover, cluster actors are linked by the shared goal of bolstering the competitiveness of the cluster as a whole. On top of this, as the focus of this study is on policy processes of cluster development at the national level, the clusters that are identified by the government or in national policy are considered a 'cluster'.

To be clear, the term *'cluster actors'* mentioned above embraces the existing organisations and agencies participating in a particular cluster and those that are supposed to participate. These organisations/agencies mainly include (1) firms in the core businesses of an industry and in related/supporting industries, (2) public agencies, (3) academic and R&D institutions related to the cluster and (4) trade and industry associations representing or involved in the cluster.

2.3.2 Cluster Policy versus Industrial Policy

Nowadays the cluster approach is gaining increased attention from governments, local business leaders, academicians and other cluster practitioners (Cortright 2006, Sölvell et al. 2003). Yet, one might confuse clus-

ter-based policy with industrial policy. In fact, cluster development can be construed as a new approach to industrial policy. Traditionally, industrial policy was based on a view of international, or more generally locational, competition by which some industries were recognised as creating greater wealth than others. Therefore, industrial policy by and large has concentrated on promoting industries with greater prospects, usually in high-tech or fast-growing sectors (Porter 1998). Moreover, given the significance of scale, instrumental policies for industrial development have tended to emphasise subsidies, selective import protection and restricted foreign investment. The idea is to nurture emerging or infant industries until they reach a more secure developmental stage. In short, the fundamental goal of industrial policy is basically to achieve higher international market shares.

However, the emergence of the 'new economy', characterised by digital and Internet-based technologies, has generated a considerable impact on industrial development (Elsner 2003). In this new economic context, a traditional policy for industrial development can no longer create a wealthy nation. Manufacturing and service sectors have become more interdependent and intertwined. This has brought about new economic coordination problems, particularly concerning direct interdependencies, externalities, collective goods and information and expectations. Cluster development provides one solution to the new requirements of industrial development.

Cluster policy is complex and exhibits many levels and types. Porter (1990) and Ketels (2003) view clusters in a broad sense as a new model of economic development, not just a narrow revision of traditional sectoral policies or merely an additional economic policy instrument. Clusters provide a more effective way to conduct microeconomic policy in regions and nations. Cluster policy helps actors to identify challenges affecting an overall economy and creates a more constructive and efficient platform for business-government dialogue and collaboration (den Hertog et al. 1999). Cluster policy is important in regional and local development as well, since it corresponds with the trend towards decentralisation of policy and a development focus on the indigenous potential of localities and regions (Martin and Sunley 2002).

In contrast, Nauwelaers (2001) views cluster policy not as a new instrument of economic development, but as an innovative combination of traditional policy instruments, e.g. university-industry cooperation, in-

vestment policy and financial support for businesses, infrastructure de-
velopment and skill upgrading. However, her view aligns with Porter's in
that she too sees cluster policy as a useful tool for economic develop-
ment. It provides a new method of public intervention that facilitates a
more interactive way of implementing economic and industrial policy.

Evidence shows that not all clusters are successful. This creates scep-
ticism about cluster policy interventions, especially regarding whether
and how such interventions can add value beyond what other economic
actors could attain independently. Cluster policy is expected to initiate
comprehensive ways to overcome market, government and systemic fail-
ures[1] (Andersson et al. 2004). When considering cluster policy, it is im-
portant to distinguish cluster-specific interventions from those that are
not. For example, a policy to upgrade infrastructure might not be con-
sidered a cluster-specific policy, but it could be judged a cluster-specific
policy if it is specifically aimed to improve accessibility to a logistics facil-
ity necessary for a particular cluster. Cluster policy must contribute in
some way to development of clusters (England's Regional Development
Agencies 2004).

Cluster policy often comprises a range of measures and strategies car-
ried out by authorities, which theoretically are public agencies, to gener-
ate socio-economic benefits for nations. Cluster policy can be measures
to enable public-private dialogue and collaboration, polices for education
and skill training and international strategies for improving basic condi-
tions for clustering and innovation (Andersson et al. 2004). Such policies
are complemented by actions to accelerate cluster development. What is
new in cluster policy is the changing mode of intervention and roles of
public actors in market economies towards more of a facilitating stance.
This implies more participation of the private sector in determining and
implementing cluster policies.

The focus of cluster policy varies depending on the characteristics of
industries. Policies aimed at encouraging newly emergent clusters in
high-tech sectors tend to be closely linked with science and technology
policies. Moreover, policies in support of newly emerging high-tech clus-
ters are likely to be top-down policies. In contrast, policies to promote
natural resource-based or traditional clusters are more bottom-up ori-
ented. Nonetheless, in practice there is no clear-cut line between cluster
policy in its various forms.

Industrial policy today must create interactive processes for strategic cooperation between the private and public sectors in order to elicit information and needs from businesses to generate suitable policy initiatives (Rodrik 2007). Many countries, thus, have incorporated cluster policy in industrial policy, as it emphasises more the process of policy implementation. Different from a traditional industrial policy, cluster policy simultaneously encourages cooperation and competition among firms in an industry. Porter (1998, p.249) emphasises that "what matters is not what a nation (location) competes in, but how". This implies that all existing and emerging industries in a country, not merely targeted ones, can benefit from cluster-based policy. This aspect contrasts with conventional industrial policy, which aims to distort competition to favour a particular location. On the contrary, cluster policy concentrates on removing constraints to productivity growth of firms.

Figure 2.1
Holistic Framework for Analysis of Cluster Policy
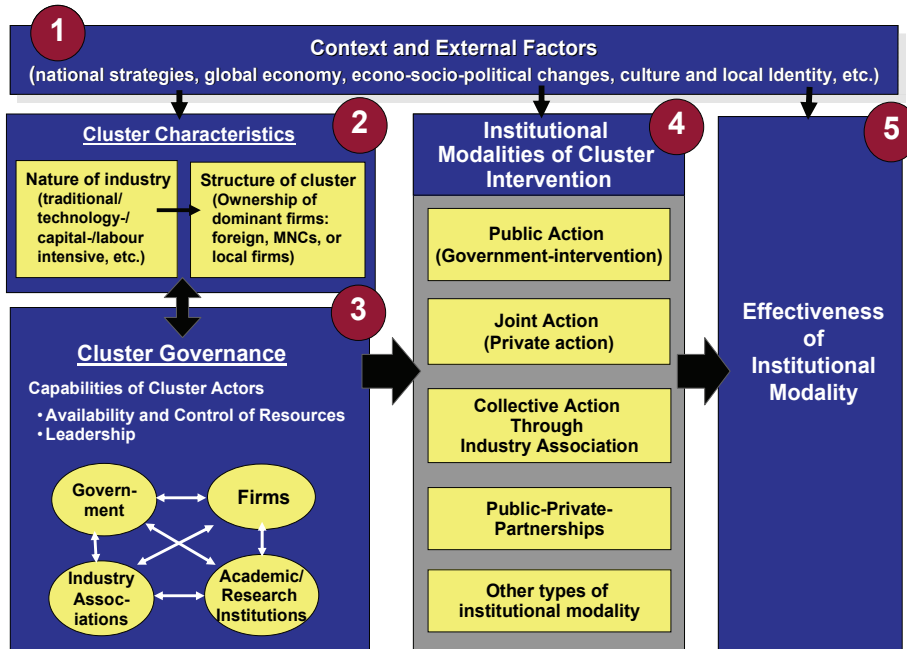
2.4   The Analytical Framework and Its Elements

The holistic framework designed for this study takes into account the dynamics of clusters in the complex environment of globalisation. The framework centres on the meso level of economic development, or so-called 'cluster level'. It comprises five main elements: (1) context and external factors, (2) cluster characteristics (i.e. nature of the industry and structure of the cluster), (3) cluster governance, (4) institutional modality of cluster intervention and (5) effectiveness of the institutional modality of cluster intervention (figure 2.1). The details of the five elements and theories/concepts from which they were drawn are elaborated below.

2.4.1   Contexts and External Factors: Business Systems as Contexts of Clusters

The institutional context has a great impact on cluster development and should be considered as a factor in cluster policy analysis. This study focuses on two main types of context that influence clusters, i.e. the national/local context and the external context. The national/local context includes national strategies, especially regarding industrial/cluster development and related policies, econo-socio-political changes, and culture and local identity. The global context also significantly affects the clusters, and is considered as an external factor.

The Business System Concept originated by Richard Whitley provides a major theoretical notion for analysing the element of national context and external factors. This concept focuses mainly on interrelationships between various institutional factors and economic activities, including institutional and social contexts, market structure and arrangements, business organisation and coordination, business behaviour and economic efficiency (Whitley 1994, 2001). Business systems constituted under different social and institutional contexts will display differences in the beliefs and rationalities of economic actors. These eventually bring about different market structures, business organisations and coordination. Relationships between key actors in clusters are influenced by these differences as well. Hence, the Business System Concept can help to explain the interrelation between context and cluster governance, as well as the interrelation with the other elements in the analytical framework.

In examining the context of clusters, this study takes into account the effects of culture and local identity on business systems and on the behaviours of cluster actors. Indeed, culture and local identity are critical

factors in building trust, which is increasingly recognised as a crucial element for collective action in cluster development. This observation is in line with the Business System Concept, which highlights the effects that shared social values and cultural homogeneity have on the formation of the business systems in a nation (Schaumburg-Müller 2001). A locality having high social heterogeneity or being diverse in socio-cultural characteristics is likely to face more difficulty in creating positive effects from collective action. People's level of participation in economic development activities in such localities tends to be low, and this limits trusting relationships (Ruttan 2008). Additionally, many studies reveal that clusters in traditional sectors are mostly linked by local identity, structure and cohesion. Social and cultural exchange is embedded in their economic relationships (Zucchella 2006).

One interesting aspect of the Business System Concept is the role of government in shaping national business systems. The key feature always seen in developing countries is a cohesion and autonomy of the state. Public agencies in developing countries normally face a problem of limited ability to pursue long-tem economic development goals. Rather, they are driven to accommodate the various demands of different interest groups, which seek particular short-term benefits. This affects the commitment, stability and predictability of the policy priorities/decisions of public agencies and of the state towards economic development. Private firms, hence, find it difficult to pursue their business in line with the national development direction. This leads to a coordination problem in economies and in clusters.

However, Wad (2001) argues that Whitley's Business System Concept seems to focus on the role of the state as the core structure or agency for industrialisation. Moreover, Whitley's theory cannot explain the influence of FDI in large/influential industrial sectors in East and Southeast Asian economies. This is because Business System Theory focuses on the effects of institutional context at the national level, or in other words on the formation of the business system in a nation, while paying less attention to internationalisation. Global developments, however, also affect changes in business systems, especially where strong cohesive international institutions are established and national institutions are weak. Yet Wad's argument seems to overlook some details of the Business System Concept. In fact, Whitley did point out the impact of internationalisation on business systems. Nonetheless, he emphasises the significance of

domestic institutions and agencies, especially the state, in managing, controlling and leveraging the external resources accompanying internationalisation, i.e. flows of capital and technology, so as to achieve the long-term economic development goals of a country (see Whitley 2001).

In sum, the Business System Concept is useful for analysing the influence of the national context on interactions among cluster actors and on cluster policy for at least two reasons. *First*, it integrates economic and social aspects to shed light on the relationship between a nation's institutional context and the behaviours of actors in economic organisation. This is useful for understanding the contexts of clusters in East and Southeast Asia, which are largely associated with a strong social-embeddedness. *Second*, it pays attention to economic actors' learning and adaptation within the institutional contexts of nations to illuminate the evolution of business organisation and coordination in clusters.

2.4.2 Cluster Characteristics

By and large, characteristics of clusters have significant influence on how clusters are developed and governed. In the analysis of 'cluster characteristics', this study concentrates on two elements, i.e. the nature of the industry and the structure of the cluster. The nature of the industry shapes the specific context that influences cluster structure and the behaviours/relationships of firms and other parties involved in the cluster. According to the Structure-Conduct-Performance (S-C-P) concept, market structure can influence the behaviour of firms and the performance of the market. Market performance sheds light on the extent of market power, which reflects social efficiency. On one hand, firms operating in a market structure that has a low concentration or a large number of firms are likely to behave competitively. The more competitive the firms behave, the less powerful the market is (in other words, greater social efficiency is achieved). On the other hand, behaviours of firms (Conduct) and market performance (Performance) can also influence market structure. This is because firms decide to enter or exit an industry according to a rationale of whether they can make a worthwhile profit. If a market is collusive, newly established firms may have difficulties entering the industry. The number of firms in the industry is hence limited and the market structure becomes more concentrated. With these regards, this study considers the structure of the industry as one aspect to be analysed

in the element of 'cluster characteristics' that can influence the behaviours and interactions of cluster actors.

In fact, the nature of the industry and the structure of the cluster are intertwined and cannot be separately analysed. Differences in the nature of industries can influence power and control between key actors and also lead to different cluster structures (see studies of M. Caniëls and H.A. Romijn 2003, Chia 2006, Iman and Nagata 2005, Rasiah 2003a, Techakanont 2007). Firms operating in an industry with rapidly changing technology are likely to exhibit a structure and behaviour different from firms in an industry with more slowly changing technology. Firms in fast-changing technology industries require high investments in technology, R&D and advanced skill development. Small and medium-sized enterprises (SMEs) in these industries have more difficulty in growing quickly if they are not part of the global supply chains of MNCs, from which they can obtain technical assistance and widen market channels (Caniëls and Romijn 2001, M. Caniëls and H.A. Romijn 2003, Iman and Nagata 2005, Rasiah 2003a). Remarkably, clusters in high-tech manufacturing sectors in developing countries are largely dominated by foreign MNCs (though local MNCs may play a leading role in some clusters). Reliance on foreign MNCs derives from the fact that local firms in developing countries generally have limited or even lack domestic technological capability and capital (Iman and Nagata 2005).

As seen in many countries, lead firms tend to dominate the development direction of clusters since they have negotiating power and high influence over the decision-making of government, the behaviours of small firms and the governance of clusters, especially at the growing stage of development (Rabellotti and Schmitz 1997). However, some exceptional cases might emerge. For example, in Italy, some clusters are mostly SME-based and SME-driven. Size and the ownership structure of dominant firms in clusters therefore do matter in shaping cluster structure and governance. Hence, this study considers such elements in analysing 'cluster characteristics' and their relations with the other elements in the framework.

2.4.3 Cluster Governance

Numerous studies have discussed the influence of institutions, institutional arrangements and different market economies on firm structures and behaviours (Whitley 1994), on interdependence between key institu-

tions in economic development (e.g. state, business, financial system, etc.), and on the various forms of business organisation (see Cammett 2007, Techakanont 2007, Young 1993). The central notion of cluster theory is that clusters emerge where a group of agents, intentionally or unintentionally, establish mechanisms for market coordination. These mechanisms help to reduce various transaction costs and facilitate innovation processes between individual cluster firms (Lorenzen and Foss 2003). A cluster involves myriad actors encompassing firms, government, industry associations and academic institutions, each playing different roles in cluster development. Interactions and power relations between these key actors are crucial to the success or failure of cluster development.

Firms in a cluster are intertwining and interdependent, as each has limited capability to individually cope with the increasingly complex challenges in the global economy. Collaboration with other firms and institutions allow firms to more easily access specialised inputs/supplies and to acquire knowledge to support their learning and innovation (Ketels 2003, Porter 1998). Coordination is a core issue in cluster theory; however, it is not a simple or easy process. Coordination problems could possibly emerge in every economic activity and divert the expected outcomes of economic development. This heightens the importance of insights into cluster governance in the cluster literature (Helmsing 2001, Schmitz 1999). The cluster approach provides platforms or mechanisms to facilitate solving coordination problems in industrial development (Ketels 2003, Lorenzen and Foss 2003, Porter 1998). Industrial structures and institutions are relevant for facilitating coordinated strategies and activities among multiple agents in clusters towards collective actions (Lorenzen and Foss 2003). The industrial district literature widely discusses the roles of inter-firm cooperation in generating specialised services for firms in clusters. More recently, cluster specialists have incorporated the issue of international trade in cluster governance through global value chains (Humphrey and Schmitz 2004, Vargas 2001).

The issue of cluster governance is closely related to the concept of 'institutions'. Both are shaped by how actors in a cluster/society interact or behave with one another. According to Williamson (2001), institutions operate at two levels. Firstly, the *macro level* deals with the institutional environment or 'rules of the game' governing political, economic and social interactions. This level consists of both informal elements (e.g.

sanctions, taboos, traditions, customs and codes of conduct) and formal rules (e.g. constitutions, laws and regulations). The other level is the *micro level*, concerned with institutions of governance and covering various modes of contracting (e.g. the market/quasi-market and hierarchical modes). Nauwelaers (2001) combined Williamson's two levels of institutional theory by defining institutions as a set of rules, norms, routines and cultures that people in a society use to change undesired conditions prevailing in an environment where policies are elaborated. This is consistent with the view of Den Hertog et al. (1999), who describe institutions from a broader view including 'behaviour' taking place in routines, norms, rules, laws or general practices. Fagg Foster (quoted in Bush and Tool 2003, p.23) defined the term 'institution' from a more social perspective and emphasised more the macro level of institutions. He sees institutions as "a set of socially prescribed patterns of correlated behaviour, which have both instrumental and ceremonial aspects".

Brown (2000) and Enright (2000) view cluster governance based on a micro level of institutional analysis. They explain that a structure of cluster governance refers to relationships among cluster firms in regard to the way that transactions, the overall industrial structure and the distribution of power within a cluster are organised. Governance structure could be constructed in several forms and is not necessarily associated with cluster-based development initiatives or management of cluster-specific organisations. Transactions in clusters can be governed by markets, coalitions or other forms of relationships within and between firms (Enright 2000). Moreover, cluster governance refers to the structure of an industry and the way firms interact with one another. It also includes a coordinating mechanism by which inter-firm relations are organised, and the approach to cluster intervention by government (Brown 2000).

Definition of 'Cluster Governance' Used in this Study

The concept of cluster governance used in this study combines the macro and micro levels in the so-called 'meso level' of analysis. The reason is that clusters encompass various actors/organisations and operate in complex socio-economic institutional settings. Institutions at the macro level are influential in governing the interactions of cluster actors through rules, regulations and norms, whereas at the micro level the structure of economic transactions and market activities can shape the behaviours of cluster actors. Viewing institutional settings holistically and

investigating their influence on the behaviours of actors in clusters provides a valuable understanding of the dynamics of cluster governance.

In this study, *'cluster governance'* is defined as 'a structure of existing institutions/organisations involved in the development of a specific cluster. Cluster governance covers the complex of laws, regulations, norms and customs that influence regular practices, behaviours and interrelations of established institutions/organisations or cluster actors'. In this respect, cluster governance is a part of the environment or context in which a cluster operates. It is linked to power and control relations amongst actors in clusters within existing structures and institutions. This study focuses on the interplay or interactions between four key cluster actors: dominant firms, government agencies, industry associations and academic/R&D institutes.

Capabilities of Cluster Actors and Cluster Governance

Key cluster actors vary in their degree of active participation in cluster development. Their behaviours are influenced by the national context, the nature and structure of the industry and the level of their capabilities. This analysis of cluster governance examines the capabilities of each key cluster actor and the effects of these capabilities on interactions among actors in cluster development. In so doing, it focuses on the availability and control over resources and leadership in clusters.

This study views 'capabilities of cluster actors' as able to create a unique form of 'local capability'. Many scholars equate the term 'local capability' with 'technological capability', albeit with differing emphases, depending on the level of analysis (i.e. firm level or national level) (Figueiredo 2008, Fontes and Coombs 2001, Iman and Nagata 2005, Oyelaran-Oyeyinka and Lal 2006, Rasiah 2003b). Many discuss technology transfer from MNCs to host countries (Chia 2006, Fontes and Coombs 2001, Rasiah 2003a, 2003b). Explicitly, technology is a combination of hardware (or physical economic assets) and software (i.e. the way of using economic assets) (Belussi and Gottardi 2000). Literature highlighting the 'software' of capability points out that skills are largely embedded in organisational capabilities derived from individuals' experiences and their ability to perceive, recognise and extrapolate patterns of behaviours. This kind of capability is also embodied in social networks (Belussi and Gottardi 2000). The notion of 'local capability' hence has a wide scope encompassing two aspects: (1) physical/hard capabilities (e.g.

infrastructure, presence of regulations, etc.) and (2) intangible/soft capability (e.g. skills, knowledge, know-how, competence, etc.).

As this study focuses on the meso or cluster level of analysis, *'local capability'* in this study does not mean the capabilities of individual firms or organisations. Rather, it is regarded as the overall capability of key actors and institutions in a cluster (e.g. firms, government, industry associations and educational/research institutions) that enable or encourage collective efforts for successful cluster development. Capabilities of cluster actors are closely related to organisational or 'institutional capacities' as described by Doner (2009, pp.72-74). He set out three interdependent sets of institutional capacities necessary for public-private collaboration in policy processes. Firstly, *'consultation capacities'* are related to the abilities of actors to understand one another's capabilities, preferences and intentions to achieve common goals and overcome collective action problems. These can be stimulated through information exchange and collective learning. Secondly, *'credible commitments'* refer to abilities to create mutual trust and belief among actors in their mutual willingness and ability to comply with agreed actions and goals. Thirdly, *'monitoring capacity'* is crucial to create credible commitments, as it gives public and private actors information about each other's actual performance, thus helping to create 'responsible behaviour'.

Doner's concept of institutional capacities concentrates only on soft capabilities. In fact, cluster actors' capabilities are constituted by both hard and soft factors. Moreover, each cluster actor behaves or acts based on different rationales. Understanding these rationales is necessary to analyse interactions between cluster actors. Theoretically, economic actors behave rationally to satisfy their needs and serve their interests. Rationales of cluster actors can be simply categorised into three kinds: 'economic', 'social' and 'political'. Economic rationale is associated with resources, while social rationale is about trust and political rationale is related to power. This study focuses on two elements in analysing the capability of cluster actors, i.e. 'availability and control of resources' and 'leadership'. Availability and control of resources is mainly concerned with economic and political rationale and reflects hard and soft elements of institutional capacities. Meanwhile, leadership combines all three rationales, but is most likely concerned with social and political rationales. Furthermore, leadership is a key ingredient for creating the three elements of institutional capacities proposed by Doner.

Availability and Control of Resources

Resources (e.g. budget, personnel, technology, etc.) are prerequisites for every organisation to operate effectively. However, limitation of managerial resources is the main constraint faced by government agencies in policy implementation. Slow progress and discontinuity of policy implementation has been consistently and effectively attributed to governments' lack of managerial resources for cluster development. On the private sector side, firms might have limited technology capability, which compels them to cooperate with other firms or find support from government or other agencies. This is mostly seen in SMEs with insufficient resources and skills. Availability of resources affects whether organisations can be proactive (or must be reactive) in cluster development.

Resource availability is closely linked to the issue of commitment, which in turn is related to political influence. If organisations in a cluster commit strongly to cluster development, it is more plausible that resources will be adequately allocated towards supporting cluster-related activities/initiatives. Nonetheless, the basic rationale of firms is to seek profits for business survival and growth. If firms are unsure of the government's commitment to cluster development and of the benefits they stand to gain from clustering, they may find participation in cluster activities unattractive or even useless and are unlikely to commit. Similarly, if government agencies do not really commit to cluster policy, perhaps due to political influences, budget and personnel are unlikely to be allocated sufficiently to execute cluster policy. This certainly affects the success or effectiveness of cluster policy implementation. Hence, the analysis of resource availability is not done by merely looking at the extent to which resources are available, but also takes into consideration the rationales or power relations behind resource allocation.

Leadership

Leadership is a soft-side factor that is difficult to measure but has significant effect on policy implementation. Admittedly, this study has limitations in studying how leadership influences cluster policy decision-making. To do so, it would be necessary to develop another comprehensive analytical framework, which would be a diversion from the main aim of this study. Nonetheless, this study is aware of the crucial influence of leadership in cluster policy processes and hence points out some interesting aspects of its influence in the analysis.

Empirical studies from many developing countries reveal leadership to be the key to the success of economic and industrial development (Lui and Qiu 2001, Shome 2002). Leadership influences how clusters are governed and also cluster policy processes through resource allocation. Stimson et al. (2005) found that strong and proactive leadership affects the success of institutional changes and adjustments to optimally utilise resources for effective economic development in a dynamic environment. A key characteristic of cluster development is the collective or concerted effort of all parties concerned. In this light, a conductor of such mutual effort is crucial to steer all parties in the same direction. Even joint action by a small number of cluster firms requires someone to take the lead (Rabellotti and Schmitz 1997). Roles of cluster leaders have been apparent and widely recognised in many clusters. A conductor or leader of cluster initiatives can be an individual or an organisation in the public or private sector. In some clusters, government may take a leadership role in cluster development, especially in authoritarian governed countries. Leading firms in clusters can play a focal role in driving cluster development as well (Boari 2001). However, the essence of leadership in successful cluster development is strong determination and commitment by the leading actor.

2.4.4 Institutional Modality of Cluster Intervention

In recent years, cluster studies have focused on cluster governance, innovation and collective learning through networking of firms, either explicitly or implicitly based on Schumpeterian evolutionary economics (Beerepoot 2004, Boschma and ter Wal 2005, Camagni and Capello 2000, Guerrieri and Pietrobelli 2000, Keeble and Wilkinson 2000, C. Lawson 2000). Technological change influences economic policy, technology policy, corporate strategy and national systems of innovation (Hodgson 1999, Sam 2000, Tamasy and Sternberg 2000) and is thus a fruitful line of cluster analysis. Nevertheless, this concept is often used in micro-level analyses, i.e. in studies at the firm or organisational level, to shed light on the learning and capabilities of firms and resource-based or competence-based theories of firms (Hodgson 1999, Lorenzen and Foss 2003). These theories explain the existence, structure and boundaries of firms in relation to the existence of individual or group competences, e.g. skills and tacit knowledge, which are in some ways fostered and maintained within organisations.

The principal concept of evolutionary economics focusing on the meso level of analysis, which is relevant to this study, is how economic actors deal with changes within a structure, not of a structure (Lambooy and Boschma 1998). In this respect, an interesting question is how do clusters deal with challenges arising from internal and external factors under the governance structure in which they operate. Many studies have examined the ability of clusters to overcome pressures from global competition (Pietrobelli and Rabellotti 2006, Schmitz and Nadvi 1999). Based on the meso perspective, this study concentrates on the ways clusters deal with challenges affecting their competitiveness, called the *'institutional modality of cluster intervention'*.

Basically, clusters apply a specific institutional modality to generate specialised services in response to particular problems. Institutional modalities of cluster intervention can take several forms. Helmsing (2001) summarised six institutional modalities that clusters may select to constitute specialised services. The first is 'public provision' in which generic or specific services, such as marketing services, vocational training and technology services, are provided to clusters by public agencies. In the second modality, called 'public-private partnerships', government fully invests in or co-finances with the private sector to establish specific service mechanisms, but lets the private sector execute them. The third modality, 'intermediary forms of non-profit enterprise promotion agencies' is a mechanism to deliver specific services for enterprise development. In the fourth, 'business associations' provide specialised services for clusters. In the fifth, a small number of firms cooperatively form 'consortia' with formal agreements to pool efforts or resources to achieve collective purposes. The sixth type is 'the formation of groups of firms', which is restricted to a smaller group of firms and often involves a more flexible or informal arrangement to cooperate on common issues (e.g. joint tendering for export or production orders and joint procurement of inputs).

Definition of 'Institutional Modality of Cluster Intervention' Used in this Study

The term *'institutional modality of cluster intervention'* in this study is defined as 'the institutional set-up or vehicle through which a particular intervention of cluster policy or instrument is organised in order to solve or handle a particular cluster-specific problem or competitive challenge'. 'Institutional modality of cluster intervention' can be abbreviated as

'institutional modality'. This book uses these two terms interchangeably. The institutional modality may be e.g. public action, joint private action, collective action through industry associations, public-private partnership (PPP) or other forms (see appendix 3 for a description of each type of institutional modality). Clusters facing similar competitive challenges may apply different institutional modalities to deal with them, depending on the governance, characteristics and contexts of each cluster.

Clusters may face different kinds of competitive challenges, e.g. lack of specialised human resources, lack of information that is critical to business, restricting government rules and regulations, market access constraints, limited logistics facilities, poor R&D infrastructures, inability to conform with new global standards, weak links with supporting/related industries and so on. By nature, clusters choose an institutional modality that is most likely to create positive externalities and is best suited to their existing governance or conditions. They might initiate new projects, programmes, standards and rules to facilitate creation of platforms for fair competition among firms. Clusters may create a new specific organisation to deal with these issues, e.g. a training institute or standard testing centre. Restructuring existing organisations to give them more proactive or facilitating roles for cluster development is another possibility.

One may perceive 'cluster governance' and 'institutional modality of cluster intervention' as very similar. In fact, these two terms differ regarding the specific interactions to which they refer. Cluster governance covers institutional arrangements and relationships among cluster actors that take place under more general or regular circumstances. Institutional modality of cluster intervention refers to interactions or relationships among cluster actors towards a specific issue or a particular competitive challenge. Institutional modality is influenced by various factors, including cluster governance. Relative strengths and weaknesses of each actor/institution involved in a cluster and path dependency are other key factors altering the behaviours and interactions of cluster actors. Cluster actors tend to employ ways they are familiar with or have experience with to deal with current challenges.

In addition, it should be noted that this study does not aim to compare which institutional modality of cluster intervention is the best or better than others. Clusters tend to select the institutional modality that best suits their conditions. Moreover, an institutional modality imple-

mented successfully by one cluster might fail when applied by other clusters or in another situation. Hence, the essence of the analysis of institutional modality of cluster intervention in this study is to understand what influences the choice of institutional modality and how such modalities function. These relationships are complex and non-linear. Having a clear picture of them, nonetheless, will be fruitful to further understanding of the complexities of cluster policy.

2.4.5 Effectiveness of the Institutional Modality of Cluster Intervention

As mentioned, clusters may apply different institutional modalities to manage their critical competitive challenges, depending on various factors and conditions. Merely understanding which and how such institutional modalities are selected and applied may not provide an integrated view on the whole process of cluster policy. This study hence finds it necessary to incorporate the effectiveness of the chosen institutional modality of cluster intervention in the analytical framework. The question here is how can the effectiveness of the chosen institutional modality of cluster intervention be measured, or what features might reflect such effectiveness. A growing number of studies discuss policy evaluation. Nevertheless, few specifically explore the effectiveness of cluster policies, particularly those responding to dynamic competitive challenges. Policy interventions are context-bound (Hill and Hupe 2009). To understand the effectiveness of implementing cluster interventions, it is essential to realise that contexts influence the process of implementation. The UK Department of Industry and Trade (DTI) (2004) suggested a measurement for cluster policy based on three aspects, namely, appropriateness, effectiveness and efficiency of interventions. Regarding effectiveness of interventions for cluster development, DTI proposed three areas of indicators, i.e. the nature of clusters, the nature of the interventions adopted and the overall policy objectives. Notably, DTI takes a conventional approach to policy evaluation, emphasising measurement of inputs and outputs/outcomes.

Again, the aim of this analysis is not to examine which institutional modalities are better than others. A particular institutional modality might be appropriate or applicable under some circumstances and not under others. Thus, this study's assessment of the effectiveness of institutional modalities of cluster intervention aims to gain a better under-

standing of mechanisms of the cluster development process. Cluster development is viewed as a 'process' not a 'project'. The effectiveness of institutional modalities and of cluster policy involves complex interdependencies of elements and factors. This study hence focuses more on 'process effectiveness' than on 'performance effectiveness', though this latter tends to be the focus of most policymakers. The 'process effectiveness-focused' analysis offers policymakers more insight into relationships and gaps between policy formulation and implementation and will be beneficial in the design of more suitable instruments to effectively implement cluster policy.

Hill and Hupe (2009) support the idea that policy researchers should shift from the conventional focus on policy goals or outcomes as dependent variables to evaluate the success of policy towards focusing more on relationships between the means and the ends of policy. A key issue for understanding the effectiveness of institutional modalities is that each challenge requires a different level of endeavour of concerned parties. Addressing some challenges may require committed participation of particular actors in a cluster. Moreover, a critical challenge faced by a cluster may be impossible to completely solve using only one institutional modality at all times. Additionally, a particular institutional modality may be effective only when some conditions exist or at a certain stage of cluster development. When time and other conditions change, clusters might need different institutional modalities. This is where the evolutionary perspective comes into play in the analysis.

The industrial policy-related literature, especially that focused on developing countries, cites the capability of local institutions as a key to the success of industrial policy (Lall and Narula 2004, Ozawa 2003, Schmitz 2004). Clusters are likely to take this into account, even though it might not lead to the most effective institutional modality due to constraints posed by local business conditions. Differences in the types of competitive challenges faced may affect clusters' selection of institutional modality. Today, many policy studies highlight the implementing process of industrial policy as a substantial ingredient to effectiveness of industrial policy and development (Hill and Hupe 2009, Rodrik 2007). Also, Porter (1998) suggests that cluster development and upgrading is a long-term process and cannot be judged as a one-shot effort.

Aligned with this perspective, the current study aims to provide a better understanding of the conditions and circumstances that impact effec-

tive implementation of the institutional modality of cluster intervention. Its analysis of the effectiveness of institutional modality focuses on policy for long-term sustainable development of clusters. Some conventional indicators (e.g. increased exports or FDI inflows, industry growth and productivity), applied in measuring cluster performance or overall success of cluster policy, are less useful for indicating the sustainability of cluster development. After all, a clustering process is dynamic, and clusters that are quick to adapt to a fast-changing environment are more likely to sustain their competitiveness. Hence, this study concentrates more on 'process effectiveness' of cluster intervention in creating a cornerstone for long-term development, than on performance or outcome evaluation. In this light, long-term commitment of all parties concerned in clusters is perhaps the most significant indicator of effective cluster intervention.

Definition and Indicators of 'Effectiveness of the Institutional Modality of Cluster Intervention' Used in this Study

'Effectiveness of the institutional modality of cluster intervention', as used in this study, refers to *'the effectiveness of an institutional modality in (1) creating or enhancing processes of collective effort of all related actors to handle the competitive challenges currently facing the cluster and/or (2) helping to prepare a foundation for the cluster to overcome challenges in the future'.* The approach used to evaluate the effectiveness of the institutional modality mainly focuses on processes and contexts of cluster development. The assessment aims neither to derive a comprehensive set of statistically based indicators nor to evaluate which modalities are better than others. Based on the notion of Rodrik (2007) stating that identifying the right process is more crucial in industrial development than specifying the outcome, a set of indicators has been developed, however, called 'elements' to avoid confusion with the term 'indicators' as it is generally used in traditional statistics-based policy evaluation. There are two groups of elements (see also the empirical discussion in chapter 7):

1) *Practical prerequisite element.* This element is crucial for clusters to manage the coordination problems which occur in cluster development. This group comprises three sub-elements:
   - presence of a core mechanism/institution for long-term cluster cooperation and development,
   - ability to create a shared/common goal or development direction among key cluster actors,

- distribution of responsibilities and co-investment in solutions between the public and private sectors.

2) *Real commitment and effort of key actors in clusters.* This element is composed of two sub-elements:
   - ability to play a catalytic role to create commitment or ownership of cluster actors,
   - ability to create collaboration in evaluating projects and readjusting cluster strategies.

2.5   Conclusion

This chapter contained two main parts. The first part started by describing the global forces shaping a new platform of competition and shifting perspectives on the competitiveness of nations from macroeconomic-focused towards more microeconomic-focused. The new concept of competitiveness has brought about a new approach to industrial policy, i.e. cluster development. Competitiveness is a key goal of cluster development, and its meaning varies according to the level of analysis (i.e. national, industry, firm level). Though measuring competitiveness is not the focus of this study, Porter's concept of the competitiveness of nations is used as a basic idea to construct the analytical framework. Competitiveness of nations sheds light on the extent to which nations can provide a sound business environment for cluster firms to increase productivity and create innovation. Presently many East and Southeast Asian countries, including Thailand, Taiwan and Malaysia, are applying the cluster approach as a new policy instrument for economic and industrial development to raise their national competitiveness. Industrial and cluster policy in these regions have common characteristics of being state-led and FDI-oriented. These clusters are facing challenges of upgrading local capabilities to adapt to fast-changing business conditions and platforms linked with FDIs.

The second part of this chapter presented the analytical framework for this study and concepts underlying each of the framework's five elements. The *first element* is context and external factors, which is analysed based on the Business Systems Concept originated by Richard Whitley. The *second element* is cluster characteristics, comprising two sub-elements: the nature of the industry and the structure of the cluster. The Structure-Conduct-Performance (S-C-P) concept provides the theoretical rationale for this element as it explains the interrelationships between the structure

of the industry and the behaviours of economic actors. Cluster governance is the *third element* in the framework. This element focuses on explaining interactions among key cluster actors in cluster development and rationales behind the actions of such actors. In the analysis of cluster governance, the capability of local actors was taken into consideration, as it can influence how cluster actors interact. Since, the concept of governance focuses on control and power relations between economic actors, two sub-elements were incorporated to analyse the capabilities of local actors: 'availability and control of resources' and 'leadership'.

The *fourth element* is the institutional modality of cluster intervention. The analysis of this element concentrates on how clusters respond to critical competitive challenges and why they select a certain modality for solutions. Clusters may apply different institutional modalities to tackle a similar challenge. Cluster context, characteristics and governance influence a cluster's selection of an institutional modality of intervention.

The *fifth element* is effectiveness of the selected institutional modality of cluster intervention. The analysis of this element focuses on 'process evaluation', not on outcome/output evaluation. This should provide insight into what is missing in the execution and mechanisms of policy implementation. Two main groups of indicators were developed to analyse this element: the 'practical prerequisite element' and the 'real commitment and effort of key cluster actors'. Chapter 3 discusses the first element of the analytical framework in greater detail.

Notes

[1] According to Andersson et al. (2004), systemic failure occurs when there is a mismatch or inconsistency between interrelated institutions, organisations or rules in the market and public spheres, especially with respect to innovation. These institutions/organisations include both public and private institutions producing knowledge and products that are of a public or private nature, e.g. firms, the science system, public research institutes, managers, entrepreneurs and venture capitalists.

3 The National Context of Clusters in Thailand, Taiwan and Malaysia

3.1 Introduction

Evidence from clusters in many countries shows the significance of national context in constituting different development paths and cluster structure and governance. To analyse how contextual factors influence characteristics and governance of clusters, it is necessary to primarily understand the contexts surrounding clusters.

This chapter describes the national contexts in which the selected case clusters operate. It also elaborates on the history of these nations, which is relevant for understanding the culture, norms and local institutions influencing cluster development. Moreover, this chapter makes some observations related to the issue of path dependence of industrial development. The variation of state involvement in industrial development is rooted in the historical evolution of particular states (Evans 1995, p.11). Past development experiences in industrial development can influence how current policies are constructed as well as the relationship between the public sector and the private sector and the behaviours of each.

It should be noted at the onset that the focus of the element 'context and external factors of clusters' indicated in the analytical framework of this study is 'contexts at the national level', or 'country-specific contexts'.
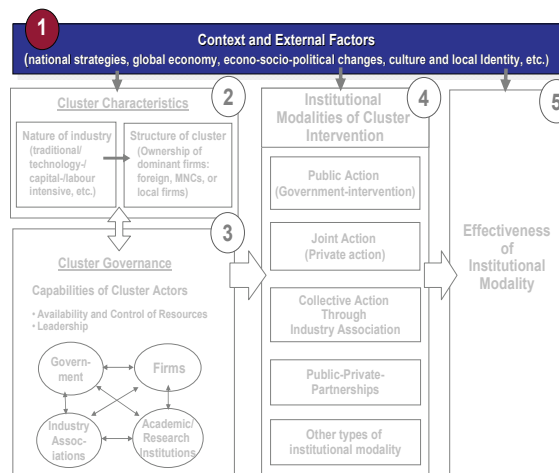
This chapter applies the Business System Concept, originated by Richard Whitley (1994, 2001) to analyse the contexts of clusters. The central notion of this concept is that institutional context is a conditional set of elements that influences the evolution of different business systems. Each nation generally creates its own unique business system, which reflects interdependence between institutional context, economic organisation and coordination, and the behaviour of economic actors. This study views the national context, including the economic, social and political contexts, as forming the business system, which in turn affects relationships amongst actors in the clusters operating under them. Furthermore, business systems can directly and indirectly influence cluster characteristics (i.e. the nature of the industry and the structure of the cluster). Understanding national contexts or business systems is useful for analysing relationships among cluster actors, their influences on cluster characteristics and governance, and the interrelations between cluster characteristics and governance, which will be discussed in later chapters.

This chapter mainly illustrates the first element in the analytical framework, i.e. the national context and external factors of clusters. Since the history and evolution of industrial development matter in the current economic performance or policy implementation of nations, this chapter also discusses the relevant industrial development histories and evolutions to shed light on the national contexts of the clusters in the three economies. The discussion starts by describing the key historical events that influence institutional arrangements and business systems in the three economies. Then, the following sections present roles of key government institutions in industrial development and characteristics of government-business relationships, especially with respect to economic control and coordination.

3.2   Historical Contexts: Driving Forces of Industrial Development in Thailand, Taiwan and Malaysia

Thailand and Malaysia are located on the Southeast Asian continent and have a connecting border at the south of Thailand and the north of Malaysia. Taiwan is an island located on the East Asian continent and has a close economic connection with Thailand and Malaysia. Thailand, Taiwan and Malaysia have pursued government-managed capitalism, or a mixed economy approach, in their economic development, with different degrees of government intervention. Taiwan and Malaysia are widely

recognised as strong states, where government has high degree of influence or intervention in the economy. Thailand, by contrast, is viewed as a weak state, where government has pursued limited intervention in the economy.

Taiwan, part of the Republic of China (ROC), is a small island with a relatively short history. Nevertheless, in the late 1980s, Taiwan was widely lauded as one of the Newly Industrialised Economies (NIEs), in which industrial evolution played a major role in leading the island towards becoming one of the most advanced economies in the world. Thailand and Malaysia are characterised as 'New Asian Tigers'. Their key industrialisation strategies, however, are different from those of Taiwan, due mainly to differences in the characteristics of their governments and business systems, which have been significantly influenced by historical forces.

The Malaysian and Taiwanese governments pursued largely nationalist policies in their economic and industrial development, albeit in different directions and led by different driving forces. This can be primarily attributed to their histories in nation-state building and the experiences of policymakers in working towards national development goals (Nesadurai 2008). Taiwan's nationalist economic policies took shape in a context of political tension emanating from the desire to be independent of the control of mainland China since 1949. Meanwhile, Malaysia's nationalist economic policies developed from political tension of an ethnic nature, with conflict between the nation's Malay and Chinese citizens. Thailand's economic development evolved without serious political and ethnic tensions. Thailand thus experienced fewer divisive internal forces in development and perhaps for this reason pursued management of its economy through liberalisation with limited government intervention.

As discussed in the literature, the fundamental characteristics of Taiwan's industrialisation are relatively similar to those of other East Asian countries, such as Japan and Korea. These fundamentals include (1) stable government ruling by political-bureaucratic elites, (2) public-private cooperation under the overall guidance of the central planning agency, (3) continuous investment in education and human resource development along with sound policies towards equitable income distribution and (4) pragmatic government intervention based on market-price mechanisms (Booth 1999, Kuo 1999, Schmidt 2003). These fundamentals are mainly attributed to Taiwan's political history. The strong drive

to be completely free of mainland China made past political leaders in the Kuomintang (KMT)[1] government fervently determined to quickly build a strong Taiwanese economy and to gain recognition by the world. Government endeavours sought to develop local capabilities by heavily investing in human capital, in the educational system and in non-market institutions. In the meantime, the government strengthened the private sector to spur economic development (Booth 1999). In short, Taiwan's industrialisation can be characterised technocratic and state-led, by which the government focused on creating a strong foundation for upgrading local capability (Ngo 2005).

Unlike Taiwan, Malaysia's industrialisation was driven by ethnic conflict, which to some extent is rooted in its history of nation-building. Malaysia was colonised by many nations from 1511 until her independence from British Colonial Rule in 1957. Prior to 1970, the development policies of Malaysia were primarily aimed at accelerating economic growth by emphasising exports and attracting FDI. Although the Malaysian economy grew by leaps and bounds during this period with an average growth of 6% annually, problems arose related to wealth distribution. Citizens of Malay ethnicity were largely poor and mostly worked in the agricultural sector in rural areas, whereas those of the Chinese ethnicity were in the industrial and trading sectors, which could generate more income. Most Chinese lived in towns and cities and had a better quality of life and education than the Malays. In addition, those of Indian ethnicity mostly worked as professionals or technical experts and had higher economic status than the Malays (Nelson et al. 2008). Consequently, socio-economic imbalances among ethnic groups emerged and led to racial riots in May 1969.

Since 1969, ethnicity has critically influenced political practices and policy implementation in Malaysia. In mid-1970, the government announced its New Economic Policy (NEP), a 20-year plan aiming to promote the unity of the nation with a two-pronged strategy: (1) eradicating poverty and (2) restructuring society to bring more balance in terms of opportunities in wealth generation, employment and education for all Malaysian people. The NEP was a social goal-based economic policy, and it significantly changed the industrialisation of the nation. It implied the abandonment of *laissez faire* economic management and a shift towards state-interventionism. Following the launch of the NEP, government hugely invested in improving the public educational system

and expanding it to rural areas to raise the capabilities and economic opportunities of 'Bumiputeras',[2] or the Malay-ethnic group. Special policies and treatments were provided for the Bumiputeras, e.g. preferential quotas for entering public education, funding and subsidies for education and business, and preferential business ownership regulations (Meerman 2008). This ethnicity-based industrialisation constituted a unique business system that has since greatly influenced relationships among actors in Malaysian industries.

Unlike Taiwan and Malaysia, Thailand's industrialisation evolved through liberalisation with fewer government interventions in business activities. Many scholars have called this 'the private sector driving development' (Hewison 2001, Jomo et al. 1997, Lewis and Kapur 1990, Wingfield 2002). Thailand continuously focused on sound macroeconomic management since the late 19th century, when the government decided to reduce state intervention in economic policy and establish modern economic management institutions to deal with the increasingly complex private capitalist economy. The key reason behind the successful economic development of Thailand in the past was the autonomy of the state power from capital and the government's focus on macroeconomic stability.

Thailand's industrial policy was initially quite fragmented. Macroeconomic and microeconomic management were not congruent. This was because strong technocratic bureaucrats mostly concentrated on the major macroeconomic institutions, while the line ministries involved in policy implementation had insufficient institutional capacity to effectively drive sectoral development (Jomo et al. 1997). However, the Thai private sector was significantly involved in the formulation and implementation of industrial policy through formal and informal lobbying by large firms and business associations. Like Malaysia and many other developing countries, Thailand's industrial policy has basically concentrated on attracting FDI. However, the lack of coherent policies to promote specific industrial sectors, along with unclear promotion guidelines for investment, led to ineffectiveness in promoting potential industries at the onset of industrialisation. Although Thailand did attract considerable foreign investment during the early industrialisation era, local firms did not really gain, especially in terms of upgrading their technology and management capabilities. This was a major factor in bringing about the weaknesses of local institutions thereafter.

3.3   Current Institutional Arrangement and Business Systems in Thailand, Taiwan and Malaysia

The increasing complexity of industrial development has led a growing number of agencies to be involved in industrial policy processes. Evidence from East and Southeast Asia suggests that highly capable institutions for effective economic development can be built under different organisational arrangements (Doner 2009). The state can influence the form of economic coordination in various ways. Formation of a business system at the national level is largely influenced by the degree to which national institutions govern capital and labour markets. State structures and policies and national institutions determine the way that economic actors interact with one another and the extent to which national business systems are formed (Whitley 2005). Business systems are characterised by four key institutional features: the state, the financial system, the skill development and control system and trust and authority relations (according to Whitley, referred in van Helvoirt 2009).

From this perspective this section mainly discusses the role of the state and business-state relationships in industrial development in Thailand, Taiwan and Malaysia. The focus is on national institutional arrangements that construct the business systems in three respects: (1) financial support and business development, (2) human resource and skill development and (3) technology and R&D.

3.3.1   Role of the State in Industrial Development

State involvement and intervention in industrial development cannot be neglected. Conventional debates on the role of the state often discuss 'how much' the state should be involved in industrial development and transformation. However, Evans (1995, p.10) argues that the key issue, in fact, is 'what kind' of intervention/involvement the state should undertake. Moreover, differences in the structure of the state can affect its capacity and roles in executing industrial development (Evans 1995). This section presents the main policies and the functions of key government agencies pertaining to industrial development in the three selected economies to exihibit the major part of the national context in which the clusters operate.

Key Industrial Policy in Thailand, Taiwan and Malaysia

An overall picture of key national and industrial development policies in Thailand, Taiwan and Malaysia provides a basis for further discussion of the roles of these governments in the three main activities for industrial development mentioned above.

Taiwan with its more advanced endowment, owing to huge government efforts in the past, has concentrated on investing in physical infrastructure, upgrading its advanced technology basis and facilitating local businesses' ability to leverage their existing competencies and to create new strengths to be globally competitive. In 2001, the Taiwanese government announced the vision to become the 'Green Silicon Island', in its national development plan for the new century, aiming for sustainable competitiveness.[3] Four areas were prioritised for government investment: human resources, innovation and R&D, global logistics and distribution channels, and the living environment.

Besides the increasing challenges presented by globalisation, Taiwan faced even more complex international competition challenges after joining the WTO in January 2002. Taiwan's economic environment then became more liberal and integrated into global industrial systems. In response to this change in economic structure and the new platform for competition, the government restructured the economy to shift from the industry and services sectors towards knowledge-intensive industries to create higher value-added products and services. In 2002, the Ministry of Economic Affairs (MOEA) identified four industrial niches, called the 'Two-Trillion' and the 'Twin-Star' industries. The semiconductor industry and colour-image/flat panel display industry were designated as the 'Two-Trillion' industries, while the digital content industry and biotechnology were dubbed the 'Twin-Star' industries.[4]

Industrial development in Malaysia had different driving forces than in Taiwan. Though the authoritarian style of Malaysia's government enabled industrial development to be effectively manipulated through various interventions, the economic successes could not balance social losses, especially in terms of ethnic integration. Even today, the problem of integration remains a key impediment to the industrial development of the country. Malaysia has continued a strong determination to achieve its 'Vision 2020' goal, initiated in the era of Prime Minister Mahathir Mohamad[5] (in power from 1981 to 2003). Vision 2020 has shaped Malaysian industrial development for over two decades. Its aim is make Ma-

laysia a fully developed country, a united nation and a knowledge-based society by the year 2020. To achieve this long-term national development goal, several development plans were implemented: the Second Outline Perspective Plan (OPP2, 1991-2000), the Second Industrial Master Plan (IMP2, 1996-2005) and the Eighth Malaysian Plan (2001-05). A cluster approach has been adopted in Malaysia's industrial development since the IMP2 period (Rasiah 2005).

Currently, Malaysia follows the direction and policy of the Ninth Malaysian Plan (2006-10) and the Third Industrial Master Plan (IMP3, 2006-20). The main focus of the 15-year IMP3 is 'Malaysia: Towards Global Competitiveness', aiming to shift the country towards more openness to global competition through economic transformation and innovation and to boost private Malay business interests through privatisation. IMP3 targets 12 priority manufacturing sectors. Six of these, including the electronics sector, are not natural resource-based.[6]

In the case of Thailand, in 2003 the Thai government identified five strategic industries, or 'global niches', as highly prioritised sectors to be promoted, especially by a cluster approach. These include the automotive industry, tourism, fashion (including textile and garment, jewellery and leather products) and software (focusing on animation software). The government assigned the Office of the National Economic and Social Development Board (NESDB) as the core agency coordinating overall cluster development. The NESDB cooperates closely with the Department of Industrial Promotion (DIP), the Ministry of Industry and key industry associations (i.e. Chamber of Commerce and Federation of Thai Industries) to promote high-potential clusters. However, since 2006 political instability and the short duration of government administrations have effected a discontinuity of industrial policy implementation. Though the process of cluster development continues, it has faced many difficulties in terms of financial and technical assistance from government agencies and its recent progress has been relatively limited.

In 2006, the NESDB in collaboration with key ministries conducted a strategic review of the competitive positions of Thailand's industries and set out a plan for industrial restructuring. Three groups of industries were identified for promotion: potential industries, new wave industries and improving industries.[7] Specific policies for each group were formulated. In the group of 'potential industries', the automotive industry and electronics industry were prioritised.

The brief discussion above shows the similarities in the industrial policies of the three economies. All three aim to drive their country's economies towards a more balanced and sustainable structure, albeit with differences in strategic sectors and development mechanisms. This direction of industrial development is mainly a response to the challenges presented by global competition and the changing nature of competition, forcing emerging economies to strive for higher value-added and more innovation- and knowledge-oriented activities. The next sections examine the three aspects of industrial policies in Thailand, Taiwan and Malaysia. The major role of government-related institutions in industrial and cluster development in the three economies is presented in table 3.1. This table provides basic facts about the concerned institutions, which will be further discussed in later sections and chapters.

Financial Support and Business Development

Development finance is essential for industrial development, especially for SMEs and new start-up businesses. In general, the discussion about financial support and business development sheds light mainly on the situation of SMEs. This is because large firms generally have more capabilities and wider opportunities for self-development and normally use other channels to influence government decisions on providing support for them, e.g. lobbying through business associations. In Thailand, key government and government-related organisations responsible for financial support and business development include the Department of Industrial Promotion (DIP), the Office of Small and Medium Enterprises Promotion (OSMEP) and the Small and Medium Enterprise Development Bank (SME Bank). These agencies focus on SME development and are under Ministry of Industry, so their strategies and actions are to a large extent aligned.

Table 3.1
Comparison of Key Government Agencies and Institutions Related to economic and industry development in Thailand, Taiwan and Malaysia

Responsibilities Related to Economic and Industrial Development	Thailand	Taiwan	Malaysia
National Planning	• Office of the National Economic and Social Development Board (NESDB), under the Prime Minister's Office	• Council for Economic Planning and Development (CEPD), under Executive Yuan (Prime Minister's Office)	• Economic Planning Unit (EPU), under the Prime Minister's Office
Sectoral Planning	• Ministry of Industry (MOI) • Ministry of Agriculture and Cooperatives • Ministry of Tourism and Sports	• Ministry of Economic Affairs (MOEA) • Council of Agriculture (COA)	• Ministry of International Trade and Industry (MITI)
Investment Promotion	• Board of Investment (BOI), under Ministry of Industry (MOI)	• Department of Investment Services, under MOEA	• Malaysian Industrial Development Authority (MIDA), under MITI
Financial Support and Business and SME Development	• Department of Industrial Promotion (DIP), under Ministry of Industry • Office of SME Promotion (OSMEP), under Ministry of Industry • SME Bank, under Ministry of Industry	• Industrial Development Bureau, under MOEA • Small and Medium Business Administration (SMEA), under MOEA	• Small and Medium Industries Development Corporation (SMIDEC), under MITI • SME Bank • Malaysian Industrial Development Finance (MIDF), under MITI
Trade and Commerce (Domestic and International)	• Ministry of Commerce (MOC)	• Department of Commerce, under MOEA • Bureau of Foreign Trade, under MOEA	• Malaysia External Trade Development Corporation (MATRADE), under MITI
Technology Development	• Ministry of Science and Technology (MOST)	• Department of Industrial Technology (DoIT), under MOEA • Industrial Technology Research Institute (ITRI)	• Malaysia Multimedia Super Corridor (MSC) • Malaysian Industry-Government Group for High Technology (MIGHT) • Malaysian Technology Development Corporation (MTDC) (Venture Capital for Business)
Skill Development	• Ministry of Labour (MoL)	• Bureau of Employment and Vocational Training (BEVT), under Council of Labour Affairs (CLA)	• Ministry of Human Resources • State Human Resource Development Centre, e.g. Selangor Human Resource Development Centre (SHRDC)

Source: Summarised from the websites by author

DIP is mainly involved in implementing the sectoral plans and driving projects related to industrial promotion, especially for light manufacturing and SME-based sectors. A special unit was set up under DIP to deal with cluster development, particularly SME-based clusters. Presently, this unit provides support for more than 22 clusters in areas such as training, network building and linking local cluster firms to wider markets. Similar to DIP, OSMEP is a public agency under the Ministry of Industry. It is responsible for formulating and driving strategic plans for SME development, supporting SMEs and managing an SME development fund. A major SME development strategy of OSMEP is to promote clustering of SMEs. Also, OSMEP coordinates with and provides funding to universities in many regions in Thailand to set up and operate incubation centres for SMEs.

The SME Bank of Thailand is government majority-owned and acts as a source of finance for SME promotion. It operates under the supervision of the Ministry of Finance and Ministry of Industry. At present, the Bank is shifting from being only a financial institution for SMEs towards becoming an institution to build an entrepreneurial society. Hence, it now provides a full range of development finance for SMEs, including cultivating, funding and advisory services. The Bank also supports cluster development, especially of SME-based clusters. A major example is the case of the Chonburi Automotive and Machinery-parts Cluster (CAMC), in which the Bank is actively involved as a key member and financial advisor. Moreover, the Bank is working to create a close network of SME-based clusters, and is designing a financial support package to suit their needs.

Similar to Thailand, in Malaysia many public agencies provide financial and development support for businesses, e.g. the Small and Medium Industries Development Corporation (SMIDEC), the Malaysian Industrial Development Finance (MIDF) and the SME Bank. The first two agencies are under the Ministry of International Trade and Industry (MITI), and the SME Bank is under supervision of the Ministry of Finance. Under IMP3, in 2007 the government set up two funds, the Service Export Fund and the Service Development Fund, to provide financial support to SMEs for developing service provider businesses and firms that aim to venture abroad. Under the Ninth Development Plan, the government allocated a budget of RM145.8 million to the Service Export Fund, operated by the Malaysia External Trade Development

Corporation (MATRADE). The Service Development Fund for SMEs received a budget of RM15 million, which is administered by SMIDEC (Ministry of International Trade and Industry Malaysia (MITI) 2007).

Founded by MITI in 1996, SMIDEC has a major role in strengthening small and medium-sized industries (SMIs) in Malaysia by providing infrastructure facilities, financial assistance, advisory services, market access and other supporting programmes. The role of SMIDEC is akin to that of OSMEP in Thailand. In 2009 it was reconstituted as the Small and Medium Enterprise Corporation Malaysia (SME Corp. Malaysia) and given the additional role of coordinating all government policies/programmes related to SME development. Also, it provides matching grants for SME business start-ups and funding for upgrading activities, e.g. in human resources, equipment, management information systems and technology.[8]

SMIDEC/SME Corp. Malaysia has initiated a variety of programmes to link local entrepreneurs/SMEs to the international sphere, e.g. the Vendor Development Programme (VDP) to link large enterprises/MNCs and SMIs and the Global Supplier Programme to encourage internationalisation of local Malaysian suppliers. The Global Supplier Programme focuses on finding funds for training SMIs in supply chain and logistics management and brokering international subcontracting agreements between local SMIs and MNCs (Felker and Jomo 2007). The SME Bank of Malaysia is another key SME development finance institution. Established in 2005, it functions as a one-stop centre for financing and business development and entrepreneurial training services to SMEs. However, currently its SME development activities are limited, as it is still in an initial stage of establishment.

Nonetheless, even though these institutions in Malaysia have claimed their success by quantitative indicators (e.g. the amount of funds provided to SMEs and number of subcontracting agreements completed), in terms of quality, SME upgrading remains doubtful, as seen in the cases of the Malaysian electronics cluster and the automotive and auto-parts cluster (see chapter 6 and case studies 3 and 5 on CD-ROM). This is due to the fact that the Malaysian industrial development policy has been bound by racial-based constraints in advancing the Bumiputera. Development finance and SME promotion have been developed especially to assist the Bumiputera and not to create a wide effect on the whole SME sector.

In contrast, Taiwanese SMEs have outstanding characteristics distinct from those in Thailand and Malaysia. They are outward-looking and export-oriented (Chou 2002), owing to the supporting role of government. Taiwanese SMEs have received significant government support, especially in terms of financing for technology upgrading and linking to large firms that are part of upstream industry. The vertical division of labour in Taiwanese firms has large firms producing upstream intermediate products for SMEs and then SMEs operating downstream to process these intermediate supplies for export. This is different from other countries, where SMEs concentrate on producing intermediate supplies for large firms to assemble and export.

Taiwan's government applies a dualist approach to financial support for SMEs. It encourages them to use private capital (e.g. from informal credit cooperatives, real estate mortgages and networking relationships) to finance business start-ups and development. Simultaneously, the government strictly controls financial organisations so that support is awarded selectively to firms in the targeted sectors, mostly capital- and technology-intensive sectors. The government also supports SMEs with an extensive monitoring system of production, marketing, financing for technology development and so on. This system enables the Taiwanese government to provide suitable assistance and to eliminate many of the obstacles that SMEs face (Chou 2002).

The government agencies related to development finance and business development in Taiwan include the Industrial Development Bureau (IDB) and the Small and Medium Business Administration (SMEA). Both are under supervision of the Ministry of Economic Affairs (MOEA). Established in 1981, SMEA assists SMEs in improving their operations and structure, their access to finance, their ability to innovate in production technology and automation, and their capacity to upgrade skills. Since the 1990s, the government has intensively promoted SME development to meet an increasingly complicated set of global demands and challenges. The Small and Medium Business Development Fund, amounting to NT$12 billion (US$358.6 million), was set up as a financing facility and guarantor of SME development. Besides providing mid- to long-term financing for major investment projects (NT$100 million or more) upon application by enterprises, the government established the SME Credit Guarantee Fund (SMEG) in 1974, which now operates under MOEA/SMEA. SMEG has been successful in providing a bridge

between banks and firms facing financial difficulties. It has given such firms access to various types of special low interest loans.

Human Resource and Skill Development

Human resource and skill development is another crucial activity for industrial and cluster development. The governments of Thailand, Taiwan and Malaysia have focused on skill development as one strategy to increase the competitiveness of industries. Policies related to skill development can be roughly categorised into two groups: policies to encourage firms to invest in skill development and direct support for skill upgrading of individual labourers. Thailand's skill development systems and policies remain weak, obstructing the development of industries and clusters. The key organisation responsible for skill development there is the Department of Skill Development (DSD) under the Ministry of Labour (MoL). DSD mainly provides basic skill development and training courses for individual workers, not for firms, and gives incentives for firms to upgrade the skills of their employees. Nevertheless, evidence shows that these policies have had limited effectiveness.

An example of such an incentive measure is the 150% tax write-off for eligible training expenditures of firms. However, most firms seem unaware of the existence of this incentive (Intarakamnerd et al. 2002). Also, according to the interviews, this incentive is unattractive for many firms as the procedures for obtaining the tax refund are complicated and take much time and resources. In addition, the private sector has limited involvement in designing DSD training programmes. The main focus of the MoL is employment rather than technological development (Intarakamnerd et al. 2002). Hence, the skill training programmes provided by DSD are far from what the industries need. Another critical issue for skill development in Thailand is weak university-industry linkages. Mostly such linkages are established based on personal relationships between academicians and firms, rather than organisational commitments (Intarakamnerd et al. 2002). Universities and vocational colleges in Thailand by and large have a supply-side focus in supplying human resources to labour markets, rather than on the demand side or industries' needs. These weak links echo the skill-demand mismatch between the existing workforce and new graduates, both in terms of quantity and quantity and especially in science and technology (S&T) fields (NESDB 2005). However, recently the Vocational Education Commis-

sion (VEC), under the Ministry of Education, started shifting its role to encourage vocational colleges to closely collaborate with industries in the areas nearby. This is a good sign for further development of clusters.

In Taiwan, skill development seems more effective than in Thailand and Malaysia. The government has continuously encouraged and subsidised the development of the education system, especially for serving industrial demands. Vocational education has been strengthened to supply semi-skilled labour for local firms, especially SMEs, without additional costs for on-the-job training (Lan 2002). The Bureau of Employment and Vocational Training (BEVT) under the Council of Labour Affairs (CLA) is responsible for overall planning of vocational training, certifying skill levels, encouraging companies to emphasise employee training, providing on-the-job training, and establishing platforms for industry-academic linkages.

Though the government has invested hugely in the development of human resources and the educational system – which in turn has generated an ample supply of researchers and highly skilled human resources – the key problem remaining is that most high-calibre personnel is concentrated in academic and research institutes, not in industry. As a result, there appears to be some inadequacy of R&D human resources in industry (Chu 2006). In response, the government has initiated various measures to promote university-industry linkages to mobilise high-calibre skills to more effectively serve industries' needs. Besides promoting S&T education in general, the Ministry of Education also promotes university-industry collaboration. It encourages and supports six universities specialised in S&T to establish university-industry collaboration centres to work closely with industries in their various vicinities.

Evidence from Malaysia reflects a problem of skill shortage at all levels, especially in technology-related fields. Akin to Thailand, Malaysia's higher education does not focus on serving industrial needs. This creates large human resource supply-demand gaps for all types of skills and education (Jomo 2007: pp.28-32). Here the problem is largely rooted in an uneven distribution of education and training opportunities among the different ethnic groups. In line with the NEP, Malay-ethnics have been given greater quotas to enter tertiary education. Consequently, most non-Malays have gone abroad for their advanced study and most did not return home after graduation, as job opportunities for them are also limited due to the unequal treatment in government policies (Ritchie 2005).

In response to skill shortages, the Malaysian government has assigned at least five ministries to cooperate in developing comprehensive vocational training for industries and simultaneously launched several policies and measures, such as setting up the Human Resource Development Fund to encourage firms to invest in training. Unlike Thailand and Taiwan, in 1993 Malaysia established a public centre to facilitate and coordinate firm-level training, the Human Resource Development Corporation (HRDC) (Ritchie 2005). Each state also set up a skill development centre to provide training services for their respective main industries. The most successful centre is the Penang Skill Development Centre (PSDC), established by the Penang State Government in cooperation with the Penang Development Corporation (a government-owned enterprise, PDC) and private sector actors related to electronics industries. PSDC enjoys wide renown as an effective public-private collaborative mechanism for skill development that has helped the electronics cluster in Penang enhance its competitiveness (see case study 3 on CD-ROM). Following the success of PSDC, the Selangor State Government established the Selangor Human Resource Development Centre (SHRDC) to support skill development for industries, especially those in the electronics and machinery sectors. SHRDC collaborates closely with industry to design and conduct training programmes to meet industry requirements.

Technology Development and R&D

Today, technology development and R&D are critical for industrial development and are a high priority of many governments. In this respect, Taiwan seems to be a successful case. The Taiwanese government pursued three steps towards technology development that were taken simultaneously. The first step was encouraging SMEs to link with larger or foreign firms through subcontracting. The second step was development of specialised infrastructures to stimulate technology diffusion to SMEs by government-sponsored organisations, e.g. Hsin-Chu Science Park (HSP) and the Industrial Technology Research Institute (ITRI). The last step was enabling and empowering industry associations to actively create linkages between FDI firms and local suppliers (Aw 2003).

The public agencies concerned with technology development in Taiwan are ITRI and the Department of Industrial Technology (DoIT), under the Ministry of Economic Affairs (MOEA). Basically, DoIT collaborates with ITRI to formulate the national science and technology

development plan, promoting the application of innovative technologies, establishing international cooperation in R&D, creating linkages among stakeholders in innovation and improving technology development infrastructures. DoIT set up the Technology Development Programme (TDP) to integrate the innovation capabilities of various stakeholders, such as firms and academic and research institutes to collaborate on innovation and high value-added activities. A main activity of this programme is to fund three groups of organisations related to technology development and R&D: universities, non-profit research institutes and firms (especially SMEs).

In 2001, MOEA provided funding to projects aimed to help industries upgrade their technology capabilities and to develop new strategic products through its Industrial Development Bureau (IDB). Three types of projects are eligible: 'national', 'main' and 'general' projects. A budget of approximately NT$2,832 billion was allocated to this scheme. The largest share of the budget (NT$2,761 billion) was devoted to the third type, 'general' projects. University-firm collaboration was supported under the 'national' category (Chu 2006).

The Industrial Technology Research Institute (ITRI) is an outstanding example of a technology development mechanism in Taiwan. ITRI has played a pivotal role in the development of the Taiwanese semiconductor cluster (see case study 2, CD-ROM). Nowadays, it has expanded its functions to actively spearhead technological development for other newly emerging and high-potential industries, e.g. optoelectronics, information and communication, and chemical and nanotechnology. To strengthen R&D and innovation within SMEs, MOEA set up 77 innovation and incubation centres for SMEs in many regions and universities. Three incubation centres were established in the Nankang Software Park and the Tainan Science Park, including the Nankang Software Incubation Centre, the Southern Science Incubation Centre and the Nankang Biotech Incubation Centre. Besides providing a nurturing base for SMEs' technological innovation, these incubation centres also support incubation centres in nearby universities and research institutes. The success of these centres is reflected in the fact that 54 incubated enterprises generated over NT$490 million in investment capital and employed some 690 in staff.[9]

In Thailand, the government agencies that have direct responsibility for technology and R&D are the Ministry of Science and Technology

(MOST) and   the National Science and Technology Development
Agency (NSTDA). MOST formulated a national S&T policy that targets
an increase in R&D expenditure from some 0.25% of GDP to 0.5% of
GDP by 2011, especially from private expenditure on R&D. Attempting
to follow the model of ITRI in Taiwan, MOST established NSTDA in
1991, as a semi-governmental agency to plan and take action towards
technology development. NSTDA implements S&T policy through its
four centres: NECTEC (National Electronics and Computer Technology
Centre), BIOTEC (National Centre for Genetic Engineering and Bio-
technology), MTEC (National Metal and Materials Technology Centre)
and NANOTEC (National Nanotechnology Centre). In 2005, NSTDA
set up a new unit, called the Technology Management Centre (TMC) to
provide assistance to SMEs in technology upgrading through the Indus-
trial Technology Assistance Programme (ITAP). TMC also manages and
commercialises the intellectual property of NSTDA and provides finan-
cial support for new business start-ups in technology and R&D facilities.

   In 2002, NSTDA established the Thailand Science Park (TSP), fol-
lowing the model of Hsin-Chu Science Park (HSP) in Taiwan. TSP is
expected to become a hub for private sector industrial R&D activities.
TSP, the only science park currently operating in Thailand, is located
close to two educational institutes, Thammasart University (Rangsit
Campus) and the Asian Institute of Technology (AIT). All five centres
and the Central Office of NSTDA are located in TSP. This allows
NSTDA to work closely with experts in academic institutes. TSP's main
services are provision of space and facilities for businesses to do R&D,
training and comprehensive technology incubation. Moreover, TSP en-
courages NSTDA's researchers to spin-off their business endeavours and
provides them support in the form of investment and funding. As of
December 2008, more than 50 incubated clients had collaborated closely
with NSTDA, conducting research at TSP. MTEC (a centre under
NSTDA) spun-off one unit, called the Design & Engineering Consulting
Service Centre (DECC) in 2008, to which MTEC gave a start-up fund of
10 million baht. DECC was initially expected to be fully self-financed
within five years, but according to its current performance DECC ex-
pects to pay back the initial start-up fund within its second year of opera-
tion.

   In the case of Malaysia, the government has stringently pursued tech-
nology policy to enhance industrial competitiveness. In alignment with

its Vision 2020, the government's first large investment in IT and multimedia infrastructure was the Multimedia Super Corridor (MSC). Launched in 1996, the MSC attempts to replicate the US Silicon Valley Model (Okamoto 2005). The major goal of the MSC was to enhance the economic transformation of Malaysia from a manufacturing-based economy towards a knowledge-based one by 2020. The government invested around US$1-2 billion in creating a high-end technology information infrastructure, e.g. a fibre-optic infrastructure. To attract foreign IT firms to invest in the Corridor, government offered them various incentives, such as freedom in ownership and employment (exemption from the requirement of local ownership and local employment) and general financial privileges.

However, though infrastructure development is one essential factor, it is not a sufficient condition for technology development. A large pool of creative and innovative human resources also has to be developed with a sustained capacity to come up with new ideas (Okamoto 2005). The Malaysian government therefore also stimulated the private sector to establish the Multimedia University, which supplies human resources in the fields required by MSC firms. The Multimedia University is the first private university in Malaysia. It is owned by Telecom Malaysia and located in the MSC area. It recruited its first 1,300 students in 1998 and at present supplies high-tech trained graduates, contributing to over 63,000 knowledge-based jobs in Malaysia.[10]

Other main agencies dealing with technology development in Malaysia are the Malaysian Industry-Government Group for High Technology (MIGHT) and the Malaysian Technology Development Corporation (MTDC). Both have key roles in facilitating information exchange between industry and educational institutes, business incubation and investment management (Ritchie 2005). MIGHT operates as a not-for-profit company, according to its official registration. Its operations are driven by both public and private members. Its key mission is to strengthen pubic-private partnerships to develop capacity and competency for strategic technology-driven industries. MTDC is a public-initiated agency to promote and commercialise local research and to provide grants, funds, venture capital, and incubation services for new technology-related businesses in Malaysia.

Regarding R&D, the government encourages universities to work closely with industry. Five universities were designated as centres of ex-

cellence,[11] having a key role in providing industries with technological support and R&D facilities, incubation services for start-up firms, market intelligence and access to funding (Ministry of International Trade and Industry Malaysia (MITI) 2007).

3.3.2 Government-Business Relationships towards Industrial Development: Economic Control and Coordination

This section looks at public-private relationships with respect to economic control and coordination in accordance with the Business System Concept. The state can be viewed as a primary institutional condition that influences the interrelationships and interdependencies of economic actors. The scope and degree of linkages between firms and government affects economic activities, coordination and the competitive strategies of firms. This section discusses two main issues: the characteristics of public-private relationships in economic and industrial development and institutional set-ups or mechanisms for government-business collaboration towards industrial development.

Characteristics of Government-Business Relationships for Economic and Industrial Development

Cooperation between the state and the private sector is characterised by long-term and reciprocal relations among firms, financial institutions and government agencies (Schmidt 2003). Basically the government-business relations towards economic development in Thailand, Taiwan and Malaysia are alike with regard to businesses' close links with politics. However, public-private relationships in the three economies do differ in their contexts and conditions. In Thailand, government-business relationships developed through deep patronage networks, which existed between politicians and the Sino-Thai[12]-owned big firms and conglomerates. They are characterised by some scholars as 'loosely structured' (Hewison 2001, Wingfield 2002). Presently, the Thai government and private sector collaborate closely in economic and industrial development. Businesses, mostly large firms, are involved in the government's industrial policy from the onset via several means and channels, e.g. business associations. However, smaller private entities still have limited involvement in policy evaluation, though this is crucial for policy feedback and learning.

For Taiwan, the relationship between government and businesses in the past was influenced by technocrat politicians. Although the Taiwan-

ese government was characterised as authoritarian – similar to Malaysia – the relation between the Taiwanese state and society was basically corporatist-oriented (Wu 2004). The strong Taiwanese government manifests itself in an autonomy from business activities and in its high capability to successfully implement long-term economic development policies (Whitley 2001). Driven by the desire to gain international diplomatic recognition and the associated need to preserve political stability so as to claim the legitimacy of its authoritarianism, the government's economic planning and development was steered by a small group of economic technocrats strongly committed to drive economy prosperity of Taiwan. State interventions to support achievement of the desired economic development goals took many forms: granting subsidies to target industries, awarding special loans to individual firms and encouraging new product development. Moreover, many local institutions were established and strengthened to create a good foundation for the long-term growth of local businesses (Ngo 2005).

Unlike Thailand and Taiwan, Malaysia implemented an industrial policy based on power relations not only between politics and businesses, but also between ethnic groups. State-business linkages mainly took the form of private companies with public enterprise ownership. Under this strategy of the 'state-as-entrepreneur' or 'government-in-business' (Embong 2008), the Malaysian government has since the 1970s been a key player in business – and one with more privileges than private firms. In many cases, political parties in the ruling coalition, i.e. the Barisan Nasional (BN) coalition, have owned or controlled key private enterprises, particularly those in major industrial sectors, such as the automotive industry. This is very different from Thailand, where the government had no direct involvement as a key player in business activities. The Thai government was involved only in creating a level playing field to support and facilitate firms to do businesses efficiently.

To achieve the NEP goals, the Malaysian government gave special favours to create Malay-ethnic capitalists, and this led to strong economic control and coordination between state-owned enterprises and Bumiputera businesses (Embong 2008). After the serious economic crisis in the mid-1980s and in response to the rising global pressure for economic liberalisation since that time, Malaysia has actively undertaken privatisation and gradually reduced the number of state owned-enterprises. Nonetheless, significant government controls over major

local firms remain, though with different forms of ownership and control. The government has provided preferential licenses for some companies to undertake ventures in industry. This constitutes a new form of state-monopolised firm, or so-called 'government-linked companies' (Jomo et al. 1997, Wah 2008). These are in evidence in the automotive and auto-parts cluster (see case study 5 on CD-ROM).

In 2004, government-linked companies under control of the state made up some 40%, or approximately 34% of the country's total capitalised market. These companies' capital assets accounted for more than half of Malaysia's GDP, or some RM232 billion. Presently, the government controls seven of the top ten listed companies through a majority holding of their shares. A few examples of these are Malaysian Airlines, Telekom Malaysia and Tenaga Nasional (an electricity company). This paradoxical role and conflict of interests of the Malaysian government have led to unequal treatment of private firms, especially between Chinese-owned and Malay-owned enterprises. This high government control over economic activities has had significant impact, discouraging private concentrations of wealth and dampening economic organisation in the market.

Institutional Set-ups and Mechanisms for Government-Business Collaboration towards Industrial Development

Institutional set-ups and mechanisms for collaboration between government and the private sector are essential in industrial development. In the three selected economies, these mechanisms vary in forms and rationales of establishment. Malaysia shows highly government-driven or controlled collaboration mechanisms between the public and private sectors, albeit aimed to balance economic prosperity among ethnic groups. The Thai government has set up various intermediary mechanisms, at the national, provincial and sectoral levels, to provide platforms for government-business dialogue. In Thailand, the key problem affecting government-business collaboration is discontinuity of policy directions and a weakness of intermediary mechanisms, due to the low capacity of government agencies (Doner 2009) along with the political instability of recent years. In Taiwan, the government's heavy and continuous investment in the educational system, its development of public administrative capacity and its stimulating the entrepreneurial capabilities of local firms (Adelman 1999, Chen 1999) have resulted in establishment of intermedi-

ary mechanisms for strong and effective public-private cooperation, especially for technology development (i.e. ITRI).

For Malaysia, since the 1980s many institutions have been created to support public-private cooperation, but these have been aimed mostly to control economic activities in the targeted sectors. An example is the Heavy Industries Corporation of Malaysia (HICOM), which serves as a channel through which the government invests in strategic heavy industries. Nonetheless, the role of the private sector was somewhat enhanced under a new development approach called 'Malaysia Inc.' (Malaysia Incorporated), initiated by Prime Minister Mahathir Mohamad in 1983. Under this concept, the nation was viewed as a corporation or business entity, jointly owned by the public and private sector (Abdul Karim 1996).

In the case of Taiwan, the government utilised state-owned enterprises (SOEs) or government-linked agencies to support the development of local businesses. SOEs in Taiwan are unique in that they are responsible for supporting highly export-oriented firms, especially SMEs, downstream in supply chains by supplying them with raw and intermediate materials in stable volumes and at reasonable prices. This kind of division of labour between public-controlled enterprises and local firms has created a strong foundation for SME growth in Taiwan (Lui and Qiu 2001). SOEs have played a significant role as upstream suppliers, whereas large enterprises are suppliers in intermediate stream businesses. This is a key factor contributing to the success of Taiwanese SMEs in many industrial sectors, including semiconductor manufacture.

In Thailand, the structure of public-private relationships changed significantly after the Asian economic crisis in 1997. During the economic turmoil, the government was criticised for its seeming determination to restructure the economy by giving preference to foreign investors and ignoring domestic firms. The ownership structure in key industries in Thailand – e.g. the automotive, electronics and banking industry – changed drastically thereafter (see case study 1 and 4 on CD-ROM). A revamping of the foreign ownership law in 1998 allowed wider space for foreign investors to take over many commercial banks and companies in various sectors. In addition, the foreign shareholding in numerous local companies increased to 40-49% (Hewison 2005). From the perspective of the private sector and academicians, the government strictly followed a neo-liberal agenda, from which it nonetheless derived no benefit.

Moreover, it was said to create problems in the long-run as the local firms would lose, while foreign firms would gain. Public-private relationships were tense during this period.

In 2001, a new government under Prime Minister Thaksin Shinawatra came to power and drastically changed the form of government-business relationships. A successful businessman himself, Thaksin moved to protect the benefits of large leading firms and balanced this by promoting SMEs and the rural poor. Developing competitiveness was highlighted as a key national priority and a new mechanism was set up, i.e. the National Competitiveness Committee (NCC), to serve this agenda. The NCC was effectively a platform by which the private sector could directly convey its needs to the Prime Minister and get a quick response.

Thaksin's administration (2001-06) made big changes in government practices and administration. During that time, bureaucrats and technocrats came under the dominant power of the government, even more than in the past. More importantly, decisions on budget allocations were centralised in the hands of the Prime Minister (Santitniramai 2007). Nevertheless, during this period the private sector was highly committed to the industrial policy process.

After Thaksin's government lost power in 2006, the NCC was completely dissolved and the cooperation between public agencies and the private sector became weakened. The current government under Prime Minister Abhisit Vejjajiva resurrected the Joint Public-Private Consultative Committee (JPPCC), which was an effective mechanism used during the 1980s. The internal challenges posed by political instability along with the external forces exerted by the global economic crisis have rendered the private sector more active in cooperating with the government in industrial development.

3.4   Concluding Remarks

This chapter discussed the role of government in the industrial development of Thailand, Taiwan and Malaysia in three respects (i.e. financial support and business development, skill development, and technology and R&D), based partially on the Business System Concept. It described the institutional arrangements in these three economies and characterised government-business relationships. Because economic development is a historical process (Siriprachai 2009), to understand the present it is necessary to understand the past, as path dependency may, to some extent,

affect present practices in economic and industrial development. Hence, the review of the national context of clusters in this chapter also drew out some highlights of the industrial development histories of the three economies.

The main common characteristic in the industrial development of Thailand, Taiwan and Malaysia is state-led development, albeit to different degrees and with differing approaches. The business systems in all of these three economies have been significantly influenced by the government. However, these three economies also display two differing aspects that impact economic control and coordination. *Firstly*, differing driving forces – derived from the history of nation-building of the three economies during the modern or post-colonial era – have been a key element in determining their various forms of state-led development. Taiwan and Malaysia are recognised as developmental states with a high degree of state intervention, whereas Thailand has pursued a more *laissez faire* approach with a smaller degree of state intervention. Looking back on its developmental history, Thailand's success in economic development has been attributed to well-managed macroeconomics. Nevertheless, this was fragmented from microeconomic management, mainly because of an imbalance in the concentration of highly capable technocratic bureaucrats between major macroeconomics institutions and line ministries. The implementing agencies were not strengthened as much, which limited the effectiveness of sectoral development policies.

Unlike Thailand, Malaysia is a multi-racial society dominated by Islamic culture. Tension derived from income disparities among the main ethnic groups led to severe racial conflict there. Afterward, Malaysia shifted its development policy from *laissez faire* to the ethnicity-based policy of the 1970s by introducing the New Economic Policy (NEP). The NEP – a social goal-based policy – has dominated the direction of economic and industrial policy of the country for almost 40 years.

Taiwan's state-led development was driven by the strong desire of the Taiwanese government and people to be independent of mainland China. A strongly embedded nationalism was a critical factor enabling the concerted effort by politicians, bureaucrats and the private sector in economic development. Politicians had high influence in directing and gearing economic development and bureaucrats were responsive to political demands by businesses, akin to Thailand and Malaysia. Nonetheless, Taiwan's governments in the past were more technocratic and

pragmatic in character, compared to those in the other two countries in the same period. On top of seeking technical assistance from foreign investment in the initial stage of industrialisation, the Taiwanese government invested large effort in developing the capabilities of local institutions that thereafter could constitute a strong foundation for long-term development. These ingredients of development were missing in Thailand and Malaysia.

The *second* aspect in which the three economies differ is in the role of the state and the business-government relationship to promote industrial competitiveness. The Taiwanese business system seems to be more advanced than that of Thailand or Malaysia in this regard. This is the result of the robust and pragmatic efforts put forward by past governments to create a strong foundation for local capability development, especially in technological and human resource capabilities. The technology development-related institutions in Thailand imitated the Taiwanese approach. However, due to institutional weaknesses, both in the bureaucracy and in the private sector, many obstacles remain for Thailand to achieve Taiwan's level of technology development. One key challenge, among others, is the misalignment of policy implementing agencies and the disconnection between planning and implementing agencies. For Malaysia, although the government has pursued an authoritarian model of industrial development, akin to that of Taiwan in the past, the results have not matched the level of success experienced by Taiwan. This is rooted in the past history of ethnic tension which continues to influence policy actions, shaping a unique business system. The current business system of Malaysia incorporates racial issues that engender mistrust between economic actors and government and limits the effectiveness of policy implementation.

Additionally, regarding government-business relations, the Malaysian government employs its power to intervene in business activities by becoming involved as a key industrial player. Many state-owned firms were established and have been given preferential support from government. This limits the upgrading of local capabilities. In contrast, the Thai and Taiwanese governments have never become involved as a key player in business activities. They play a supporting role to businesses rather than a leading role. However, in most cases special government support has been awarded to businesses with close ties to politicians. The strong capabilities base of the Taiwanese bureaucracy has enabled a more resilient

and pragmatic implementation of industrial policies. It can thus be seen that business systems or national context can shape the behaviours and coordination of economic actors. Chapter 4 investigates the relationship between national context and cluster characteristics.

Notes

[1] The Kuomintang of China (KMT), or the Nationalist Chinese Party, is founded by Republic of China (ROC), or Taiwan, as a ruling political party. KMT is the oldest political party in the Republic of China. Its headquarters is located in Taiwan. Currently, KMT is the majority party in Taiwan with regards of the number of seats in the Legislative Yuan. The KMT supports the One China Principle and defines "One China" as the Republic of China and not the People's Republic of China. The KMT was founded by Song Jiaoren and Sun Yat-sen after the Xinhai Revolution in 1912. Later Chiang Kai-shek became the leader of KMT. KMT controlled the government in Taiwan under a single party state until the political reforms during the late 1970s to 1990s. The ROC was once referred to synonymously with the KMT and known simply as "Nationalist China" after its ruling party.

[2] 'Bumiputera' refers to ethnic Malay people. Chinese and Indian ethnics are not included in Bumiputera. The Malaysian society is composed of three main ethnic groups, i.e. Malay (60%), Chinese (25%), and Indian (10%). A majority of population is Malay ethnic, which has dominant power in governing the country. However, most of economic activities are dominated by Chinese and Indian ethnics.

[3] Source: Government Information Office, Taiwan Republic of China (ROC), http://www.gio.gov.tw/taiwan-website/ad/win/012/html/silicon.htm

[4] It was estimated that by 2006, Taiwan would become the biggest supplier of TFT-LCD panels in the world and one of the most attractive locations for 12-inch wafer fabrication industrial investment. Moreover, Taiwan aimed to be the leading player in biotechnology and digital content industries, focusing on design and application, in the Asia-Pacific region.

[5] Mahathir Mohamad was the forth Prime Minister of Malaysia. He is the longest-serving Prime Minister in Malaysia and even in Asia. He tremendously influenced the transformation of Malaysia towards a more advanced economy.

[6] In the IMP3, the prioritised sectors include *non-resource based industries* (including electrical and electronics, medical devices, textile and apparel, machinery and equipment, metals and transport equipment) and *resource based industries* (including petrochemicals, pharmaceuticals, wood-based, rubber-based, oil palm-based and food processing). Likewise, eight service sectors are indicated as potential sectors,

namely business and professional services, distributive trade, construction, education and training, health care services, tourism, logistics services and other services.

[7] The first group, 'potential industries', includes (1) automotive; (2) petrochemical, petroleum refinery and plastic; (3) rubber products; (4) fashion (textile and apparel, jewellery and leather); and (5) electronics (including integrated circuits (ICs), radio, and TV). The second group, 'new wave industries', includes (1) biomaterial (packaging, interior trims for automotive), nutraceuticals and bio-fuel. The last group, 'improving industries', include those needed to enhance value creation, such as (1) chemicals, (2) furniture, (3) electrical machines, (4) pharmaceuticals, (5) office & home appliances, (6) steel, (7) processed fruit and vegetables, (8) canned fish and seafood, (9) rice and grain and (10) sugar refinery.

[8] Source: http://www.smidec.gov.my/

[9] Source: Small and Medium Enterprise Administration (SMEA), Ministry of Economic Affair (MOEA), Taiwan

[10] Source: www.mscmalaysia.my

[11] Centres of excellence include the Science University of Malaysia (USM) for microelectronics, the Technological University of Malaysia (UTM) and the Malaysia Multimedia University (MMU) for ICT, the National University of Malaysia (UKM) for micro-electromechanical systems, and the University of Malaya (UM) for photonics.

[12] 'Sino-Thai' refers to children of intermarriage between Chinese immigrants in Thailand and indigenousThais.

4 Cluster Characteristics and National Context

4.1 Introduction

This chapter covers three subjects: (1) the relationship between national context and cluster characteristics, (2) the nature of an industry and how it affects cluster structure and (3) the influence of the national and industrial contexts on the capabilities of local actors (which then affects cluster governance, discussed later in chapter 5). This
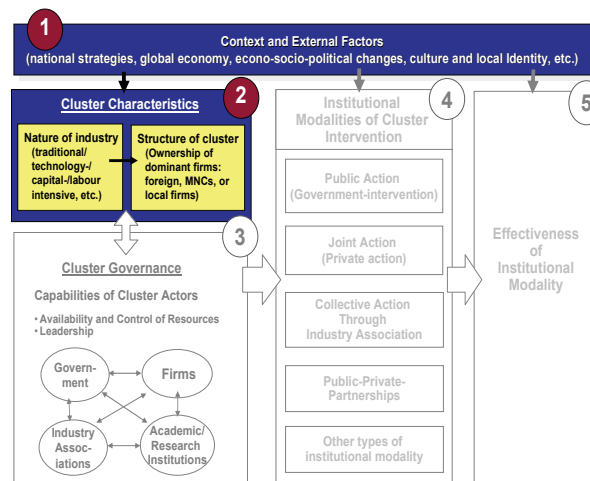
chapter mainly responds to two sub-research questions: (1) What are the characteristics and industrial configurations (industrial structure, nature and supply chain) of the selected clusters? (2) How do the contexts of the selected clusters influence cluster characteristics?

The nature of the industry directly affects the structure of a cluster. Clusters with a similar nature of industry are likely to have similar basic characteristics and structures. However, the case studies reveal that clusters might have very different structures as well, even within a similar industry. Such differences are mainly derived from the capabilities of local actors, which are affected by the differing contextual factors of each cluster. This study differentiates two types of contextual factors: country-specific and industry-specific. Referring to the main analytical framework of this study, the country-specific context is viewed as akin to 'national

context' and the industry-specific context is similar to 'the nature of the industry'.

Two propositions can be drawn from the analysis in this chapter. *Firstly*, inter-firm relations and cluster structure are directly influenced by industry-specific contextual factors. *Secondly*, the structure of clusters can be altered from the normal features (shaped by the industry-specific context) by the influence of the country-specific context through the capabilities of local actors. This is a kind of complementarity of institutional fit. The next section describes the basic concept of country- and industry-specific contexts used in this study. Then, the following parts present the analysis for the two propositions, respectively.

4.2   Country-Specific versus Industry-Specific Context

Besides being influenced by the nature of the industry, the structure of a cluster is influenced to a large extent by cluster context. Two types of contexts cause cluster structures to differ. The first type is *'country-specific context'*, which encompasses institutional aspects, such as norms, social cohesiveness, local identity, rules and regulations, and government intervention through industrial and other related policies. More specifically, national context can be differentiated along the three lines introduced in chapter 3: financial support and business development, human resource and skill development, and technology and R&D. The second type of context is *'industry-specific context'*, which refers to the characteristics of a cluster's supply chain and the nature of the industry.

Empirical evidence from the seven case studies suggests that industry-specific context more directly affects the behaviours of firm actors in clusters than non-firm actors, especially with regard to inter-firm linkages and ownerships of dominant actors. In contrast, country-specific context more significantly influences the characteristics and practices of non-firm actors in clusters, to some extent also influencing behaviours of firm actors. Country-specific factors largely impact the capabilities of local actors or institutions, which consequently alter the structure of clusters. Key local cluster actors investigated in this study are firms, government agencies, industry associations and research/academic institutions. Local institutions, particularly public agencies, play a crucial role in managing integration of external resources (i.e. foreign flows of funds) with internal resources (i.e. national endowments) for long-term economic development (Whitley 2001).

The structures of the seven clusters selected for this study can be classified into three types, based on the cluster typology of Richard (2003). Richard categorises types of clusters in developing countries based on the structure of the dominant firms: (1) clusters of subsidiaries of MNCs and local suppliers, (2) clusters of large national firms and local suppliers and (3) clusters of SMEs. Accordingly, Taiwan's semiconductor cluster and Malaysia's automotive and auto-part cluster are characterised as 'clusters of large national firms and local suppliers', whereas the Thai and Taiwanese orchid clusters are judged as 'clusters of SMEs'. The Thai HDD, Malaysian electronics and Thai automotive and auto-parts clusters, on the other hand, are 'clusters of subsidiaries of MNCs and local suppliers' (Figure 4.1).

Figure 4.1
Structures of the Seven Clusters
and Country- and Industry-Specific Contexts

Country-Specific Contexts			
Nature of Industry	**Structure of Cluster**		
	Thailand	**Taiwan**	**Malaysia**
Electronics • Very fast changing technology • High capital-Intensive • Complicated and quite long supply chain	**Hard Disk Drive** Cluster of subsidiaries of MNCs and local suppliers	**Semiconductor** Cluster of large national firms and local suppliers	**Electronics** Cluster of subsidiaries of MNCs and local suppliers
Automotive and Auto-parts • Moderate fast changing technology • High capital-Intensive • Complicated and long supply chain	Cluster of subsidiaries of MNCs and local suppliers	-	Cluster of large national firms and local suppliers
Orchid • Slow changing technology • Low-medium capital-Intensive • Not complicated and short supply chain	Cluster of SMEs	Cluster of SMEs	-

Industry Specific Contexts

Figure 4.1 shows that the structure of clusters might vary, even though they have the same industrial nature. Taiwan's semiconductor cluster comprises many strong local leading firms and a myriad of capable SMEs, whereas the Thai HDD cluster and the Malaysian electronics cluster are dominated by foreign MNCs. Similarly, the automotive and auto-parts clusters in Thailand and Malaysia reflect the influence of country-specific context on the structure of the clusters. While the Thai automotive and auto-parts cluster is dominated by foreign MNCs, which control supply chains and the operations of their local SME suppliers, the Malaysian automotive and auto-parts cluster is dominated by large local leading firms.

The orchid clusters in Thailand and Taiwan reflect little difference in structure. Both clusters are local SME-based with restricted, or even no, role of foreign MNCs. In the two orchid clusters, industry-specific factors appear to be more dominant than country-specific ones in determining cluster structure. This is likely related to the nature of the agricultural sector, with its strong influence of primary inputs. Another reason might be that in the past these clusters lacked targeted government attention and support. The governments of Thailand and Taiwan only recently began to view the orchid industry as a high-potential sector, providing it more support. One observation from the case studies is that country-specific context, particularly government policies and interventions can be more influential on the structure of technology-driven clusters, whereas industry-specific factors are likely to have a greater influence in shaping the structure of natural resource-based clusters. The following sections elaborate on why and how these distinct cluster structures come about and are shaped by these two types of contextual factors.

4.3   Country- and Industry-Specific Contexts and Structure and Inter-Firm Relations of Clusters

The nature of an industry generates an industry-specific context that directly influences the features of supply chains and inter-firm relations in clusters. This study classifies the seven cluster cases simply into two types: technology-driven clusters and natural resource-based clusters. The first is capital-intensive and technology-intensive. The relations of firms in these clusters' supply chains are producer-driven. Production in technology-driven clusters is likely to be dominated by large enterprises that own advanced technologies. Hence, large firms are potentially cen-

tral in coordinating backward and forward linkages along the supply chain. SMEs in this type of cluster are involved in the supply chain as subcontractors of large firms and are heavily reliant on the technologies and standards set by large firms. Technology-driven clusters mainly produce specialised products; however, they might also produce consumer products which require high technology in their production. Among the case studies, the clusters characterised as technology-driven are the Taiwanese semiconductor cluster, the Thai hard disk drive (HDD) cluster, the Malaysian electronics cluster, and the Thai and Malaysian automotive and auto-parts clusters.

In natural resource-based clusters, on the other hand, production relies largely on environmental conditions and nature. They tend to engage family-owned SMEs and entrepreneurs located in proximity to communities/areas with suitable climate and geographical conditions for production. These clusters, hence, are generally community-based. By nature, these clusters are closely tied with local social values, norms, cultural identity and kinship/friendship. In the past, natural resource-based clusters were viewed as low-tech and requiring only limited R&D because their production processes had fewer complicated activities than technology-based clusters. However, the image of these clusters is changing. Most are becoming more knowledge-intensive and innovation-oriented so as to increase value-added in products. Product specialisation and differentiation now play a larger role in these clusters and are developed through community learning. Large firms and hierarchical control of global production systems are generally limited in these clusters' supply chains, since basically they rely on domestic production factors and markets.Consequently, firms in these clusters are likely to have limited exposure to global markets and to concentrate mainly on domestic markets, unless they integrate forward into downstream activities, especially trading. These conditions constitute a buyer-driven supply chain, where trading firms have high power in mandating prices, standards and quality of products (Albu 1997, Gatrell et al. 2009).

Global competition nowadays is shaped by the interactions of a broad set of technological, institutional and organisational factors. These contextual factors as well as changes in regulations effect a transformation in the structure of industries and of power relations between firms in supply chains. The pattern of these interactions has changed over time and across industries, resulting in particular forms of governance in global

value chains (Gereffi 2001). The following sections discuss the influence of industry-specific and country-specific contexts on cluster structure by industry.

4.3.1 Electronics Clusters: Country-Specific Context Alters the Supply Chains and Inter-firm Relations of Clusters

The electronics industry encompasses a wide range of products. Semiconductor and HDD products are classified as electronics according to the international standard industrial classification (ISIC). In this study, the Taiwanese semiconductor cluster and the Thai HDD cluster were chosen to represent the electronics industry. In the case of Malaysia, the government applies a cluster approach to the electronics industry as a whole. Thus, the institutions supporting cluster development there are not specific to individual electronics products; rather, they are aimed at the overall electronics cluster. Hence, the analysis of the Malaysian case focuses on the electronics cluster as a whole. To gain a basic understanding of the linkages between these three electronics products, figure 4.2 illustrates the overall supply chain of the electronics industry. Note that the semiconductor industry is upstream in the electronics supply chain, while the HDD industry is one of assembling electronics products in the mid-stream of the chain.

Electronics manufacturing has a relatively long supply chain, involving many parts and components that require advanced and precision technologies. This renders key features of the electronics cluster as fast-changing technology and high capital investment. For instance, semiconductor technologies change every 18 months or less. HDD technologies change even faster (less than nine months for some products) than those for other electronics products. The HDD industry is increasingly confronted with technological pressures and highly stringent production requirements due to more demanding and sophisticated consumers. HDD storage capacity significantly increases almost every month, while prices (per megabyte) are declining dramatically. In the 1990s, the average price per megabyte of HDD was around US$11, but in 2000 it was only a penny. Concurrently, storage capacity (areal density) has grown at a rate of more than 100% per year since 1997 (McKendrick 2004, p.144) (for details see case study 1 on CD-ROM).

Figure 4.2
Supply Chain of Electronics Industry

Markets for Electronics Products

Other Electronics Components
• Display
• Resistors
• Capacitors
• **Disk Drives**

Semiconductor Materials
• Silicon
• Compounds
• Gas Purification
• Ceramics

Enabling
• Manufacturing Process
• Design
• Modeling/Simulation
• Testing Equipment

Software

Semiconductor Manufacturing Equipment
• Plasma Etching
• Lithography
• Ion Implantation
• Diffusion Furnaces
• Chemical Vapor Deposition

Semiconductor Manufacturing
Integrated Circuit
• Microprocessors
• Memories
• Custom Logics
• Multiplier
Discretes
Photonics

Electronics Packaging
• Wafer Scale Integration
• 3-D Silicon
• Multi-chip Modules
• Discretes
• Hybrids
• Printed Writing Boards
• Coatings
• Printed Circuit Boards
• Materials

Communication

Manufacturing

Data Processing

Consumer Electronics

Defense

Source: Gover, J. & Gwyn, C. (1992). Strengthening the U.S. microelectronics industry by consortia. Albuquerque: Sandia National Laboratories.

The increasingly intense competition in the electronics industry on price and technology pressure electronics firms to find ways to increase economies of scale, shorten product cycles and reduce costs (Gonsalves 2007, Gourevitch et al. 2000, McKendrick 2004, Rasiah 2001). As such, technological and product innovation and manufacturing capability are key to the competitiveness of many technology-driven clusters, particularly the HDD and semiconductor clusters (McKendrick 2004, McKendrick et al. 2000). The major technological challenge facing HDD manufacturers is to miniaturise the HDDs and offer bigger storage capacity and lower cost. High precision technologies and extreme cleanliness in assembly are also vital in the industry. HDD firms must therefore put substantial emphasis on investments in advanced technologies and in upgrading skills, R&D and production equipment to maintain or strengthen their competitive position. Similar to the HDD cluster, inte-

grated circuits (ICs), also called 'microchips' or 'silicon chips', are a major product of the semiconductor cluster and require high investment in maintenance of facilities and machinery. To remain competitive, IC companies must fully utilise all facilities and machinery to recover their huge costs.

Key producers in the electronics industry tend to be large firms or MNCs that can afford massive investments. Due to the complicated and long supply chain, combined with a short product lifecycle, during the 1960s and 1970s electronics firms were likely to be vertically backward integrated in order to gain benefits from cost reduction and control or to secure the supply of parts and components. Many US-based firms were dominant players in the computer manufacturing industry at that time. They started producing their own HDDs for their computer production. IBM was first[1] followed by General Electric and Control Data. This trend prevailed in Japan and Europe as well (McKendrick et al. 2000). Vertical integration was a crucial strategy of many HDD firms to compete globally, although it was not universally implemented. Likewise, some HDD firms have applied a business model of contract assembly relations. For instance, Union Technology Co. Ltd. (UTC, Saha Union Group) – a local Thai-owned company – has been a contract assembling company (also called an 'OEM' or original equipment manufacturer) for IBM for years and continued producing HDD under the brand of Hitachi after its acquisition of IBM. Nevertheless, the contract assembly model is relatively less significant in the HDD industry in terms of its share of total production of the whole HDD industry in the world. Most HDD companies still maintain and rely on in-house assembly, especially of HDDs and their key components (McKendrick et al. 2000).

Electronics products today are produced through a worldwide production network. Electronics companies increasingly apply a global outsourcing approach to gain cost advantages and diversify risks in procuring inputs for their products. In the late 1980s, US and Japanese MNCs in the HDD industry were the first to start moving their assembly plants offshore to low-cost locations in developing countries in Southeast Asia, starting in Singapore then in Thailand, Malaysia and the Philippines. Today, US and Japanese firms are key players in the HDD cluster in Thailand and in the Malaysian electronics cluster. The influence of US-based firms in the two clusters is relatively higher than that of the Japanese, owing to their advantage of being the first to enter this region. In addi-

tion, the global outsourcing model has enabled electronics MNCs to stimulate specialisations at each location, hence, creating regional production systems. Since the US and Japanese HDD MNCs embarked on their production in Southeast Asia, Singapore has become the centre for HDD assembly; Malaysia has developed a specialisation in heads and PCBA (printed circuit board assembly). Thailand has become a specialist in producing a general mix of heads, disk drives and spindle motors (McKendrick et al. 2000).

Industry-specific contexts have forced many electronics firms to pursue vertical integration and global sourcing models. These models hence influence the structure and inter-firm relations between foreign MNCs and local suppliers. This influence is seen in the Thai HDD cluster and the Malaysian electronics cluster. In the Thai HDD cluster, foreign-owned firms are in the majority, accounting for some 95% of all HDD firms in Thailand, while Thai-owned and Thai majority-owned firms accounted for 4.2%. Only 2 of 60 firms are 100% Thai-owned, and 5 firms are Thai majority-owned firms (see case study 1 on CD-ROM). The Malaysian electronics cluster reflects a similar structure. According to the Malaysian Industrial Development Authority (MIDA), in 2006, foreign investment in the electronics industry accounted for some 80% of total investment in this sector. In addition, like in Thailand, currently some 95% of electronics companies in Malaysia are foreign-owned or foreign-majority joint venture firms (see case study 3 on CD-ROM).

The limited participation of local firms, mostly SMEs, in the Thai HDD and the Malaysian electronics clusters is attributed to a lack of capital, highly skilled workers and technological capabilities. Rasiah (2004) studied the technological capabilities of electronics firms in Thailand, Malaysia and the Philippines and found that foreign firms had greater technological capabilities than local firms in all of the measured aspects (human resources, R&D and process technology). As a result, they dominated and controlled the local firms in the host countries. Moreover, the literature points out weaknesses of local infrastructures and institutions in encouraging participation of local firms in this sector, especially in the more advanced activities (Ariffin and Figueiredo 2003, Chia 2006, Henderson and Phillips 2007, Lauridsen 2004, Narula and Dunning 2000, Siew-Yean and Zainal-Abidin 1999).

Based on the observation from the interviews, the nationality of the leading MNC also impacts the characteristics of inter-firm relations in

the electronics clusters. This is due to the MNCs' different organisational forms and management styles. Japanese firms by culture focus on building close inter-firm linkages and long-term relationships with suppliers (so-called '*keiretsu*'), to facilitate better coordination at all stages of their production and to lower transaction costs. The essence of Japanese style inter-firm networks is long-term relationships between core manufacturers and their sub-contractors or suppliers based on mutual trust and economic benefits, which supports coordination in complex production processes and eventually reduces transaction costs (Stam 2004). Hence, Japanese electronics supply chains in the past were less vertically integrated than those of US-based firms (McKendrick et al. 2000).

US electronics and HDD firms in the Malaysian and Thai clusters manage their supply chains with more business-like relationships. Suppliers in the chain are under contract and control by the electronics and HDD MNCs. The MNCs strictly control their suppliers based on cost and quality, and they, in turn, are controlled in their own core activities, such as R&D and design, by headquarters. Interviews of Japanese HDD assembly and supplier companies in Thailand and of electronics producers in Malaysia suggest that at present most Japanese firms in the electronics-related industries have moved to a more American style of management and industrial organisation in their inter-firm relations with suppliers to respond to the fiercer competition in the volatile global electronics markets.

Next to the industry-specific context, cluster structure and inter-firm relations can be significantly influenced by the country-specific context. Government policies and interventions are typical country-specific means of altering cluster structures and inter-firm relations. The Taiwanese semiconductor cluster is a good example of this. Initially, Taiwan developed its semiconductor industry by an approach similar to that of Thailand and Malaysia. Taiwan, at the onset of its industrialisation, attempted to attract FDI to its semiconductor industry so as to gain technology transfers and upgrade local firms' technological capabilities. Given that developing countries normally expect to receive technology transfers through FDI, local capability is a crucial factor in enabling the transfer of technologies or to make technology transfer more effective. As such, both technology providers and recipients need to have basic capabilities. Numerous empirical studies have found the lack of local capabilities to be a key obstacle to the industrial development of many de-

veloping countries. In this regard, the government has a crucial role to play, particularly during the nascent stage of industrial development (Abdulsomad 2003, Chia 2006, Giuliani 2002, Rasiah 2003b, 2004, Sonobe and Otsuka 2006, Wad 2001).

The Taiwanese government has implemented a two-pronged industrialisation strategy: (1) building the capabilities of local institutions and entrepreneurs while (2) attracting FDI. Being a former colony of Japan benefited Taiwan in its early stage of industrialisation, in terms of bringing skills for mass production and supplying fundamental broad-based industrial technologies (Stam 2004). The government continued massive investments to create an enabling R&D environment and facilities for technological upgrading of local firms. The goal has been to raise local firms' absorptive capability for foreign technology transfers. The Industrial Technology Research Institute (ITRI) was founded in 1973 as a government arm to strengthen local technological capabilities. Just one year later, the Electronics Research and Service Organisation (ERSO) was set up under ITRI and became a pivotal mechanism in identifying, acquiring and developing absorptive capability and for diffusing semiconductor-related technologies in Taiwan. Thereafter, Hsin-Chu Science Park (HSP) was established in 1980 with an initial budget of US$1,679 million to provide proper supporting facilities for firms in technology-intensive industries. The government continues to invest in HSP's infrastructure, amounting to some US$1.9 billion since it started operations.

ERSO used the spin-off approach to develop local semiconductor firms. In fact, many of today's internationally known Taiwanese semiconductor-related companies were spun-off from ERSO, such as United Microelectronics Corp. (UMC) in 1979, Taiwan Semiconductor Manufacturing Corp. (TSMC) in 1987, Taiwan Mask Corporation (TMC) in 1988 and Vanguard International Semiconductor (VIS) in 1994. The spin-off of these companies attracted over US$3.6 billion of investment in IC manufacturing to Taiwan, and now these firms have become globally successful[2] and strong supporters of the development of Taiwanese SMEs suppliers. Although at the early stage, ITRI and the universities were fully state funded, the government soon encouraged these institutions to become self-financed. Since 1988, only 55% of ITRI's funding has come from the government, with the remaining 45% provided by the private sector (from service fees for new product development), whereas

ERSO received only 20-25% of its budget from the government (Lui and Qiu 2001).

Alongside the development of physical infrastructure, the government strategically induced Taiwanese engineers and technicians working in the US to return home and help develop the semiconductor cluster (Song et al. 2001). After the late 1980s, the number of returned Taiwanese engineers increased rapidly, from around 10% early in the decade to more than 30% in 1998. Some 3,000 returned engineers worked with private local companies at Hsin-Chu Science Park and with ITRI/ERSO. Many of these returnees became founders of ITRI's spin-off semiconductor companies or started their own businesses in IC design. TSMC is one of the outstanding examples in this regard.

Not only did the government strengthen local institutions for supporting firms, it also implemented various policies to encourage local firms to invest in the semiconductor industry and to develop their technological capabilities. For example, in the Electronic Industry Development Programme (EIDP), the government allocated a budget amounting to NT$410 million (some US$11 million) for the first phase and NT$786 million (US$21 million) for the second phase through public agencies, ERSO in particular (Hongwu 2006). Since local firms at that time were still reluctant to enter this high-risk industry, the Taiwanese government, via its Ministry of Foreign Affairs (MOEA), set up a joint state-private venture to promote the diffusion of innovative technology to businesses and to encourage private investment in this sector. The Industrial Technology Investment Corporation (ITIC) was established in 1979 to provide venture capital for the IC industry and now is a wholly owned subsidiary of ITRI (Lui and Qiu 2001). ITRI used ITIC to spin off many local companies (e.g. UMC and TMC). Currently, ITIC provides funding to more than 50 companies and incubation services for some 30 start-ups in various high technology industries.

It can be pointed out here that the development of the semiconductor cluster in Taiwan at the onset owed a large debt to government's efforts and policies in support of R&D and technological development facilities through the specialised R&D institute. However, in the later stage, it developed and grew through interactions between local firms and the global business environment and markets (Jan Tain-Sue and Chen 2005). The strong technological foundation provided by ITRI support at the early stage enabled Taiwanese semiconductor firms to use trial-and-error

to develop their own business and supply chain model. This became established and is still proven successful according to current performance. This business model is called 'vertical disintegration', which separates manufacturing and design activities for ICs, which are a major product of the semiconductor cluster. The supply chains and inter-firm relations of the Taiwanese semiconductor cluster have been transformed to become 'vertically disintegrated' over the last two decades. Traditional semiconductor firms too have shifted their strategy to focus more on chip/IC design and outsourcing manufacturing activities to contracted companies.

The semiconductor manufacturing-focused companies are called *IC foundry* firms. These focus on fabricating and testing IC products. The other type of IC companies, those concentrating on R&D and design, are called *fabless* (fabrication-less) integrated circuit industry. Because they work upstream in the supply chain without involving any manufacturing activity, they can avoid costs incurred by owning production machinery and equipment. Fabless companies are closely linked to foundry firms through contracts. Fabless companies normally serve computer or electronic appliance producers by designing ICs that fit their products, whereas foundry firms produce IC products to order for the IC design houses or other semiconductor manufacturers. IC foundry firms are challenged to develop their strengths in specialised technologies to provide specialised products that meet the needs of their customers (i.e. the design houses). Close collaboration with partners and customers is therefore a key element of the foundry business (Ku and Kao 2006).

The vertical disintegration supply chain model used by Taiwan's semiconductor cluster has created specialised local SMEs (Ming and Chih 2002), e.g. in semiconductor design and electronics design automation (EDA). These tend to have close links with large local firms. Some IC foundry companies, such as TSMC, have expanded their businesses and successfully honed their strengths to integrate design services and wafer making. TSMC has held some 50% of the world's IC foundry market in recent years, followed in market share by UMC (which holds some 17%)[3].

Remarkably, not only does the SME-based structure of the Taiwanese semiconductor cluster fit the vertical disintegration model, but it is also tailored to the nature of IC products. ICs are intermediate goods by nature. They have to be assembled with other components to make semi-

final products and end-products. This business model might not fit the HDD industry, since HDDs can be both end-products, directly sold to consumers, or intermediate goods. Beyond the cost factor, design is critical to the competitiveness of HDD-manufacturing companies. Hence, HDD firms find the vertical integration model more suitable and effective for their businesses than the disintegration one.

The success of the Taiwanese semiconductor cluster reflects the effect of country-specific context, especially with regard to the strength of local technology and human resource development institutions, on the structure and inter-firm relations of the cluster. This enabled the cluster's structure and development path to deviate from the other two electronics-related clusters, in Thailand and Malaysia. Another case that shows the impact of country-specific factors over industry-specific ones on cluster structure is the automotive and auto-parts clusters. But, such impact has brought about different results, due to the differences in the government's policy actions. The next section elaborates on this case.

4.3.2 Automotive and Auto-Parts Clusters: National Context and Policy Choices Matter for the Structure and Inter-firm Relations of Clusters

The automotive and auto-parts industry is characterised by capital-intensive, technology-intensive, scale-driven, product push-oriented, and standardised mass production (Lehmann 2004, Poapongsakorn 2004). The rapid growth of the industry has given rise to intense competition and high pressure on auto-making firms to upgrade their technologies. Three major trends are seen in the global automotive industry: a dynamic market, establishment of global alliances and industry consolidation (Nag et al. 2007). Presently, almost all of the world's auto-makers have created their own production plants and facilities in many countries, which they use as production and market bases. Similar to the HDD case, large auto-making firms mainly apply a vertical integration model in their supply chains to reduce production costs (Wibbelink and Heng 2000). However, on each production platform, car makers mostly produce different models of automobiles for different markets (Nag et al. 2007).

Moreover, large-scale investments and fast-changing technologies have caused a consolidation in the automotive industry that has been ongoing for decades. The automotive industry can be described as an oligopoly of international auto-making companies. Nowadays, there are

just a handful of manufacturers. In 2001, there were only 13 major auto-makers in the world, occupying 87% of total automotive production. Each produced more than a million vehicles (Humphrey and Memedovic 2003). The recent trend is the merging of most of these giant companies, e.g. Daimler-Benz and Chrysler, Hyundai and Kia, Renault and Nissan and Mazda, Ford and Jaguar and Volvo (Hashmi and Van Biesebroeck 2007). Though the automotive and auto-parts cluster is technology-driven, akin to the electronics cluster, its technologies do not change as fast as those of the electronics clusters. Additionally, it has a longer and more complex supply chain, involving various parts and component suppliers in every tier of production (Figure 4.3).

Figure 4.3
Supply Chain of Automotive and Auto-parts Industry
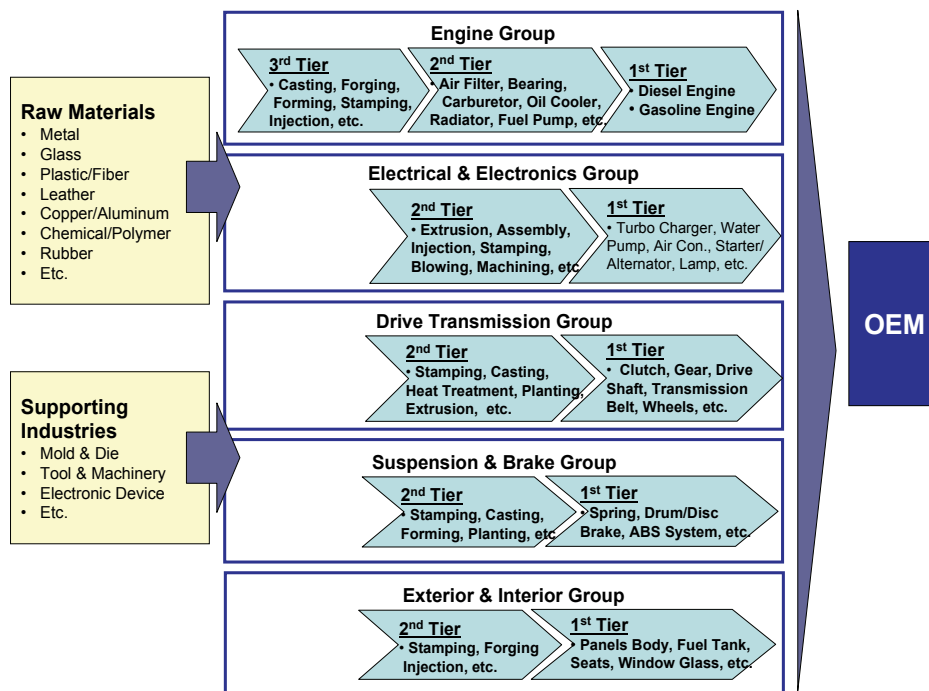
To quickly and cost efficiently adapt to highly flexible and fast processes and new product developments, many automotive enterprises have

adopted a model of common platforms and interchangeable modules. This model enables auto-makers to produce a wide variety of products at large economies of scale (Nag et al. 2007). Logistics thus becomes a critical factor in success. Many companies require their suppliers to be located near their assembly plants to ensure quick deliveries of parts and components. The nature of the industry therefore stimulates clustering of automotive firms in places where there is good infrastructure. In Thailand, the clustering of automotive and auto-parts companies and supplier firms is concentrated around Bangkok (the capital city) and in the eastern region, where the Laem Cha Bang International Port is located. In Malaysia, automotive and auto-parts firms are clustered in the areas near Kuala Lumpur (the capital city) and Selangor State. Some firms are scattered in Kedah in the north and in Perak in the central region.

Due to intense global competition and rapidly changing consumer demands, automotive producers have focused on improving the product development and design process. These activities require huge investments in technology and R&D. In 2005, the top 13 auto-making companies spent more than US$55 billion on R&D. They obtained more than 50,000 US patents during 1980-2004. Cost reduction is perhaps the most critical factor determining their survival under the current conditions. The need to cut costs affects inter-firm relations between automotive makers and their suppliers. Most large auto-makers have a strictly implemented cost reduction strategy along their supply chains to involve their suppliers in sharing the risks of production. At every stage of production – from procurement to manufacturing, assembly and sales – auto-making MNCs push their suppliers to bring down costs to deliver higher margins on end-products. Alongside the push to reduce costs, automotive OEMs and suppliers are forced to increase their productivity, to follow the strict standards of the car makers, and also to be responsible for sub-system designs or sub-system assembly for them. Additionally, automotive makers develop contracts with their suppliers based on a targeted price reduction and ability to deliver qualified standard components for them (Nag et al. 2007).

Presently, automotive suppliers which are OEMs (original equipment manufacturers) for foreign automotive MNCs are severely suffering under this system. But they have to submit; otherwise they may lose their MNC contracts. To diversify risks, OEM firms have in some cases shifted or expanded their businesses to produce for replacement mar-

kets, becoming replacement equipment manufacturers (REMs). This effect of industry-specific factors on inter-firm relations and supply chain management is seen in the Thai automotive cluster. The dominant power of auto-making MNCs in the cluster's supply chain is apparent, and this significantly influences cluster governance. Chapter 5 discusses this issue further.

Given the complexity and dynamism of cluster development, national contexts and government policies are likely to come into play in influencing the distinct structures of clusters through interventions in local capabilities. The findings from the automotive and auto-parts clusters in Thailand and Malaysia support this proposition. Government's selective or industry-specific policies can alter the structures of clusters. State policy interventions directly affect firms' operations and behaviours (Whitley 1994). However, some interventions might affect firms' behaviours indirectly. This is particularly true of interventions in the capabilities of local actors and institutions. Such interventions might help strengthen or upgrade the capabilities of local institutions, as in Taiwan's semiconductor cluster, while some (e.g. highly protectionist) industrial policies might weaken local capabilities. The essence of successful policy intervention to upgrade the capabilities of local institutions is a strong commitment of policymakers to economic development and raising the competencies of the relevant government agencies (Whitley 2001). The automotive and auto-parts cluster in Malaysia is an interesting example in this regard.

In fact, the development paths of the automotive and auto-parts clusters in Malaysia and Thailand were similar during their formative stages (i.e. both followed the FDI attraction path). During the 1970s, both countries implemented similar protectionist policies to support establishment of local firms in this industry, e.g. restricting the number of automotive models, limiting completely built unit (CBU) imports, increasing import duties on completely knocked down (CKD) units, and raising local content requirements. Dissatisfaction with the slow progress of the private-led development of the automotive industry, however, prompted the Malaysian government in 1985 to shift to a state-led approach, aiming to build its own national car to promote the local auto-parts industry. Since then, the development paths of the automotive clusters in the two countries have diverged. The Thai government continued promoting the local

auto-parts industry, following an FDI-driven path and pursuing market liberalisation and reduced state intervention.

With the aim of creating a national car, the Malaysian government got involved in the industry as a key auto-maker. This shifted the Malaysian automotive cluster towards a considerably different path than its Thai counterpart and other technology-driven clusters. Actually, the rationale behind this action was to solve the racial conflict. The objectives of the national car project were twofold: (1) to strengthen domestics firms, especially those owned by the Bumiputera, in the automotive industry and (2) to develop local technological capabilities (Abdulsomad 2003). Afterward, HICOM (Heavy Industry Corporation of Malaysia) was set up in 1980 as a state-owned enterprise directly involved in ownership and subsidies, controlling competition in the domestic market and assisting Bumiputeras in training and in taking advantage of business opportunities.

In addition, the government implemented vigorous protectionist policies to limit the entrance of foreign automobiles, aiming to protect the local automotive market from global competition. As a result, the structure of the industry changed from being foreign MNC-dominated with SME-based support towards domination by large local government-supported firms. Today, Malaysian brand automobiles, e.g. Proton, Perodua and Naza, occupy some 70% of the domestic market, while Japanese brand vehicles hold around 25%. In 2008, Perodua – the second national car – beat Proton – the first national car – with these brands occupying 31.5% and 29.3% of the market, respectively. This structure is extremely different from that of the Thai automotive and auto-parts cluster, which is highly dominated by Japanese MNCs, which account for more than 70% of production, export and market share (figure 4.4).

Some leading auto-assemblers in Malaysia are joint ventures with foreign firms, mostly Japanese, from which local firms aim to gain technological and managerial know-how. However, in most cases, the Malaysian firms still hold the majority of shares and management power in these joint ventures. The market structure of the Malaysian automotive and auto-parts cluster can be characterised as domestic-oriented. At the moment, more than 90% of car production in Malaysia relies on domestic markets, whereas the Thai automotive and auto-parts cluster has focused on producing for export, especially after the Asian economic crisis in 1997. Presently, more than half of the automobiles produced in Thailand are exported (figure 4.5).

Figure 4.4
Automotive Production Shares in Thailand and Malaysia, by Companies

Thailand's Automotive Production Share by Companies, 2007

- Toyota 39.5%
- GM/Isuzu 24.0%
- Mitsubishi 12.5%
- Honda 10.4%
- Ford/Mazda 9.8%
- Nissan 2.5%
- Others 1.4%

Source: Thai Automotive Institute, March 2007

Malaysia's Automotive Production Share by Companies, 2008

- PERODUA 31.5%
- PROTON 29.3%
- TOYOTA 16.4%
- NISSAN 6.2%
- HONDA 6.0%
- Others 2.6%
- NAZA 1.8%
- INOKOM 1.5%
- DAIHATSU 1.1%
- HICOM 0.9%
- BMW 0.7%
- M-Benz 0.6%
- HINO 0.6%
- HYUNDAI 0.5%
- Other European Cars 0.2%

Note: Other European cars include Ford, Mercedes, BMW, Volvo, Renault, Peugeot, and Landrover.
Source: Malaysia Automotive Association (MAA), as of 30 July 2008

Figure 4.5
Production, Export and Domestic Sales of the Automotive Industry in Thailand and Malaysia

Unit: '000 units

	Thailand (2007)	Malaysia (2005)
Production	1,301	563
Export	690	47
Domestic Sales	631	551

■ Production ■ Export □ Domestic Sales
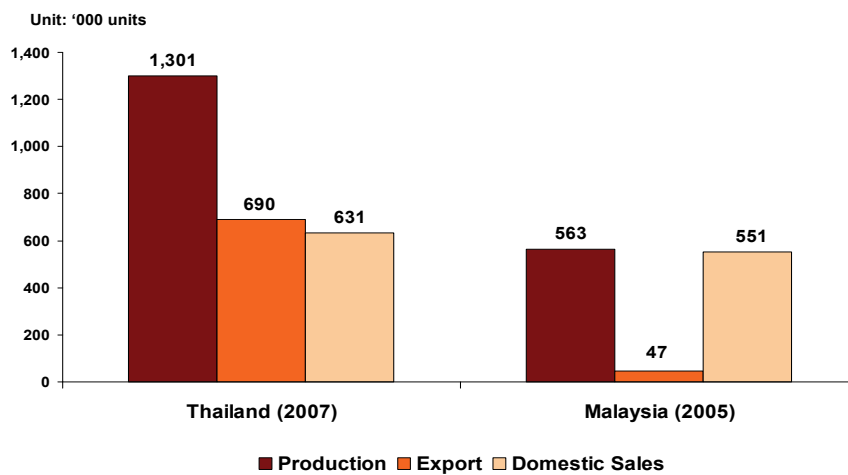
Source: (1) Thai Automotive Institute (TAI)
(2) FOURIN's Monthly Report on the Global Automotive Industry, April 2006.

Though the Thai government has continuously pursued liberalised strategies with minimal state intervention to develop its automotive and auto-parts industry, over the past four decades many strategies or policies for this industry have been strategically implemented (Abdulsomad 2003). In the early stage (1960s-1970s), the Thai government focused on promoting investments in the industry. Afterward, in the 1970s-1980s, protective policies and measures, such as local content requirement (LCR), were implemented to promote the establishment of domestic auto-parts firms and to support them in becoming established as OEMs in the supply chains of foreign automotive assemblers. Consequently, the structure of the Thai automotive and auto-parts cluster has been dominated by foreign MNCs. Currently, the number of auto-parts suppliers has reached 1,641 firms, many of which are engaged in all tiers of the automotive supply chains (see details in case study 4 on CD-ROM).

In the history of the Thai automotive cluster, Japanese MNCs played a key role in the growth of local auto-part firms (Abdulsomad 2003, Techakanont 2007), while government policies provided the key catalyst for this growth process. This differs from the Thai HDD cluster, which is US-based MNC-dominated, and also the Malaysian automotive cluster, where the state has played a pivotal role in promoting local auto-parts firms. In 1982, when the Malaysian government was about to launch its policy to create a national car, the Thai government identified the automotive industry as a strategic sector to be restructured, and the required percentage of local content for passenger car assembly was raised to 45% to support establishment of local Thai firms in this sector. Japanese auto-manufacturers wisely responded to this policy by inviting their parts suppliers to locate their plants in Thailand. Thereafter, the supplier networks between Japanese firms and local Thai firms in the automotive supply chains developed rapidly. Consequently, the 1st production tier in the automotive supply chain was dominated by foreign firms, particularly Japanese firms. Most of Thai-owned firms were engaged in the 2nd and 3rd tier of these auto-makers' supply chains. Only a handful of them could be 1st tier OEMs.

Since the early 1990s, the Thai government has shown stronger commitment towards liberalisation of the automotive sector. Many protectionist regulations and LCRs were gradually eased or abolished. On 1 January 2000, Thailand completely abolished LCRs in the automotive sector, signalling an end to the protectionist period in the development

of the Thai automotive cluster. In the meantime, various promotional policies were implemented. During 1994-1997, the Board of Investment (BOI) approved investment projects in both auto assembly and parts production valued four times higher than those of 1990-1993, a value which was much greater than elsewhere in the ASEAN countries (Doner 2009). Local auto-parts companies, hence, were pressured to upgrade their productivity, product quality and technical capabilities to survive under these circumstances. The influx of foreign investment, Japanese in particular, not only helped to promote automotive exports but also created strong linkages between foreign MNCs and local suppliers.

The dominance of Japanese MNCs in the Thai automotive industry contributed substantially to upgrading the capability of local Thai auto-parts firms. As discussed earlier, the Japanese style of supply chain management focused more on long-term relationships and developing a tight network with suppliers. Hence, Japanese auto-makers were aware of the capabilities of their suppliers and simultaneously encouraged them to perform better to maintain the relationship. Local suppliers were given technical assistance by the Japanese auto-makers to maintain a high standard and quality of their supplies. Thus, many Thai firms became accustomed to Japanese systems rather than Western systems, as seen in their tendency to adopt the Japanese *kaizen* approach and total quality management (TQM) (Nopprach 2006).

According to Nopprach (2006a), Western auto-makers in Thailand invested less aggressively in support to local suppliers, compared to their Japanese counterparts, for at least four reasons. Firstly, in managing their supply chains, Western auto-makers mainly use market mechanisms and international standards to control the performance of their suppliers. They prefer using former affiliates spun off from them as independent suppliers. For example, Delphi Automotive was spun off from GM in 1999 and became a major parts supplier to GM and other Western automotive assemblers. Secondly, when Western automotive companies entered the Thai market, there already existed plenty of suppliers, both Japanese affiliates and Thai firms, with sufficient standards and technological capabilities. This was a benefit of being a late-comer. This situation is unlike that faced by their Japanese counterparts, who invested in Thailand when the Thai auto-parts industry was at a nascent stage and local suppliers were weak. Japanese companies at that time invested heavily in technology transfer to local Thai suppliers. Thirdly, Western

automotive MNCs started investing in Thailand only when LCRs were being abolished. This allowed them more flexibility to globally procure components and parts. Lastly, the scale of production of Western assemblers in Thailand was smaller than that of the Japanese assemblers.[4] Investing in suppliers of specific components, thus, was not worthwhile.

Relationships between Japanese MNCs and local suppliers in the Thai automotive cluster have developed for more than four decades, leading to the establishment of mutual trust.[5] Presently, Japanese MNCs, such as Toyota and Honda, have increased their investments in more advanced activities in Thailand, such as R&D and automotive design. Moreover, they have actively collaborated with the government and local institutions to develop the skills and technological capabilities of local suppliers (see case study 4 on CD-ROM).

The Thai automotive and auto-parts cluster shows that the national context, created in part by government policies, can transform a cluster's structure. The structure of the Thai automotive cluster changed significantly again after the financial crisis hit in 1997. During the crisis, the Thai domestic markets for automobiles shrank by 60%, leading to a decline in production of automobiles. Numerous auto-parts SMEs closed factories or went out of business. To recover from the crisis, the Thai government put even more effort into attracting foreign investment in the sector and easing obstacles to foreign ownership in local companies. The ceiling of foreign ownership was raised to 49%. LCR, in fact, was around 20% in practice, much lower than the official regulation of 54-70% (Doner 2009).

Foreign firms responded to the crisis and to the opportunities provided by the government by injecting more capital into local firms through joint ventures or mergers and acquisitions (Abdulsomad 2003). This brought about an increased proportion of foreign majority-owned firms in the 1st tier from 41% in 2002 to 47% in 2005. Meanwhile, the number of solely Thai-owned firms fell from 50% to 23% from 2002 to 2005. The number of Thai-majority owned joint venture firms increased too from some 10% in 2002 to 30% in 2005, because most Thai firms strived to cope with the crisis by seeking joint ventures with foreign companies, mostly Japanese firms (see case study 4 on CD-ROM). Joint ventures also contributed to upgrading standards and quality of local firms to meet global requirements. This was of great benefit to the Thai

auto-parts companies, helping them to raise their level of competitiveness in an industry in which advanced technology remains critical.

The development paths of local auto-parts firms in Thailand and Malaysia are distinct due to the differences in their automotive industrial policies (Abdulsomad 2003). While local auto-parts suppliers in Thailand were developed by Japanese auto-assemblers, in Malaysia local suppliers, particularly Bumiputera-owned firms were nurtured by Proton, the country's first national car company. Backed by government, Proton supported the establishment of almost 100 Bumiputera-owned auto-parts firms during the early stage of the national car company (1985-2000). Many local auto-parts firms were spun off from Proton and many were Proton-associated companies or subsidiaries. Furthermore, Proton attempted to induce foreign auto-parts firms to join it as a vendor/supplier through joint ventures with its local auto-parts firms. The aim here, of course, was to obtain technology transfers from these foreign partners.

While local auto-parts firms in Thailand were pushed by the market mechanism and global competition to upgrade their capabilities, local auto-parts firms in Malaysia enjoyed the benefits of the government's protective policies and domestic reliance on the leading national car companies. They had limited motivation to upgrade their capabilities. Even the large local auto-making firms like Proton and Perodua are still dependent on Japanese technologies and know-how. By most accounts, human capital is the critical weakness in Malaysia's innovation capacity (Felker 1999). Basically, the government has taken the lead in human resource development with investments in education and vocational training. Due to the ethnic tension, however, the state has had to balance social restructuring and industrial development. Hence, policies on higher education and vocational training, e.g. quotas and wider channels of access to higher education, were used as a fundamental mechanism to strengthen and encourage the participation of the indigenous Malay (Bumiputera) in economic activities in order to upgrade their economic and social status.

As the public higher education and vocational training systems in Malaysia still lag behind the evolution of industrial technologies and industry's skill needs (Felker 1999), private firms must develop their employees in-house and bear the costs of training and human resource development. Interviews with private leading auto-making firms in Malaysia indicated that university-industry collaboration remains weak. The Malaysian automotive firms cooperate with their Japanese or foreign counterparts to train

their employees and local suppliers. This is certainly one of the reasons why the development of this cluster in Malaysia still lags behind that of Thailand, in terms of overall industry performance, global competitiveness and local firms' capabilities.[6] However, the Malaysian government is now being forced by global competition trends towards liberalisation to abolish the protectionist policies in this industry. The government acknowledges this shift in direction and strategy in its New Automotive Policy. Most Malaysian automotive firms are increasingly aware of this situation and are attempting to find the best solution possible to this challenge.

The above discussion reveals that the structure and inter-firm relations in the Thai automotive and auto-parts cluster are directly influenced by the industrial nature or 'industry-specific context'. However, national context, especially that related to government policies has altered the strategies and behaviours of foreign automotive assemblers' attitudes towards helping local supplier firms to develop their capabilities. This, hence, has reshaped cluster structure. The automotive and auto-parts cluster in Malaysia demonstrates the large influence of government policies and actions on structural change in the cluster, albeit with different approaches through the years, based on different rationales. In this regard, Malaysia's implementation of a nationalist economic approach to its automotive industry might be a suitable and effective way to link overall national interests and shared responsibility for the well-being of different ethnic groups.

4.3.3 Orchid Clusters: Influence of Industry-Specific Factors on the Structure of a Cluster

The structure of resource-based clusters tends to be highly influenced by industry-specific factors or the nature of the industry. Yet, this does not mean that country-specific factors are irrelevant in shaping cluster structure. The country-specific context, particularly local identity and social cohesion, provides the basis for creating local capabilities in clusters. It can engender close relationships among actors and tight social networks that are beneficial to clusters. The Thai and Taiwanese orchid clusters are interesting cases in this respect.

The orchid industry is natural resource-based, very reliant on the natural factor endowment (e.g. appropriate climate and geographical conditions). Its supply chain is not as complicated and long as those of the technology-driven clusters (i.e. the electronics and automotive clus-

ters). The orchid industry involves some capital investment and technology (e.g. tissue culture and biotechnology), but is less dependent on both than the electronics and automotive industries. The structures of the two case-study orchid clusters are relatively similar, although they operate in different national contexts. The two clusters are made up of small enterprises and farms. Though the Thai and Taiwanese orchid clusters also include some large local enterprises, like the Taiwanese semiconductor cluster and the automotive and auto-parts cluster in Malaysia, these large enterprises/farms do not have dominant power in the clusters. Exporting firms tend to have more power in the orchid supply chains in accordance with their wide market accessibility and access to market information and knowledge. But some large orchid farms also export, and thus have more influence than the ordinary growers.

While changes in technology have made large-scale farms possible, orchid cultivation in Thailand and Taiwan is mostly done on a small scale. In Thailand, there are some 300 exporters of orchid cut-flowers and 50 exporters of potted orchids. Most of these exporters own an orchid plantation of less than 3.95 acres. Only some 20 large-scale farms have a larger area, 100-500 rai (39.5-197.5 acres) for orchid cultivation. Orchid farming is not labour-intensive, but rather skill-intensive. It basically requires only 1-2 workers per rai[7] (or 0.395 acres). However, these workers must be highly skilled and experienced. In Taiwan, too, there are many small-scale orchid farms. However, compared to Thailand, orchid production in Taiwan is done on a larger scale and requires more investment. Taiwan's orchids are grown in green houses with a climatic system controlling temperature, humidity and wind. Orchid farming in Thailand is done on open natural farms. Thus, the costs of orchid production in Taiwan are much higher than in Thailand.

The supply chains of the Thai and Taiwanese orchid clusters are similar. However, they do differ in some respects, largely due to their focus on different consumer segments. Thailand specialises in fresh-cut orchids, especially the Dendrobium, and is now the world's biggest producer and exporter of tropical cut-orchids and the second largest producer and exporter of all kinds of cut-orchids, second only to the Netherlands (see case study 6 and 7 on CD-ROM). Taiwan, in contrast, specialises in potted-orchids, particularly the Phalaenopsis and is presently the world largest exporter of these plants.

The supply chain of the Thai and Taiwanese orchid clusters starts with orchid breeding and tissue culture activities, followed by growing, packing and export or domestic sales (figure 4.6). Note that the fumigation process crucial in orchid packing only in the Thai orchid cluster, as it helps increase quality and vase life of fresh-cut orchids. Since Taiwan mostly exports potted orchids, which maintain their freshness longer, the fumigation process is not necessary in the supply chain of the Taiwanese orchid cluster.

Figure 4.6
Supply Chain of Orchid Industry

Enabling/Supporting Industries
• Fertiliser/Pesticides
• Orchid-growing equipment
• Shading/Lad House/Green House Construction

• Importers/Traders
• Wholesalers
• Retailers
• Florist Shops
• Consumers

Orchid Breeding and Seedling → **Growing** → **Packing** → **Export / Domestic Sales**

• Breeders
• Seedling Companies

• Post-harvest (fumigation: Thai orchid case)
• Packing Houses

• Exporters/Traders
• Wholesalers
• Retailers
• Florist Shops
• Consumers

The nature of the industry affects the supply chain and inter-firm relations of the orchid clusters. Because flowers are perishable, logistics management is crucial in the orchid supply chain. After cutting or harvesting, cut-orchids gradually deteriorate. Post-harvest treatment and packing then are vital in preserving their freshness until they reach consumers and in extending vase life. In the Thai case, fresh-cut flowers must be exported by air transport within 24 hours (from farm to customer) to maintain high quality and freshness. By contrast, potted-orchids are normally exported by sea. Though the logistics for these two clusters are somewhat different, similar power relations have nonetheless evolved among orchid growers and exporters in both clusters. Normally,

the exporters have power over growers in the orchid supply chain because exporters have more market knowledge and information.

The Thai orchid cluster reflects buyer-driven inter-firm relations. In the Thai orchid supply chain, exporters are highly influential in controlling prices of orchids. They buy from growers orchids with a mix of quality grades and at low prices. In the packing process, they sort the orchids by quality and can obtain higher margins for premium graded orchids. Currently, orchid growers are gaining more experience with markets and more knowledge about pricing, leading to attempts to increase their negotiation power for price setting through the Thai Orchid Garden Enterprise Association (TOGEA). However, the pricing system remains controlled by exporters due to the limited capability of TOGEA in coordinating the needs of growers and in gearing collective action (see case study 6 on CD-ROM). This kind of inter-firm relations, to some extent, affects the orchid cluster's structure. Orchid growers in both Thailand and Taiwan tend to apply a vertical integration model, with both forward and backward integration. Many growers are expanding their business into exporting to gain more control of prices. At the same time, some exporters, who would like to gain more control of product quality so as to add more value, are entering the orchid farming business.

Culture and local identity, as part of the national context, also significantly affect the structure and inter-firm linkages in the two orchid clusters. Both clusters possess a specific and unique form of social embeddedness. To understand this, it is necessary to look back in the history of the orchid industry and cultivation. In the past, orchid growing was a hobby of people who were enchanted by orchids. Mostly these people were wealthy or of high social status. Orchid growers groups were simply friends sharing a common interest. They usually exchanged and shared knowledge about orchid growing. After realising the economic value of the flowers, orchid growers in Thailand started exporting orchids 40 years ago, followed by Taiwanese growers some 10 years later. However, orchid growers maintained their close relationships, owing to ties of friendship and their common interest.

Driven by the nature of the industry (and like many other agricultural sub-sectors), orchid plantations are concentrated in specific areas with a suitable climate and geographical conditions. Orchid growers persuade friends and relatives to settle nearby to grow orchids as well, and communities of orchid growers are thus established in suitable areas. In Thai-

land, orchid farms are located in many provinces in the central region, with some located in the north. Taiwanese orchid farms are concentrated in the central and southern regions along the island's western coast. These provinces/counties are not far from one another. Settling near one another enables close relationships and communication among orchid growers and helps to develop trust, which is crucial in collective action (Wad 2001).

Local culture and identity have been developed and embedded in the orchid communities through their particular growth paths. Local identity encourages the establishment of social networks among farmers, which enables knowledge spill-over and complementarities. Know-how and techniques for growing orchids have been transferred from generation to generation within families of orchid growers in the communities. However, due to the more complex technologies and wider opportunities for exports, many orchid growers now realise that their closed system of sharing and knowledge transfer has limited their capability to upgrade. Moreover, tacit knowledge and know-how in orchid cultivation has become increasingly codified, so that it can no longer be hidden or kept as 'trade secrets'. The orchid growers, hence, are becoming more open to sharing and exchanging knowledge and skills among themselves. This changing pattern of relationships and coordination in knowledge transfer and skill development is evident in both the Thai and Taiwanese orchid clusters, despite their different means of coordination (discussed in chapter 5).

In the Thai orchid cluster, there are two types of inter-firm relations between firm actors: (1) relationships among orchid growers and (2) relationships between orchid growers and orchid exporters. The local context, based on culture and local identity, have played a critical role in the first type of relations – that among orchid farmers. In contrast, the relations between orchid farmers and exporters have been constructed based on market mechanisms and industry-specific factors.

In sum, the structure of the two orchid clusters has been influenced mainly by the nature of industry, relying as it does on nature and natural resources and being concentrated within a community. The country-specific context, particularly related to aspects of local culture and identity, may have some indirect effect, but it is not as influential as the industry-specific context. This might be because the national contexts of the two orchid clusters are very similar, especially regarding government

policies. In the past, orchids were not considered to be a major economic crop or high-earning product. Additionally, orchid growers have generally been perceived as people with higher economic status than farmers in other agricultural sectors. Thus, the governments paid little attention to the orchid industry. This put pressure on orchid growers and exporters to themselves find ways to survive in their business. The economic potential of orchids has only recently been recognised. Thus, the policy focus of the Thai and Taiwanese governments has shifted to provide more support to the sector. Interestingly, a 'benefit' of the lack government support has been a contribution to strengthening the private sector in the two orchid clusters.

4.4   Reflections and Concluding Remarks

The discussion above showed that the structures and inter-firm linkages of both technology-driven and natural resource-based clusters are most influenced by industry-specific contextual factors. However, country-specific factors can play a significant role in altering these structures. In technology-driven clusters, the key industry-specific factor that affects cluster structure, supply chains and inter-firm relations is the speed of change in demand and technology. If the change in and sophistication of demands is swift and technology advancement is rapid, firms are forced to invest more in technology development and to adjust their strategy in supply chain management so as to be able to sustain their competitive position. Changes in supply chain structure and management, hence, affect inter-firm relations and the structure of clusters. Firms in the electronics and automotive clusters reflect this feature. They tend to apply a merger-acquisition strategy to grow larger and benefit from economies of scale and scope in order to cope with fast-changing conditions. Moreover, to bring down costs, they must adjust their supply chain management, which is likely to lead to a high dominance of MNC assemblers over their suppliers. By contrast, firms in natural resource-based sectors, which operate in an environment of slower changes in demand and technology, are likely to experience less pressure to create economies of scale and scope. Their supply chain management strategy can be gradually adjusted and their inter-firm relations and structures do not change as rapidly as those in the technology-driven clusters. Figure 4.7 depicts the causal effects of the industry-specific factors on the structure and inter-firm linkages of clusters.

Figure 4.7
Effects of Industry-Specific Factors on
the Structure and Inter-Firm Relations of Clusters
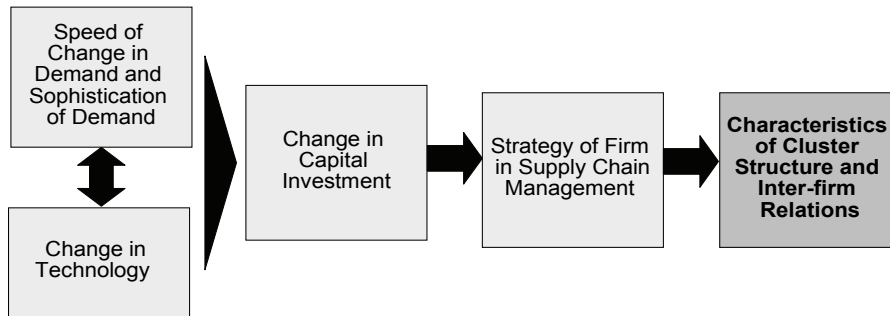
The case studies show that the economic structures and institutional arrangements in Thailand, Taiwan and Malaysia are quite distinct, due to variations in the national contexts. The findings confirm this chapter's two propositions: (1) Inter-firm relations in the clusters and structure of clusters are directly influenced by industry-specific contextual factors. (2) Country-specific contextual factors can alter the structure of a cluster causing it to deviate from the 'normal' industry features shaped by the industry-specific contextual factors by influencing the capabilities of local firms and institutions.

Two key additional observations can be made on the relationship between the national context and the characteristics of clusters. *Firstly,* country-specific contextual factors tend to be highly influential in changing the structure of technology-driven clusters, but have less influence on the structure of natural resource-based clusters. *Secondly,* government policies, a main element of the country-specific context, are crucial in reshaping or altering cluster structure towards a different form. In the electronics and automotive and auto-parts clusters, the state's role was vital in intervening in the structure of the clusters through two approaches: (1) intervention in the market mechanism, as seen in the Malaysian automotive and auto-parts cluster, and (2) upgrading local capabilities, as seen in the Taiwanese semiconductor cluster. The analysis suggests that state intervention is crucial for cluster development, particularly in the nascent stage. However, such interventions should be done strategically in order to create a foundation for upgrading the capabilities of local firms and institutions. State intervention in the market

mechanism seems to weaken local capabilities and undermine the sustainability of cluster development in the long run.

Notes

[1] IBM was the first among the American computer producers to move to vertical integration of the HDD industry. IBM produced and shipped the first rigid disk drive to its customers in 1956.

[2] TSMC ranked no. 1 and UMC ranked no.2 in the global IC foundry sector.

[3] Source: TSMC Report, IC insight and TSMC estimates

[4] In 2002, the production capacity of GM in Thailand was only 40,000 units per year. This number was much less than Toyota's capacity of 240,000 units per year.

[5] Source: Interviews of Thai suppliers and Japanese automakers.

[6] Since 2005, Thailand has been the automotive production and export hub of ASEAN, exporting more than 540,000 units per year with the export revenue of over US$5 billion. Thailand is now the largest automotive producer in Southeast Asia and was ranked 12th of the world largest producers of automobiles in 2008 (up from the 15th in 2007). Thailand is currently one of the world's largest producers of pick-up trucks, second only to the USA.

[7] Source: From interviews of key orchid farmers in Thailand.

5 Cluster Governance and Local Capabilities

5.1 Introduction

This chapter mainly discusses the third element of the analytical framework, i.e. cluster governance. It aims to answer two sub-questions of this study: (1) How are the contexts of the selected clusters characterised and how does context influence cluster characteristics and cluster governance? (2) What are the characteristics and roles

of key actors in the development of the selected clusters?
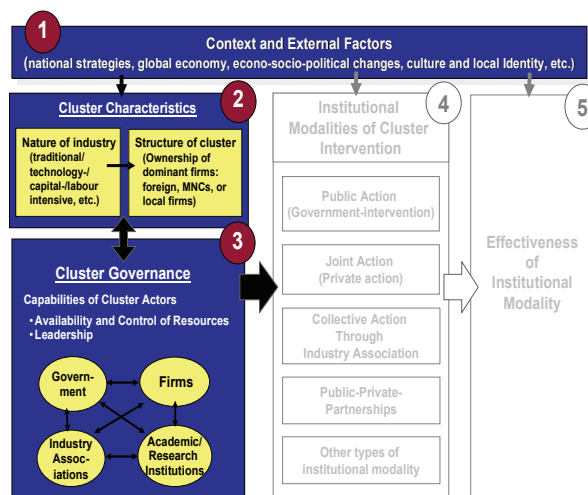
A meso-level comparative analysis of cluster governance in the seven clusters sheds light on the interplay and power relations among the key actors in the clusters: firms, government agencies, industry associations, research/educational institutions and other relevant institutions that impact how cluster policy and collective actions are constructed and undertaken. The complicated interplay of these actors creates collective action dilemmas (Doner 2009), which are basically related to two issues: (1) difficulties in aligning the development goals of all pertinent agencies and (2) capabilities of organisations to respond to increasingly complex tasks. Key characteristics of a cluster are interdependency and complementarities (Porter 1998). Complementary behaviours or actions between key actors can contribute substantially to the successful development of clus-

ters. Yet, even though the seven case clusters are governed by common 'rules of the game' (i.e. interdependency and complementarities), this does not mean that they necessarily share the same pattern of governance. These rules of the game are generic conditions of interactions among actors that may generate different patterns of governance.

Among others, the capability of each actor is a key factor determining actions and behaviours among cluster actors. Each key actor has a different capability level, which influences cluster governance. By and large, firms and economic actors tend to coordinate in areas where institutional support exists (Hall and Soskice 2004). Hence, to deal with contextual complexities, the different characteristics and the type of interplay among the related actors, clusters might need an agency to serve as an intermediary,[1] to create linkages and coordinate collective action involving firms and non-firm actors in clusters. The role of intermediary institutions in cluster governance is analysed in this chapter as well.

This chapter presents two propositions. *Firstly,* the structure of clusters is greatly influential in shaping cluster governance. Clusters that have the same structure (i.e. technology-driven or natural resource-based) are likely to have a similar form of cluster governance. *Secondly,* the role of government policy is significant in altering the cluster governance typically shaped by industry-specific context, either towards more enabling or more impeding conditions for development, by intervening in the capabilities of local firms and of supporting institutions.

To overview key findings that are further discussed in this chapter, table 5.1 presents a summary of cluster characteristics, capabilities of each cluster actor and cluster governance, briefly reflecting on the relationships between these.

Table 5.1
Summary of Cluster Characteristics and Cluster Governance of Seven Case Studies

Cluster	Nature and Structure of Industry				Capabilities of Cluster Actors		Cluster Governance
	Capital-intensive	Technology-driven	Structure of Cluster (ownership of dominant firms)	Local Private Firms	Intermediary Institutions (association/academic/research/specialised institute)	Government Agencies	
Thai HDD	High	Very fast-changing technology	Cluster of subsidiaries of MNCs and local suppliers	Local firms are weak in advanced technological capabilities	(HDD Cluster Centre) **Weak:** limited resources and weak leadership	Influential[1]	MNC-dominated and government-coordinated
Malaysian Electronics	High	Very fast-changing technology	Cluster of subsidiaries of MNCs and local suppliers	Local firms are weak in advanced technological capabilities	(PSDC) **Relatively strong:** quite strong leadership but highly reliant on foreign MNCs	Influential and supportive	MNC-dominated and government-coordinated
Taiwanese Semiconductor	High	Very fast-changing technology	Cluster of large national firms and local suppliers	Local firms are active and strong in technology	(TTRI) **Strong:** high availability of resources and strong leadership	Influential and pragmatic[2]	Local intermediary institution-coordinated
Thai Automotive and Auto-Parts	High	Moderately fast-changing technology	Cluster of subsidiaries of MNCs and local suppliers	Local firms are weak in advanced technological capabilities	(TAI) **Weak:** limited resources and weak leadership	Influential and supportive	MNC-dominated and government-coordinated
Malaysian Automotive and Auto-Parts	High	Moderately fast-changing technology	Cluster of large national firms and local suppliers	Local firms are weak in technological capabilities	(Local associations) **Weak:** reliant on large local firms and government	Strongly influential (through national car policy)	State-controlled
Thai Orchid	Low	Low	Cluster of SMEs	High level of local wisdom and expertise	(Local associations) **Weak:** limited resources and weak leadership	Supportive[3]	Local intermediary institution-coordinated
Taiwanese Orchid	Medium	Low	Cluster of SMEs	High level of local wisdom and expertise	(Local associations) **Strong:** highly available resources and strong networks	Facilitating[4] and supportive	Local intermediary institution-coordinated

Note: 1. **Influential** organisations have strong influence in decision-making or actions in important activities of cluster actors.
2. **Pragmatic** organisations usually deal with problems in a sensible and practical way in order to achieve the desired goals of the cluster, not only sticking to set ideas.
3. **Supportive** organisations assist cluster development in terms of providing essential resources or policy support.
4. **Facilitating** organisations help to make development processes easier or ease obstacles in cluster development activities.

5.2   Varieties of Cluster Governance

This section sheds light on the different types of cluster governance, based on a comparative analysis of the seven clusters. The analysis of cluster governance concentrates on the interplay and interrelations among four main cluster actors, namely, government, foreign MNCs, local firms and local intermediary institutions (figure 5.1). Interactions between foreign MNCs and local firms are basically associated with power relations in supply chains. The relationships between the government and the private sector centre on issues of investment and policy support for economic development. In developing countries, the government is likely to interact with foreign MNCs with the aim of attracting investment and technology transfer, while providing support to local firms to help them to link with foreign MNCs. However, these relationships vary, depending on national and industrial context and the capabilities of each organisation.

Figure 5.1
Interplay and Power Relations between Key Actors in Clusters
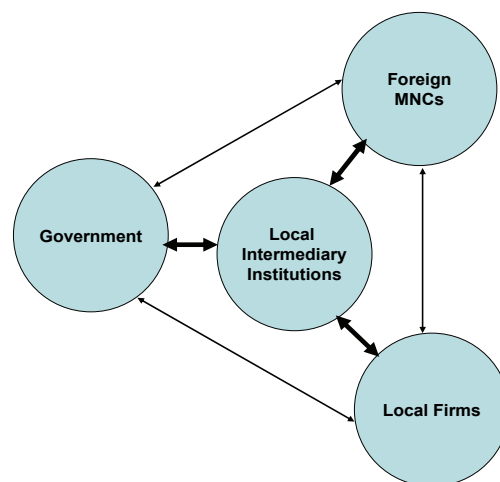
Clusters always run up against many coordination and collective action problems. Therefore, the roles of local intermediary institutions have been increasingly prominent in cluster governance in the recent development of many clusters. Such institutions are mandated to coordi-

nate and drive cluster development initiatives and innovation
(Intarakamnerd 2005, Pietrobelli and Rabellotti 2006, Schaumburg-
Müller 2001). Government policies and institutional and social systems
can help to promote or enhance institutions' capacity to undertake these
roles. In some cases, a local intermediary institution might be called a
'cluster agent'. Actors serving as intermediary institutions can be the
state, private organisations, individuals, trade unions, industry associa-
tions, social groups or another type of institution/organisation
(Pietrobelli and Rabellotti 2006).

In this study, the interrelations between the four actors shown in fig-
ure 5.1 are generally seen in the technology-driven clusters, except in
some clusters where the national context has altered these typical rela-
tionships. In the case of natural resource-based clusters, the relationship
between foreign MNCs and local firms is not as common due to the na-
ture of industry as discussed in chapter 4. The concern here is how inter-
relationships among these key actors are organised and developed, and
how these shape cluster governance. In the analysis, the capabilities of
each actor are taken into account, especially with regard to leadership
and the availability of and authority to control resources. Cluster actors
that have control over key economic resources, such as skilled workers,
capital resources and information and knowledge are likely to have more
influence in cluster governance. In the case studies, three major forms of
cluster governance were found: (1) MNC-dominated and government-
coordinated governance, (2) state-controlled governance and (3) local
intermediary institution-coordinated governance. However, in the last
form, one of several different types of local intermediary institutions may
be dominant in cluster governance.

The interplay and interrelationships among key actors in clusters can
be visualised schematically in figure 5.2. The figure uses three symbols to
represent the dominant power or influence of one actor over other ac-
tors in a cluster. Each key actor in the clusters is represented by a bubble.
The relationships between cluster characteristics and the capabilities of
cluster actors are depicted with shading and arrows to indicate their ef-
fects on cluster governance. These relationships are portrayed based on
qualitative data obtained from interviews and secondary information and
observations (see detailed data sources in appendix 4). Therefore, the
diagram does not measure the amount of power a cluster actor has and
actors' interrelationships by quantitative data/statistical means. Three

symbols are used in the diagrams to present the relationships of key cluster actors as follows:

1) *Size of bubbles* represents the degree of direct and indirect participation or involvement of each cluster actor in cluster policy processes. 'Cluster policy', in this regard, does not mean the policy formulated by the government, but refers to decisions of key cluster actors to act or not to act in developing the cluster. Bubbles are presented in three sizes, i.e. large, medium and small. The larger the bubble is, the higher is the degree of participation/involvement of the actor in cluster policy processes.

2) *Shading* represents the degree of power or influence of each cluster actor in cluster policy processes. Black represents the highest degree of power/influence, while grey represents less power/influence. No shading represents the lowest level of power/influence in cluster policy processes.
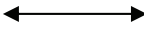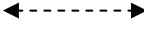
3) *Arrows* represent the direction of relationships among cluster actors. A one-headed arrow indicates a relationship in which one actor influences the other actor. A two-headed arrow shows two actors that mutually influence one another. A thicker line of the arrow means that the two actors are highly influential on one another. A normal line arrow represents regular or typical relationships, whereas a dotted line arrow represents relatively weak relationships.

Note that a cluster actor having a high degree of involvement or participation in cluster policy processes does not necessarily have high influence on such processes. Some actors might frequently be invited to be involved in cluster policy processes, but have a limited influence in decision-making. Table 5.2 recaps the meanings of the symbols used in the diagrams illustrating cluster governance.

Key actors in clusters generally function in two spheres: the public sector and the private sector. Intermediary institutions connect actors in these two spheres. To clarify roles, this analysis of cluster governance distinguishes the roles of cluster actors between these two spheres. In this regard, academic institutions are placed in the public sector sphere, since in developing countries such institutions involved in provision of specific services for cluster development are usually public institutions rather than private ones. The analysis thus focuses more on roles of public academic institutions. Where a private academic institution exists with

prominent involvement in cluster development, the bubble of academic institutions is placed in the private sector sphere.

Table 5.2
Meanings of the Symbols Used in the Schematic Diagram
of Cluster Governance

Symbols	Meaning
1. Size of Bubbles	
Large	Frequently participates/is involved in cluster policy processes
Medium	Occasionally participates/is involved in cluster policy processes
Small	Seldom or never participates/is involved in cluster policy processes
2. Shading of Bubbles	
Black	The cluster actor has high influence in decision-making on cluster policy and/or plays a leading role in initiating, driving or gearing the implementation of cluster policies
Grey	The cluster actor has some of influence in decision-making on cluster policy and/or plays a supporting or coordinating role in the cluster policy processes
White	The cluster actor has limited or no influence in decision-making on cluster policy and/or plays a reactive or following role in cluster policy processes
3. Arrows	
	The actions of the two cluster actors (that the arrow connects) have high influence on each others' behaviours or actions
	The two cluster actors (that the arrow connects) interact with each other in a regular or typical pattern
	The two cluster actors (that the arrow connects) have a weak relationship, i.e. they seldom contact or coordinate with one another

5.2.1 MNC-dominated and government-coordinated governance

This section describes each of the three types of governance found in the case-study clusters. It first looks at 'MNC-dominated and government-coordinated cluster governance' (figure 5.2). These clusters are high-

technology-driven by nature and are dominated by foreign MNCs. Such cluster governance is found in the Thai HDD cluster, the Thai automotive and auto-parts cluster and the Malaysian electronics cluster.

Figure 5.2
MNC-dominated and government-coordinated governance

Thai HDD, Thai Automotive and Auto-Parts, and Malaysian Electronics Clusters
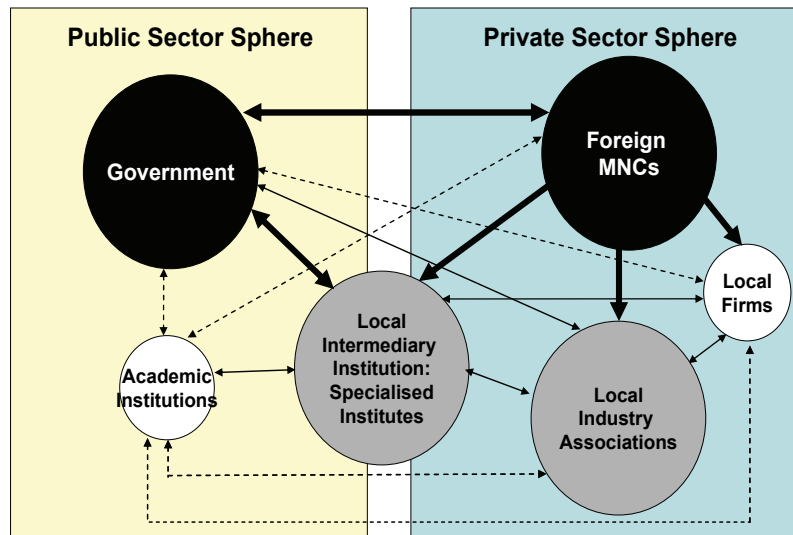
Relations between MNCs and Local Firms

In technology-driven industries, domestic firms tend to have a weak social base, while the government and foreign companies play the more vital role in directing industrial development (Schaumburg-Müller 2001). In many technology-driven clusters, FDI is a key driver of development, and foreign MNCs play a dominant role in determining the development direction and governance of these clusters. Admittedly, foreign MNCs have contributed a lot in upgrading the capabilities of local firms in developing countries. The case of the Thai automotive and auto-parts cluster is illustrative of close collaboration between foreign MNCs and local firms in technological and skill upgrading. At the same time, it depicts a high dominance of foreign MNCs in cluster governance. Toyota and Honda have shown a commitment to continue to use Thailand as their

largest base of production and to invest in undertaking more advanced activities there, such as R&D.[2] Currently, Toyota, Honda and Ford have established R&D centres in Thailand (Times Online 2008). However, this is to some extent a result of government efforts to build a basic level of capability within local firms (see details in case study 4 on CD-ROM). According to interviews with automotive producers in Thailand, production capabilities of Thai local suppliers are up to industry standards, but capabilities are still limited in R&D and other advanced areas, e.g. automotive design.

Influences of MNCs on Government and Local Intermediary Institutions

In many developing countries, governance of technology-driven clusters is shaped by interactions between MNCs and government. MNCs tend to have direct and indirect involvement and a great deal of power in decision-making on cluster policy. In clusters with MNC-dominated and government-coordinated governance, government is prominent in driving cluster development. The government may use an existing or newly established broadly targeted mechanism/agency to serve as the core co-ordinating agency or an intermediary institution targeted for particular industries/clusters. In Thailand, the government assigned an existing semi-governmental research institute, i.e. the National Electronics and Computer Technology Centre (NECTEC), to be the intermediary institution driving HDD cluster development, while setting up a new agency, i.e. the Thai Automotive Institute (TAI), to address issues related to the automotive and auto-parts industry. In the Penang electronics cluster, Malaysia, the Penang Skill Development Centre (PSDC) – Malaysia's first industry-led training centre – was set up in 1989 at the initiative of the American Business Council in collaboration with Penang Development Corporation (PDC) and the Penang State Government. PSDC is currently a key intermediary institution for skill development in this cluster.

These local intermediary institutions are actively involved in cluster policy processes, but their actions are influenced quite a lot by MNCs. For instance, NECTEC, a core agency for development of the Thai HDD cluster, set up the HDD Cluster Committee and the HDD Cluster Centre to drive the growth of this cluster. This Committee is chaired by the Director of NECTEC, and the secretariat is provided by the Director of the HDD Cluster Centre. Four large foreign HDD makers (Seagate, Western Digital, Hitachi Global Storage and Fujitsu) are major members

of the Committee. They dominate Committee decision-making and actions, especially in proposing development projects for government support. During the first three years of its operation, the Centre mostly played a coordinating role, assisting these four key foreign HDD MNCs in addressing critical issues that they faced. This was due to the Centre's limited resources and capabilities. Currently, the Centre has become more proactive in cooperating with local HDD firms in the 2nd and 3rd tier of the HDD production chain in various upgrading activities.

The influence of foreign MNCs is also seen in the case of PSDC in Penang, Malaysia. The Management Committee of PSDC is dominated by foreign MNCs. Almost half of its members are from the electronics and semiconductor industries. Foreign MNCs, especially US-based companies, are highly dominant in PSDC, providing the chairperson and members of the PSDC board. The current chairperson of the PSDC Management Council is the executive of AMD Corporations, and the deputy chairperson is from Motorola. Both are US-based companies. Vice chairpersons of the Management Council are from Intel – also a US-based company – and Engtek Group – a leading Malaysian firm. This structure sets PSDC on the track of the decision-making and ideas of the MNCs.

In the Thai automotive and auto-parts cluster, though individual foreign MNCs do not serve directly on the Thai Automotive Institute (TAI)'s Management Board, they do influence cluster policy through the industry associations, which represent them indirectly. Although TAI has been involved in policymaking and policy implementation for automotive cluster development, its actions and decisions usually rely on the policy directions set by large foreign automobile makers and the government.

Influences of MNCs on Industry/Trade Associations

Industry or trade associations are another key player in clusters. In MNC-dominated governance, MNCs tend to be key members of industry associations and have high influence on their actions and behaviours. Although some local firms do participate as members of industry associations, MNCs always have larger voice than local firms, which are mostly dependent on MNCs as their suppliers. In the Thai HDD cluster, there is no local HDD-related association. This is because the number of local Thai-owned firms in this cluster is very small. So it is hard for them

to collectively form an association to represent their needs. The Electronics and Computer Employer's Association (ECEA), the only local association mostly related to the HDD industry, represents the electronics and computer industry as a whole. The only dedicated HDD industry association is the International Disk Drive Equipment and Material Association (IDEMA), which is an international association. The electronics cluster in Penang, Malaysia is similar in this regard. In Penang, the industry association specifically representing electronics manufacture and actively participating in policy processes is the Malaysian-American Electronics Industry Association (MAEI). MAEI is part of the American Chamber of Commerce (AMCHAM) and mostly represents the interests of US electronics MNCs.

Key members of these associations are usually invited to participate in policymaking processes, but participation tends to be just as formalised protocol. International associations have limited contributions to make to benefit host countries. For example, IDEMA may support its membership in activities that benefit all national members, such as information sharing or lobbying government for investment privileges. It is reluctant, however, to get actively involved in driving HDD cluster development in Thailand, particularly as regards long-term development, as this would benefit Thailand specifically and perhaps would be harmful to IDEMA's other member countries. As a result, the key HDD cluster association plays a limited role in initiating and participating in long-term collective activities.

Unlike the Thai HDD and Penang electronics clusters, there are quite a number of local automotive and auto-parts associations in Thailand. The nature of the long supply chain and past government policy support have enabled many local firms to become established in this sector; they then formed local networks and associations. The Thailand Auto-Parts Manufacturers Association (TAPMA) and the Thai Automotive Industry Association (TAIA) are the key associations in this cluster. They have been increasingly active in cluster policy processes and development. Nevertheless, the role of foreign-based MNCs in these associations cannot be ignored. Foreign MNCs have greatly influenced the actions of these associations. However, compared to the Thai HDD cluster, associations related to the Thai automotive industry contribute quite a lot in developing and representing needs of local auto-parts firms. Foreign automotive MNCs have many channels to convey their needs to the

government. Raising issues through an association is just one channel. They are as likely to approach the government directly to request a policy response to a critical issue.

Relationships between Foreign MNCs, Local Firms and Academic Institutions

Academic and research institutions are generally a key actor in developing clusters. However, in MNC-dominated cluster governance, collaboration between academic/research institutions and industries is relatively weak, since their capabilities tend to lag behind those of industry, particularly in technology advancement. Hence, companies in technology-driven clusters are likely to seek technological assistance from their foreign partners rather than from local academic institutions. This limits opportunities for academic institutions to develop their practical knowledge and skills through working with industries.

The academic and research institutes in Malaysia and Thailand have generally performed the conventional tasks of educational institutions, focusing on the supply side rather than on the demand side or industry needs. They have duly supplied the industry with human resources with basic or general capabilities, which however are out of sync with industries' requirements and expectations.[3] Due to their limited capabilities and knowledge about industries, academic and research institutes usually have little or no influence in cluster policy processes. In most cases, academic institutions cooperate with local intermediary institutions to support the clusters. In the Thai HDD cluster, NECTEC has cooperated with three universities to set up centres of excellence in HDD technologies, to provide training and R&D services to the HDD cluster. However, leading foreign HDD firms have benefited most from this initiative. Cooperation between the universities and local firms remains limited.

In the Malaysian electronics cluster, the role of the academic sector in cluster policy processes is similarly restricted. Even though the electronics cluster has been established in Penang for more than three decades, only in late 2007 did the key university in Penang (i.e. the Universiti Sains Malaysia) set up a unit to cooperate directly with industries, including the electronics industry, to serve their skill and research needs. In addition, interviews indicated that electronics firms prefer to cooperate with the Penang Skill Development Centre (PSDC) rather than local universities to acquire training services. They view the services of local universities as

too academic and not applicable to real practice. Although the government is attempting to reform the training and R&D system to become more industry-oriented and to facilitate knowledge-intensive activities, progress has been slow. Universities, especially newly established ones, struggle to find qualified instructors and students interested in science and technology fields. They, further, have limited leverage and ability to link with industries and to make use of the expertise of foreign MNCs. PSDC seems to be the only organisation effectively playing this role (Ritchie 2005).

From the above cases, three conclusions can be drawn. *First*, the technology-driven clusters tend to be dominated by foreign MNCs. Since foreign MNCs have control over technologies and capital resources, they have great influence, both direct and indirect, on government industrial policies. Policymakers always consider the voices of MNCs in policy processes, because of MNCs' capital investment power. *Second*, in clusters where local institutions are weak and foreign firms are dominant, government has to play a coordinating role. This is mainly because firms that are key players in a cluster are unwilling or unable to take the lead as the coordinator of cluster development. MNCs are controlled by their headquarters. They do not or cannot fully commit to long-term industrial development in a host country, without their headquarters' explicit agreement. Simultaneously, local firms in host countries tend to be weak in capabilities and resources, so they are reliant on government assistance and on foreign MNCs. In this situation, government intervention is needed, especially at the initial stage of cluster development. Government might assign this task to an existing public agency or set up a new organisation/mechanism to serve as the core coordinating agency for a particular cluster. Evidence from the cases shows that establishment of a core mechanism for cluster coordination seems to be a reasonable solution for the government. However, the key is to strengthen these intermediary institutions to enable them to perform adequately in driving cluster development.

Third, in this type of cluster governance, vertical coordination (or inter-firm linkages) between cluster firms within the supply chain is hierarchical, with foreign MNCs having most control. Moreover, horizontal coordination (i.e. that between cluster firms and other non-firm actors) is not proactive. This is due to the weaknesses of local institutions, including industry associations, intermediary institutions and academic/

research institutions. Collective action for cluster development, hence, is usually undertaken at the initiative or coordinated by government with direct and indirect influences of foreign MNCs. It appears that, at least from these three cases, the strengths and weaknesses of these local institutions very much depend on past and present industrial development policies. The Thai and Malaysian governments pursued similar industrial policies, i.e. focusing on driving industrial development through FDI/investment policy, rather than by creating a foundation for upgrading local capabilities, such as strengthening local academic and research institutions and enhancing the capabilities of local firms. As a result, their local institutions have limited ability to support cluster firms, leading to weak linkages between them and local firms.

5.2.2 State-Controlled Cluster Governance

State-controlled cluster governance differs from MNC-dominated governance, even though the industrial nature of clusters representing these two types is similar industries. The difference derives mainly from the distinct policy choices made by government (figure 5.3). Clusters that have limited technological capabilities but operate in a technology-driven environment tend to be dominated by foreign MNCs. However, states can alter cluster governance through their industrial development strategy, as seen in the case of the automotive and auto-parts cluster in Malaysia.

At first glance, one may perceive this type of governance as quite similar to the first type. Nonetheless, there is a major difference with regard to the dominant firms. In the 'MNC-dominated and government-coordinated cluster governance' the dominant firms are foreign MNCs, whereas in 'state-controlled cluster governance', large local firms are in the lead, though the role of the government remains vital.

Figure 5.3
State-Controlled Cluster Governance

Malaysian Automotive and Auto-Parts Cluster
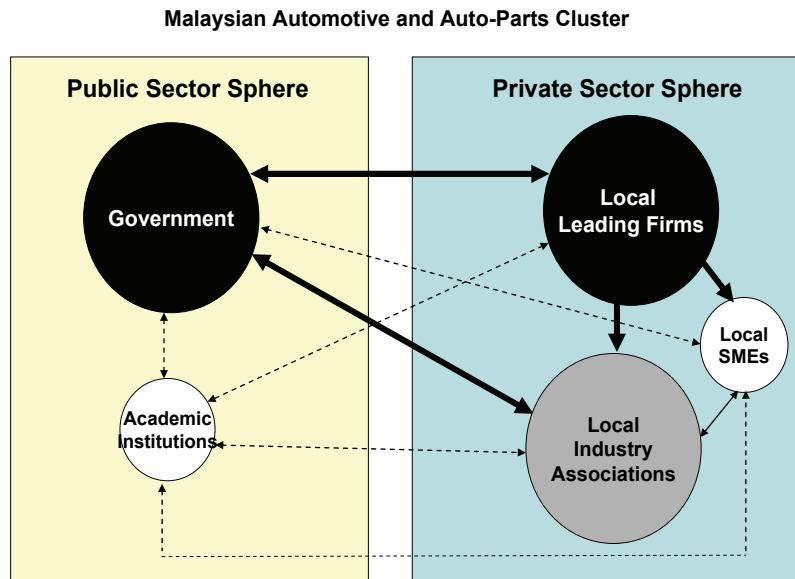
Relationships between the Government and Local Leading Firms

Governance in the Malaysian automotive and auto-parts cluster differs from that in other technology-driven clusters, as a consequence of the strategic choices made by the government in the past. The development of this cluster has been driven by the government and local leading firms. In 1982, the Malaysian government shifted its automotive industry strategy with the National Car Project, aiming also to enhance Bumiputera participation in the economic activities of the country. This was a turning point that diverted the development paths of the Malaysian and Thai automotive and auto-parts clusters. The Malaysian government began investing in the automotive sector through a newly established government organ called HICOM (the Heavy Industries Corporation of Malaysia). Since then, the Malaysian government has continued to participate in the automotive sector as a key auto-producer. This change in the national policy shifted the development direction and the structure of the local automotive industry in Malaysia from being an auto-parts supplier for foreign automotive manufacturers towards being a producer

or assembler of automobiles (Abdulsomad 2003, Kuchiki 2007) (see case study 5 on CD-ROM).

At the initial stage of establishment of the automotive industry, the Malaysian government looked to partner with a leading Japanese automobile maker (i.e. Mitsubishi Motors, in the first national car project, Proton Saga). At the same time, the government promoted participation of Malaysian firms, especially Bumiputera firms, in this sector. The state implemented various policy instruments and subsidies to protect and promote local automotive companies. As a consequence, no new automotive maker has entered Malaysia's automotive market and no foreign auto-making firm has taken over local assembly since 1985. Only the new national car projects have entered the market. However, after 2005, a trend emerged of new foreign auto-makers investing in local firms through mergers and acquisition of local firms. For example, Daihatsu, a Japanese firm, increased its shares in Perodua, which is Malaysia's second national car project, and now holds a majority of shares in Perodua. Presently, the national car firms, e.g. Proton and Perodua, operate as private firms, but authority and control remains with government.

The Malaysian automotive and auto-parts cluster now faces the challenge of trade liberalisation. As a member of the ASEAN Free Trade Area (AFTA) and the WTO, Malaysia must conform to international agreements to reduce trade and investment barriers. Many protective measures are being removed, although the government is trying to prolong this process. Having been under the government's protection for decades, local Malaysian firms are suffering under this challenge. In 2005, Proton attempted to partner with Volkswagen and General Motors to raise local sales and enhance its global market opportunities. However, the effort failed after three years of negotiation. Afterward, the government, through HICOM, increased its investment in Proton to maintain production. The situation to some extent was a reflection of the weak capabilities of local firms.

Influence of Local Leading Firms on SME Upgrading

Regarding local capability building, the large Malaysian firms (i.e. Proton and Perodua) with strong government support created vendor development programmes (VDPs) to build the capabilities of their local suppliers. Under VDPs, local auto-parts vendors receive support from the national car companies in the form of technical assistance and guidance in

product development. This enables them to supply parts and components of the required standard (Abdulsomad 2003). Nonetheless, interviews with the leading local car producers in Malaysia and other related agencies indicated that local automotive firms remain weak. Thus, the leading firms can produce automobiles at only a basic standard level. A study by Kuchiki (2007) similarly found that the local suppliers of Proton and Perodua were still unable to provide products that meet global standards and that automation in Malaysian firms' production processes is very low compared to that of Japanese firms (i.e. only 9% in Malaysian firms and 99% in Japanese firms). A study by Sadoi (2003) emphasised the low technological capabilities among local workers in the Malaysian automotive and auto-parts industry. The major problem was the lack of technical competencies in processing skills for forging and precision machining as well as in automotive and auto-parts designing.

The protective policy of the Malaysian government has limited the exposure of local automotive firms to global competition, hence obstructing their motivation to improve their capabilities (Abdulsomad 2003, Sadoi 2003). Presently, more than 90% of automobiles produced by Malaysian firms are sold in domestic markets, while local firms are shielded from foreign competitors through high tariff barriers and other protective policy measures. Based on interviews with key persons in Malaysia and Thailand, though Malaysia did manage to become one of the world's auto producers, the technologies used lag behind those of competitors, including those used in Thailand. Leading Malaysian firms still rely on foreign technologies, mostly through joint ventures with Japanese firms, but with the Malaysian government holding the majority of shares. Despite their long histories, Malaysia's largest local automotive firms, like Proton, still acquire technologies from countries such as Germany, the UK, Japan and South Korea, to contribute to design, engineering and research (Abdulsomad 2003).

Relationships between the Government, Local Leading Firms and Industry Associations

The two key local associations active in the Malaysian automotive and auto-parts cluster are the Malaysia Automotive Association (MAA) and the Malaysia Automotive Components Parts Manufacturers Association (MACPMA). The national car companies are major members and involved in the board of these associations. They thus dominate the actions of the associations. These associations tend to be invited to partici-

pate in setting the cluster policy agenda and mostly represent the voices of the national car companies and large local firms. To a great extent, they are involved in cluster development and collective activities, such establishment of an industry database, information dissemination, organising motor shows and other marketing activities.

While MAA works closely with the government to develop automotive vendors through cooperation with Japanese car companies, MACPMA is more influenced by local Chinese auto-parts firms. MACPMA helps to promote linkages between auto-part firms and automotive assemblers. It also participates in policy activities regarding the auto-parts sector. Additionally, there are other associations pertaining to auto-parts manufacture, i.e. the Proton Vendor Association (PVA) and the Perodua Vendors Club (Kelab Vendor Perodua, KVP). However, these two associations focus on fostering suppliers of particular leading firms only. Most members of PVA and KVP are also members of MACPMA. They raise their critical issues to the government mainly through MACMPA rather than through PVA or KVP, as this way they can get a more direct response.

Weak Linkages between Academic Institutions and the Industry

Similar to the MNC-dominated and government-coordinated governance, roles of academic institutions in state-controlled cluster governance are weak. Although many universities and vocational colleges provide study programmes/courses related to automobile manufacturing and engineering, no academic or research institutions are directly involved in development activities for this cluster. Key interviewees mentioned the quite limited cooperation between automotive firms and academic/research institutions. Leading automotive firms normally acquire knowhow and technological knowledge from Japanese counterparts rather than from academic institutions. Some auto-making firms and auto-part producers expressed the view that local educational institutions are too academic and cannot provide practical services to the industry. Another observation was the scarcity of literature and studies concerning university-industry linkages for automotive sector development in Malaysia.

Absence of Intermediary Institutions

There seems to be no intermediary institution in the automotive and auto-parts cluster in Malaysia. Mainly, this is because the government has

dominant power over actions of the private sector and other institutions. The government has intervened in local firms' actions and decisions through capital investments and incentives. The government protection enjoyed by these firms has limited their exposure to global competition and their eagerness to upgrade to meet global standards. They just follow state policies and take advantage of support. Moreover, in most cases, local car-makers, like Proton and Perodua, also play the role of intermediary institution, e.g. in skill upgrading for local auto-parts suppliers under the vendor development programmes (VDPs). But under such circumstances, in which the government controls economic resources and takes the lead in cluster policy processes, intermediary institutions may not be necessary to coordinate the collective activities of clusters.

To sum up, from the analysis of the state-led cluster governance in the Malaysian automotive and auto-parts cluster, two related observations can be made. *Firstly*, government intervention in industrial development through control of ownership seems to be ineffective in gearing clusters to become internationally competitive. In the case of infant industries, government control and intervention might be necessary for an industry's growth. However, the key is how such interventions are conducted. Basically, government has a role in providing public goods or in taking charge of common collective activities. But, if the government intervenes by becoming involved as a key business actor, this leads to conflicting roles and interests, since the state then has to be concerned more with the profits and losses of its businesses. State policies/actions will then likely focus more on facilitating business benefits than on enhancing the overall capabilities of the industry. Consequently, the goal to create a basic foundation for upgrading the industry as a whole may be distorted.

Secondly, where the government is strong and has a high degree of control over resources, cluster-related local firms and academic institutes tend to rely on the state for support. Local firms that are protected from external competition will likely feel little pressure or drive to upgrade their capabilities and quality. This undermines cluster development in the long run.

5.2.3 Local Intermediary Institution-Coordinated Cluster Governance

In the third type of governance, a local intermediary institution is the pivot of cluster development and policy processes. This type of cluster governance is named 'local intermediary institution-coordinated cluster governance'. The case studies showed, indeed, a significant role of intermediary institutions in shaping cluster governance, albeit through different approaches and forms of organisations (e.g. a specialised institute, a group of individuals, a network or a trade association). The exact form taken depends on the characteristics and context of the cluster and its organisational capabilities.

Under this type of cluster governance are three sub-types: cluster governance geared by a specialised research institution, cluster governance geared by an industry association, and cluster governance geared by an informal local network. Basically, these three sub-types of are not equal with regard to size, ownership and characteristics of organisation. Nonetheless, they all have local institutions playing the role of intermediary institution in the cluster. They are, hence, grouped under the same type of cluster governance. A specialised research institution acting as an intermediary institution is seen in the Taiwanese semiconductor cluster. In the Thai orchid cluster, an individual cluster leader played a central role in creating an informal network that now acts as an intermediary institution. In Taiwan's orchid cluster, local industry associations act as the intermediary institution. In the case of Taiwanese semiconductor cluster, the government has played a vital role in creating and supporting the intermediary institution. In contrast, in the Thai and Taiwanese orchid clusters, the private sector has taken the lead as intermediary. This section discusses each sub-type of 'local intermediary institution-coordinated cluster governance'.

1) A Specialised Research Institute as Local Intermediary Institution

By nature, the semiconductor industry is technology-driven, like the other two electronics clusters. This characteristic is influential in interactions among key cluster actors and in shaping the governance of the cluster. However, Taiwan's semiconductor cluster reflects a different form of governance than the other two electronics clusters, owing to the government's policy actions to strengthen the role of a specialised research institute, to make it a core agency for the development of this

cluster. This sub-type of cluster governance is called 'specialised research institution-geared cluster governance' (figure 5.4).

Figure 5.4
Local Intermediary Institution-Coordinated Cluster Governance.
Sub-Type 1: Specialised Research Institution-Geared

Taiwanese Semiconductor
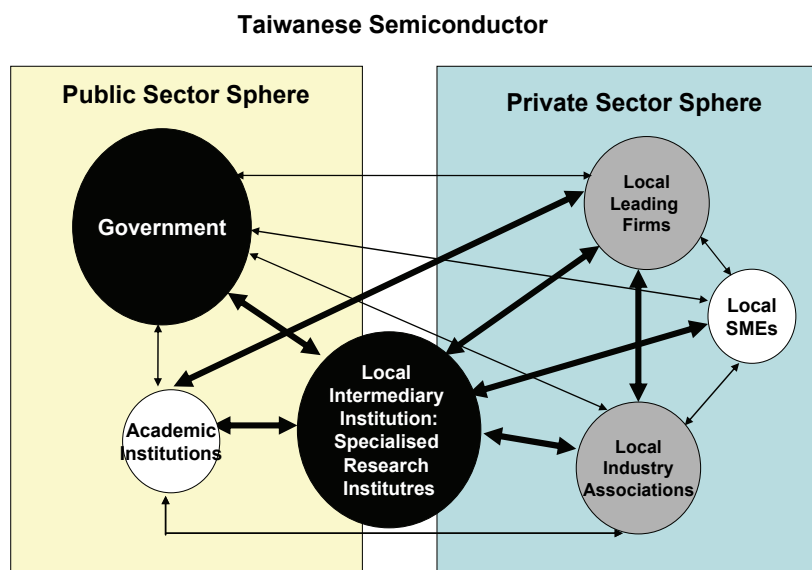
Government Roles in Enabling a Sound Business Environment and Creating a Local Intermediary Institution

Like many developing economies in East and Southeast Asia, at the onset of its industrialisation Taiwan pursued a policy of attracting FDI to establish high-tech industries and to upgrade the technological capabilities of local firms. However, the Taiwanese government also put strategic effort into strengthening local academic and research institutions and related facilities. The aim was to create a strong foundation for technology-based industries. Presently, the governance of the Taiwanese semiconductor cluster is shaped by a local specialised research institution, i.e. the Industrial Technology Research Institute (ITRI), which is backed by strong government support.

At the initial stage of industrialisation, when local capabilities were still weak in terms of resources and technology knowledge, the Taiwanese government invested huge effort in developing technological skills among workers, seeking cooperation with foreign experts in industrial technologies through investment policy and related measures. Parallel to implementing this policy to attract FDI to high-tech industries, government strategically induced overseas Taiwanese with experience or expertise in the electronics industry, mainly from Silicon Valley in the US, to return to Taiwan. Early on, 90% of Taiwanese who had graduated in S&T fields from study abroad did not return to Taiwan. Since the mid-1980s, the proportion of Taiwanese students returning from their study abroad has increased due to the active promotional measures of government and the growing prosperity within the country (Lui and Qiu 2001).

Moreover, the Taiwanese government encourages national universities and tertiary educational institutes to supply highly skilled R&D personnel for technology-intensive industries. Various universities and research institutions were assigned specific responsibilities in conducting training for industrial technicians. For example, ITRI was put in charge of training in strategic industries, i.e. the semiconductor and electronics industry, and Tsing Hwa University was asked to train traditional industrial technicians (Lui and Qiu 2001). Besides, the government collaborated closely with foreign experts, mainly from the US, to select core technologies best suited to advance the development and competitiveness of the semiconductor cluster. In 1973, immediately after the semiconductor cluster was established, the government set up ITRI in Hsin-Chu County, where two main technology-oriented universities were already located. Since then, the state has continuously strengthened ITRI to make it a core vehicle for technology diffusion and innovation for local electronics firms. Beyond this, the Taiwanese government directly allocates resources to local academic institutions to supply strong human resources for supporting technology-focused industries in the island. These strategic actions have helped to create a sound business environment for local firms to upgrade their technological capabilities and to advance their competitiveness. As a result, local firms in Taiwan's semiconductor cluster are technologically strong and successful worldwide.

Influence of a Local Intermediary Institution on Government Technology Policy, Local Firms and Industry Associations

In the past, ITRI acted as an incubation centre for local SMEs in Taiwan's semiconductor cluster. Many Taiwanese firms which are now among the world's leading semiconductor firms (e.g. TSMC, UMC and TMC) were spun off from ITRI and thus had received continuous ITRI support in terms of technical assistance and technological know-how. Trust between ITRI and local firms has been developed through long-term cooperation. The government, too, has encouraged new business start-ups in this sector and in other high-tech industries by providing venture capital, which was usually allocated through ITRI. In such cluster governance, the government develops relationships with local SMEs through links with leading firms and the research institute.

As mentioned, ITRI is vital as an intermediary coordinating all key actors in the Taiwanese semiconductor cluster. ITRI is also influential in policymaking processes, especially for technology-intensive industries. It is still assigned to draft policy/strategy and advise the government on issues pertaining to technology development. It has worked closely with semiconductor firms and the industry association, the Taiwan Semiconductor Industry Association (TSIA), to compile common needs of firms and draft policy proposals to the government. Furthermore, the close collaboration between ITRI and individual local firms is evident in many R&D projects and technology training programmes. Government now encourages ITRI to stand on its own, to serve the industry's needs. While in the past ITRI was fully government-funded, at present only half of ITRI's revenues are from the state, mostly through R&D projects and programmes of Ministry of Economic Affairs (MOEA) (see case study 2 on CD-ROM).

Relationships between the Local Intermediary Institution and Local Academic Institutions

The Taiwanese semiconductor cluster also elucidates a significant role for academic institutions in supporting business development. ITRI acts as a bridge for collaboration in technology and human resource development between the semiconductor industry and other technology-based industries and the academic sector. Universities located near the Hsin-Chu area are key supporters of ITRI in assisting electronics and semiconductor firms. With their strong base of expertise in the fields of

technology and engineering, these universities have set up numerous electronics laboratories and research centres to provide specialised services to local electronics firms. University research projects involving participation of industry or responding to industry demands have been given a high priority in getting government funding.

The development of the Taiwanese semiconductor cluster has proven very successful. Today, the industry comprises a large number of SMEs, which are highly capable in electronics technologies. Highly technologically skilled human resources are pooled in research and academic institutions to serve industry demands. Taiwan is presently among the world's top producers and exporters of semiconductors. Many leading Taiwanese firms are currently global leaders in the semiconductor markets. Evidence from the Taiwanese semiconductor cluster reveals that development through the FDI- and MNC-attraction path is not the only possible choice for developing countries to advance their technology-driven clusters. Making a strategic choice to create strong local capabilities also appears to be crucial. Local capabilities can be fortified by strengthening local institutions mandated to enhance the competitiveness of clusters.

One outstanding aspect of the Taiwanese government policy has been its strategic allocation of resources and support to enable competitive market mechanisms. The relationship between government and industry has been built up through a special research institution, which is influential in cluster policy processes in terms of technology development. Long-term relationships between the specialised research institute (i.e. ITRI) and local leading firms have helped to create trust-based interactions. Leading firms are willing to cooperate with ITRI and the government to support the technological upgrading of local SMEs. However, relationships between the government and local SMEs are not as close as the state's relationships with leading firms and with ITRI. In fact, the large leading firms do not participate directly in cluster policy processes. They usually coordinate with ITRI to communicate their needs and contribute to setting the development direction of the industry. In short, this type of cluster governance is based on the presence of a strong intermediary research institute, which actively coordinates all parties in the cluster to create a sturdy technological base for cluster development.

2) Industry Associations as Local Intermediary Institutions

The Taiwan orchid cluster shows a pivotal role played by local industry associations as an intermediary institution in the cluster. Industry associations have a high degree of participation and influence in cluster policy processes. They work closely with the government in setting the direction of and policies for cluster development. Local leading farms have indirect influence on cluster policy processes through their associations. Local academic institutions play a supporting role and work closely with industry associations in assisting local farmers. This sub-type of cluster governance is called 'local industry association-coordinated' (figure 5.5).

Figure 5.5
Local Intermediary Institution-Coordinated Cluster Governance.
Sub-type 2: Local Industry Association-Coordinated

Taiwanese Orchid Cluster
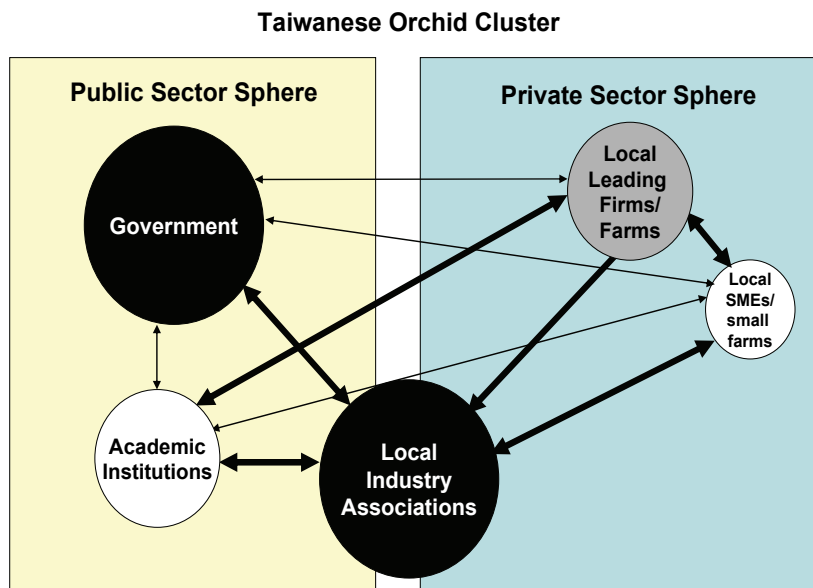
Leading Roles of Industry Associations with Government Support

Local industry associations have played a crucial role in policy processes related to the Taiwanese orchid cluster, while the government has played a supporting or facilitating role. The Taiwanese orchid cluster was not a high priority on the government agenda in the past. The government put

more emphasis on high-tech manufacturing sectors than on agricultural sectors, which contributed only one percent of GDP. However, since Taiwan's entry into the WTO in 2002, the agricultural sector, including the orchid industry, has faced strict standardisation requirements and trade barriers. The government started to pay more attention to the agricultural sector and declared orchids as a flagship agricultural product. The government encouraged concentration of orchid plantations and formation of the orchid cluster by establishing the Taiwan Orchid Plantation (TOP) in Tainan County on the south-western part of the island. TOP operates with support from the Tainan County Government to provide facilities for orchid growing, marketing and exporting, with low rental fees and other costs.

The Council of Agriculture (COA) opened space for the orchid cluster, represented by industry associations, to participate in policymaking processes and to be actively involved in driving policy implementation. Major associations related to Taiwan's orchid cluster – including the Taiwan Orchid Growers Association (TOGA), the Taiwan Floriculture Development Association (TFDA), the Taiwan Floriculture Export Association (TFEA) and the Taiwan Potted Plant Association (TPA) – have been very active in coordinating the needs of orchid growers and firms and in finding solutions together. Orchid-related associations co-operate to identify critical issues confronting the industry and initiate development projects in an annual floriculture development plan. Afterward, they propose, discuss and negotiate the annual plan with the COA for budget support (see case study 7 on CD-ROM).

Roles of Industry Associations in Supporting Local Farmers and Linkages with Local Academic Institutions

In line with their locational proximity, Taiwanese orchid entrepreneurs have developed close relationships and formed a community-based cluster. Social networks among orchid farmers emerged from within the community and consequently developed to become local industry associations. The network of local industry associations is a main mechanism that links key players together in orchid cluster development activities. Besides working closely with the government to set policy and establish a development plan for the industry, these associations, especially TOGA, initiate activities to link orchid growers with local universities. TOGA organises seminars and training programmes bringing together orchid

growers with local universities. The government allocates funding to support such skill upgrading. The key condition is that projects/programmes must serve real needs of the industry. Hence, universities are motivated to coordinate and work closely with local entrepreneurs, and normally industry associations link them together. For example, Chiayi University, located near many orchid plantations on the central part of the island, set up the Horticultural Technology Centre to conduct research related to horticultural products, including orchids. The Centre's services include flower (mainly orchid) breeding and propagation of seedlings by using biotechnologies. Moreover, its Department of Horticulture has offered a six-month training programme for orchid farmers free of charge. The training programme was sponsored by the COA and designed in collaboration with TOGA and key leading orchid farms. The University has also conducted several research projects in response to industry needs, such as breeding new orchids to serve new demands and improving logistics systems for more efficient orchid export. Recently, professors from Chiayi University worked closely with four exporting firms to study logistics system improvements for orchid export.

In sum, this type of cluster governance emerges at the initiative of the private sector and later is supported by the government. The Taiwanese orchid cluster shows that even a lack of government support can create good conditions and even be a driver for collective private sector efforts, if the key ingredients of strong social embeddedness and networks are already in place. Under such circumstances, the formation of associations seems to be a potential solution for orchid growers, giving them a greater voice in government policymaking processes and wider access to relevant information. However, the role of the government is also crucial in empowering and facilitating industry associations to support the cluster.

3) An Emerging Informal Network as the Local Intermediary Institution

The Thai and Taiwanese orchid clusters are alike in that they are community-based and comprise a large number of SMEs. Orchid farms are located in proximity to one another, and growers are linked through social relationships based on shared values and culture and a long history in the community. Governance of the two clusters is dominated by a local intermediary as well. However, the influential local intermediary in the Thai case is not an industry association, but rather an informal network

of orchid growers. This sub-type of cluster governance is called 'emerging informal network-catalysed' (figure 5.6).

Figure 5.6
*Local Intermediary Institution-Coordinated Cluster Governance.
Sub-type 3: Emerging Informal Network-Catalysed*

Thai Orchid Cluster
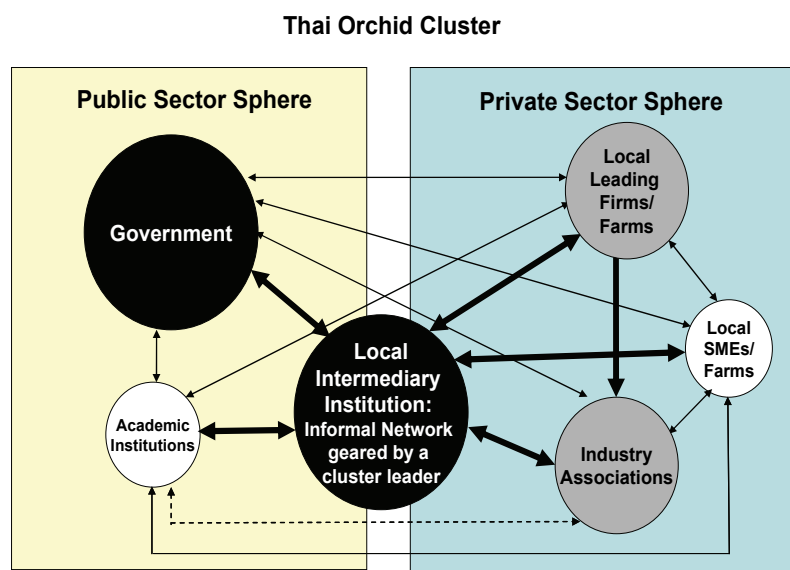
Roles of the Emerging Cluster Leader and Local Network in Cluster Coordination

Similar to its Taiwanese counterpart, the Thai orchid cluster only recently became a focus of government policy. This lack of government interest perhaps set the stage for an informal orchid grower network in Ratchaburi Province to emerge as the key driver of governance of the cluster. The network was established by an individual orchid grower, who is now recognised by key players in the Thai orchid cluster as the cluster leader. This grower continues to play a critical role in linking orchid growers, some exporting firms and local government agencies to undertake cooperative efforts to develop the cluster. Furthermore, his informal network is highly involved and influential in government decision-making on orchid cluster development.

In the Thai orchid cluster, this strong local leader has played a coordinating and catalytic role in cluster development. This cluster leader has developed and maintained relationships with other orchid growers in the community almost all of his life. In 1998, when the Department of Agricultural Extension (DOAE, Ministry of Agriculture) conducted a project to encourage formation of agricultural networks/groups of farmers, he was selected as leader of the Ratchaburi orchid group. With his strong willingness to develop the Thai orchid industry and to make it internationally competitive, he networks with other orchid groups/networks as well as with local and central government agencies and academic institutes. However, at that time, the Ratchaburi orchid group was undertaking activities in a traditional way, mostly through social activities without a clear development direction or plan.

The turning point that shifted coordination in the Thai orchid industry towards the cluster approach was the external force in 2002 of Taiwanese investors attempting to enter this sector in Thailand. After successfully protecting the sector from Taiwanese entrance, the cluster leader encouraged members of the Ratchaburi group to form the orchid cluster. He initiated several activities to connect orchid growers and to establish a strong network, which at present actively cooperates with other supporting institutions to upgrade the standard of orchids and to enhance the capabilities of Thai orchid entrepreneurs. As a result, this network has expanded and now involves local government officials and local academicians in various development activities (see details in case study 6 on CD-ROM).

One explanation of why a local cluster leader could emerge is that in a community where cultural homogeneity is high and institutional diversity is low, relatively distinct managerial rationalities and practices can be expected which lead to location-specific forms of business coordination (Whitley 1994). Relationships and friendships are a key basic factor of trust among orchid farmers and brought about an informal network in the community.

Relationships between Government and the Local Informal Network

The strengths of the Thai orchid industry and the emergence of an active network are to some extent benefits of being neglected by the government in the past. The impressive performance and prosperity of the Thai

orchid cluster, however, has recently attracted the interest of government towards the sector.

At the urgings of the orchid grower network, central and local government authorities were induced to participate in many activities of the cluster. The cluster leader strategically convinced the Ministry of Agriculture, the Ratchaburi Governor and the Provincial Office of the Department of Agricultural Extension to support the orchid cluster in terms of policy facilitation and financial backing. In late 2007, the National Orchid Development Plan was formulated and endorsed by the Cabinet, together with an approved budget amounting to 625 million baht for 2008-10. The cluster leader, local leading farms and industry associations participated in cluster policy formulation and policy implementation and are influential in the decision-making of the government towards cluster development (see details in case study 6 on CD-ROM).

The Local Informal Network and Links with Industry Associations and Local Academic Institutions

Though there are many industry associations related to the orchid industry, all have limited capability in terms of human resources and finance to drive or gear cluster development. Moreover, the two key associations, Thai Orchid Garden Enterprise Association (TOGEA) and the Thai Orchid Exporter Association (TOEA), still have conflicts of interest, which limit their cooperation. The weakness of the industry associations provided space for the cluster leader and his informal network to play a part in cluster development and cluster policy processes.

Presently, academic and research institutions are increasingly active in orchid cluster development. With the intense and continuous efforts of the cluster leader and his informal network, close collaborative linkages between the cluster and the academic sector have now become more securely established. The cluster has worked closely with Kasetsart University, Kampaengsaen Campus in Nakorn Pathom Province, in many research projects. Moreover, the cluster leader has convinced orchid farmers to co-invest with Kasetsart University to build an experimental orchid farm on the campus. Two agricultural vocational colleges have also cooperated with orchid growers to design and conduct tailor-made training programmes for horticulture students. These collaborations resulted from the cluster leader's efforts and those of his informal network

to strategically match academic needs and practical needs of orchid growers to solve problems facing the industry.

The Thai orchid cluster reflects the key role that a local cluster leader can play in shifting cluster governance towards a new form of cooperation. The cluster leader has strategically leveraged local identity, social embeddedness and opportunities provided by the government to build strong collaboration within the cluster. Currently the orchid cluster is gaining wider recognition from many government and private agencies and has received more support in both policy and financial terms, hence enabling faster development progress. The key governance challenge in this cluster is the sustainability of this small local network of altruists. No matter how altruistic they are, eventually they will come up against limitations to contribute further. To form linkages, actors in the network will need to bear some costs. But Hence, the government should consider strengthening the existing network to make it more institutionally anchored and firmly established.

5.3   Reflections from the Case Studies

The evidence from the case studies proves the main propositions of this chapter. The first proposition is that the structure of clusters greatly influences cluster governance in that clusters having a similar structure tend to have a similar form of governance. The case studies show that most technology-driven clusters are structured as a 'cluster of subsidiaries of MNCs and local suppliers' and their governance is dominated by foreign MNCs. In contrast, the two natural resource-based clusters are SME-based. Their cluster governance is also alike, led by a local intermediary institution, despite the different types of this institution.

The second proposition is that government policy plays a significant role in altering the form of cluster governance from that typically shaped by the industry context through intervening in the capabilities of local firms and supporting institutions. However, this intervention can either enable or impede cluster development. This is seen in the case of Taiwanese semiconductor cluster and the Malaysia automotive and auto-parts cluster. In both clusters, government intervention plays a vital role in shaping governance of the clusters, but in different directions. In the Taiwanese case, government intervention enhances the capabilities of local institutions and facilitates key actors in the cluster, whereas in the Malaysian case, government's power is exercised in a debilitating way, in

the form of state control over resources and resource allocation for business activities. The distinct roles of the two governments create differing national contexts in the two economies, with governance in the two clusters consequently diverging towards different forms. While governance in the Taiwanese semiconductor cluster is geared by a specialised research institution acting as a local intermediary institution, the Malaysian automotive and auto-parts cluster is governed by state control.

Beyond these propositions, this study found two additional interesting aspects of the interplay between cluster characteristics and cluster governance in relation to the factors 'leadership' and 'availability and control over resources'. Figure 5.7 depicts how these two factors influence the interplay between cluster characteristics and cluster governance.

Figure 5.7
Influence of Leadership on the Interplay between Cluster Characteristics and Cluster Governance
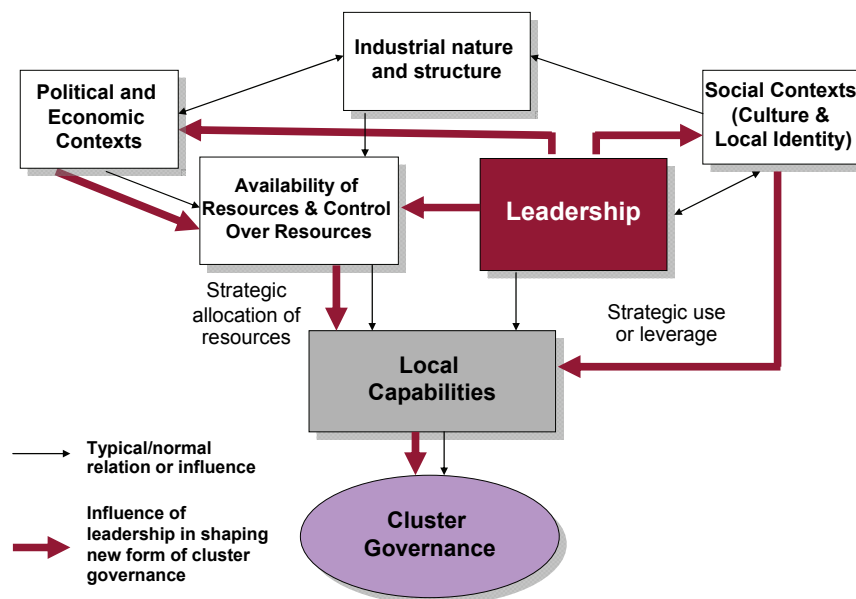
As discussed in chapter 2, national context is viewed in this study as covering the political, economic and social contexts. In figure 5.7, the social context, encompassing culture and local identity, is separated out

from the other aspects of national context (i.e. political and economic) as each is closely related to different factors that might influence cluster governance. In the figure, normal lines represent typical relations or influences between elements. Thick lines represent the role of leadership in influencing the changing form of cluster governance.

The *first aspect* here is that the factor 'availability and control over resources' plays a more significant role in shaping governance in the technology-driven clusters than in the natural resource-based clusters, where culture and local identity seems to be more influential. This is because fast-changing technology is not an important force of competitiveness in the natural resource-based clusters. The key enabling factor for knowledge sharing and collective actions of these clusters is trust, which is established and developed through long-term relations. Clusters that have a higher degree of homogeneity in culture and local identity perhaps more easily develop trust-based relationships than clusters with more diverse cultures, like technology-driven clusters, in which many foreign firms are active players.

The *second aspect* is that 'leadership' is a crucial factor affecting the enhancement of capabilities of cluster actors and local institutions, eventually determining the different forms of cluster governance. Presence of leadership in cluster development can be at the level of government, organisations, networks or individuals. It can change or reshape the form of cluster governance via at least two possible paths. *Firstly*, it can influence the factor 'availability of and control over resources' by strategically allocating important resources of the clusters in a way that facilitates cluster development. The Taiwanese semiconductor cluster case reflects strong government leadership in strategically managing resource allocation to strengthen local capabilities and to enhance the competitiveness of the cluster. Hence, governance of the Taiwanese semiconductor cluster is different from that of most technology-driven clusters, which are mostly dominated by foreign MNCs. But, Taiwan's semiconductor cluster has a strong base of local firms with high technological capability, and this became the key competence of the cluster. *Secondly,* leadership can shift cluster governance through the leveraging or strategic use of culture and local identity. As such, leadership can strengthen the capabilities of local institutions and impact the relationships between cluster actors. The Thai orchid cluster is an example of this pattern. The local cluster leader leverages local identity and cultural homogeneity in creating a

strong trust-based network for cluster development in the Ratchaburi orchid cluster. At present, the network is widening, involving more actors from the public and academic sectors, in so doing bolstering the strength of the Thai orchid cluster.

5.4   Concluding Remarks

The analysis in this chapter found three main types of cluster governance: (1) MNC-dominated and government-coordinated governance, (2) state-controlled governance and (3) local intermediary institution-coordinated governance. The first type of cluster governance was found in the case of the HDD cluster and the automotive and auto-parts cluster in Thailand and the Penang electronics cluster in Malaysia. In this type of governance, foreign MNCs control technology and capital, which makes MNCs most influential in setting the development direction and shaping the governance of the clusters. However, the case studies also show that it is not these MNCs that play the coordinating role in cluster development, but rather the government. The government intervenes by setting up a core coordinating mechanism for cluster development initiatives. Nevertheless, these core mechanisms have limitations in terms of their capability to actively play the expected roles. Consequently, local institutions in this type of governance remain weak and largely reliant on foreign MNCs.

This chapter unveiled that different government policies/actions can generate different impacts on cluster governance. The Malaysian automotive and auto-parts cluster reflects a strong government influence in leading the development of the cluster. The Malaysian state made huge investments in the automotive business, becoming a key player and protecting local firms from international competition. These actions seem to have undermined the capabilities of local firms and institutions to upgrade the cluster.

The third type of cluster governance, i.e. local intermediary institution-coordinated governance, is represented by three clusters: the semiconductor and the orchid clusters in Taiwan and the orchid cluster in Thailand. The Taiwanese government, unlike the Malaysian government, pursued a market-oriented industrialisation policy at the initial stage of development of the semiconductor cluster. Considerable investments by the Taiwanese government were put into strengthening the sector's technology and research foundation and human resource development.

A targeted research institute was established and strengthened and has now become an influential mechanism in coordinating and driving semi-conductor cluster development. The resource-based clusters, i.e. the orchid clusters in Thailand and Taiwan, are also governed by a strong local intermediary institution, albeit by different types of actor. In the Thai orchid cluster, an individual local leader and his informal network perform a coordinating and catalytic role in cluster development, while industry associations actively drive cluster development in the Taiwanese orchid cluster.

The analysis further found an interplay between cluster characteristics and cluster governance and an influence of leadership in altering the expected type of cluster governance towards a more effective type by strategic allocation of resources and leveraging of local identity and social embeddedness. Cluster governance can affect the decisions and actions of key cluster actors in response to competitive challenges. This issue is discussed in chapter 6.

Notes

[1] Porter (2003) uses the term 'institution for collaboration (IFC)' to describe an institution that plays the role of intermediary in cluster coordination. He emphasises the importance of industry associations and academic institutes in playing an active role as IFC in cluster development.

[2] Source: Master Plan for Automotive Industry Development (Phase 2) (2007-2011), Thailand.

[3] Source: Human Resource Development Strategy for Industry Competitiveness, Office of the National Economic and Social Development Board (NESDB), Thailand, May 2005 (in Thai language).

6 Institutional Modality of Cluster Intervention and Influence of Cluster Governance

6.1 Introduction

This chapter discusses the fourth element in the analytical framework, i.e. the institutional modality of cluster intervention. Under today's highly competitive circumstances, clusters face great difficulty in gaining and maintaining a competitive position. This chapter analyses how clusters respond to such competitive

challenges, called in this study the 'institutional modality of cluster intervention', or in short 'institutional modality'. Note that this study uses these terms interchangeably.

The main proposition of this chapter is that *though cluster characteristics and cluster governance can affect how clusters select an institutional modality of cluster intervention, clusters having a similar form of governance and operating in the same sector will not necessarily apply the same institutional modality of cluster intervention to cope with a particular competitive challenge.* The analysis in this chapter mainly answers the first core research question: How does the interplay of context, cluster characteristics and cluster governance affect cluster development and selection of the institutional modality of cluster intervention? Also, two research sub-questions will be explored: (1) What are
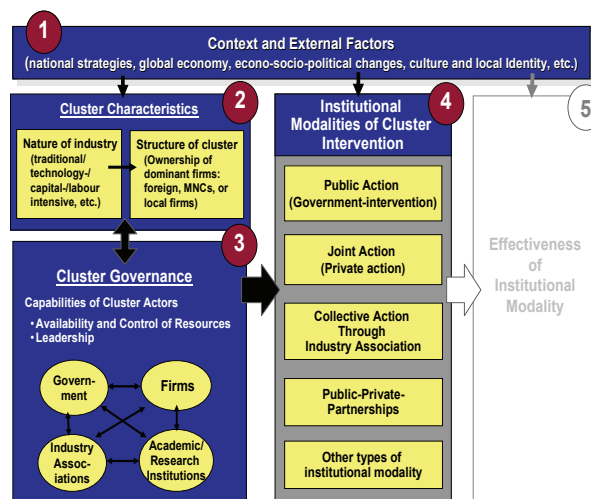
key competitive challenges identified by the selected clusters, and what forces are driving those challenges? (2) How does each cluster actor play its roles in identifying and dealing with the identified competitive challenges? The first section presents the types of competitive challenges that clusters face and how clusters identify such challenges. Then, the analysis moves to how cluster governance influences the selection of institutional modality of cluster intervention.

6.2   Overview of Competitive Challenges of Clusters and Choice of Institutional Modality of Cluster Intervention

In general, clusters face various challenges that are critical to their competitiveness. To cope with these challenges, clusters may find many solutions, but they are likely to apply the one that best suits their conditions. Basically, the institutional modality of intervention that a cluster selects will depend on at least two factors: cluster governance and cluster context. From the empirical study, it was also observed that the choice of institutional modality is influenced by the complexity of the competitive challenge. That is, firms are likely to handle a short-term challenge or one that requires a quick response alone or by joint action with a few other firms, rather than by investing effort into organising collective action with a large group of firms or with government.

However, challenges that are considered to be cluster-level challenges tend to require long-term solutions and concerted efforts to overcome them. How a cluster deals with these long-term challenges is the focus of this chapter. In the interviews, most key persons in the seven clusters identified more than one competitive challenge that the clusters confronted. Only one challenge, which is identified by the majority of cluster actors, is examined in-depth in relation to the chosen institutional modality of cluster intervention. From the case studies, the cluster-level competitive challenges faced by the seven clusters can be classified into three groups: (1) market expansion/intense international competition, (2) human resource and skill development and (3) upgrading towards more advanced technology and higher quality and standards. The empirical studies show that the seven clusters applied various institutional modalities to tackle these critical challenges. Table 6.1 summarises the findings from the case studies on the institutional modality of cluster intervention.

Table 6.1
Summary of Key Competitive Challenges and Institutional Modalities of Cluster Intervention, Applied by the Seven Clusters

Key Identified Competitive Challenge of the Cluster	Cluster	Institutional Modality of Cluster Intervention
Market Expansion/ Intense International Competition	• Taiwanese orchid cluster	• Collective action through industry association
	• Malaysian automotive and auto-parts cluster	• Public action
Human Resource and Skill Development	• Thai hard disk drive (HDD) cluster	• Public action
	• Malaysian electronics cluster	• Private-led collective action
	• Thai automotive and auto-parts cluster	• Public-private partnership led by industry association
Upgrading Towards Advanced Technology and Higher Quality and Standards	• Taiwanese semiconductor cluster	• Public-private partnership through specialised research institute
	• Thai orchid cluster	• Public-private partnership driven by private local network

Source: Summarised from interviews of key persons (see details of case studies on CD-ROM)

This study initially identified four plausible institutional modalities that clusters might apply to handle their competitive challenges: public action, private joint action, collective action through a trade association and public-private partnership (see detailed definitions in chapter 2 and appendix 3). The case studies showed, however, that government involvement appears in every cluster, albeit in different degrees. The private joint action modality was thus not found in any of the cluster cases.

The institutional modalities that the seven clusters in this study applied can be more specifically defined. These were public action, private-led collective action, collective action through an industry association and public-private partnership. Moreover, the institutional modality of public-private partnership (PPP) can be further differentiated based on the key institution that drives the actions in the partnership: PPP led by

an industry association, PPP through a specialised research institute and PPP driven by a private local network.

This study found that though the clusters face similar competitive challenges, they might employ different institutional modalities to overcome them. This is perhaps best seen among the clusters facing the challenges of market expansion/international competition and human resource and skill development. The Taiwanese orchid cluster and the Malaysian automotive and auto-parts cluster both confront the challenge of market expansion and intense international competition. Nevertheless, Taiwan's orchid cluster applied the institutional modality of collective action through industry associations, while the Malaysian automotive and auto-parts cluster chose the public action modality to deal with this challenge.

Similarly, facing the same competitive challenge of human resource and skill development, the Thai HDD cluster, the Malaysian electronics cluster and the Thai automotive and auto-parts cluster utilised different modalities to cope. While the Thai HDD cluster applied the public action modality, the Malaysian electronics cluster applied private-led collective action. The Thai automotive and auto-parts cluster, in contrast, employed public-private partnership led by industry associations. The cases of the HDD and the automotive and auto-parts cluster in Thailand reveal an interesting phenomenon that contradicts the Business System Concept. The analysis will return to this issue in section 6.4.2.

Only the Taiwanese semiconductor and the Thai orchid clusters applied the same institutional modality of public-private partnership to deal with the challenge of upgrading towards more advanced technology and higher quality and standards. However, the forms of partnership they applied differed. The public-private partnership modality used by the Taiwanese semiconductor cluster was geared by a specialised research institute, whereas in the Thai orchid cluster it was driven by a private local network.

The section below elaborates on the competitive challenges facing the seven clusters and how they were identified. This is followed by a discussion of the influence of cluster governance on the different institutional modalities of cluster intervention.

6.3   Competitive Challenges of the Clusters and the Mechanisms for Identifying the Challenges

The case studies show that the competitive challenges facing the clusters are driven by particular forces, both national and international. Each cluster may use different approaches to identify critical competitive challenges, depending on the relationships among key actors and their surrounding context.

6.3.1 Driving Forces of the Clusters' Competitive Challenges

The seven clusters in this study identified two forces driving competitive challenges: (1) forces from international organisations' rules and agreements and (2) forces stemming from the shifting of the global competition platform towards becoming more knowledge-based and innovation-oriented.

New Rules and Agreements of International Organisations

In today's globalised era, competition has become ever fiercer and forms of competition have dramatically changed. International organisations, like the WTO, and other organisations for regional cooperation play a growing role in global governance, especially in international trade. Under pressure by these, governments and firms in developing countries are being forced to quickly adapt and respond. The Taiwanese orchid cluster and the Malaysian automotive and auto-parts cluster reflect the acute effects of this pressure.

According to the interviews, the requirement to conform to rules set by international organisations is a key force driving the competitive challenge of market expansion and international competition of both clusters. The Taiwanese orchid cluster has faced increasing foreign competition and more sophisticated international standards since its WTO accession on 1 January 2002. Taiwan has to fulfil its commitments and abide by WTO rules, especially with regard to the opening of its own markets. As a result, Taiwan's agricultural sector has encountered many new challenges stemming from the strong competition of liberalised trade.

Under WTO rules, Taiwan committed itself to reduce its tariffs on agricultural products to 14.01% in the first year of its accession (from an average rate of 20.01% in 2001). Beyond this, tariffs on some 137 prod-

ucts that were under a tariff-rate quota (TRQ) had to be reduced by 2004. Taiwan's agricultural subsidies had to be cut by 20%, or some NT\$3.5 billion, and non-tariff protection on 41 agricultural products had to be eliminated by 2002.[1] These changing conditions of international trade caught the attention of Taiwanese orchid farmers, who quickly realised that they would not be able to overcome such a large challenge on their own.

Similarly, the WTO and ASEAN Free Trade Area (AFTA) agreements are key forces driving the Malaysian automotive and auto-parts cluster. Under the national car policy, the government continuously implemented protectionist policies towards this industry. Yet these policies are against the trade liberalisation rules set by the WTO and AFTA. While Thailand, a neighbouring country to Malaysia, has already completely abolished the local content requirement and other protectionist measures for the automotive and auto-parts industry, in accordance with AFTA and the WTO, Malaysia kept a high degree of protection. Malaysia was nonetheless obliged to reduce its protective measures, e.g. to phase out its local content requirement for automotive production by 1 January 2005 (Siew-Yean 2008). This situation has impinged on the local auto-parts firms in Malaysia that have enjoyed preferential treatment and protection for over two decades.

Changing Platform of Global Competition towards a More Knowledge-Based and Innovation-Oriented One

Nowadays, a new competition platform is emerging. Competing based on low cost is no longer likely to sustain a firm's competitiveness. Firms must adopt a strategy to accelerate knowledge creation and innovation in order to uplift their value chain towards higher value-added activities. Ability to create knowledge and innovation has thus become a significant factor in enhancing competitiveness in every industry (Boschma and ter Wal 2005, Camagni and Capello 2000, M. Caniëls and H.A. Romijn 2003, Rasiah 2003b). Human capital is a prime asset for generating innovation and knowledge. To a large extent, it is this driving force that has led to the challenges of upgrading human resources and advancing technology and the quality and standards of clusters.

The Thai HDD cluster, the Malaysian electronics cluster and the Thai automotive and auto-parts cluster are somewhat stuck in addressing these challenges. The electronics-related and automotive industries in Thailand and Malaysia are highly technology-intensive and very reliant

on foreign technology transfer. However, they are no longer cost-competitive locations for these foreign MNCs. To maintain or enhance their competitive position against lower cost countries like China, India and Vietnam, which are increasingly attractive to foreign MNCs, a key strategy of Thailand and Malaysia has been to upgrade their human resource base. Local firms in these three clusters, in fact, are now capable using production technologies at a satisfactory level for MNCs. However, as technologies in these industries are changing rapidly, local firms are under pressure to continue to upgrade their human resources to absorb and make use of ever more advanced technologies from the MNCs, or even to create innovative technologies themselves.

Presently, many leading foreign MNCs in the automotive industry, e.g. Toyota, Honda and Denso, are shifting their advanced activities in automotive design and R&D to Thailand. This is also happening in the Thai HDD cluster. The leading foreign MNCs, i.e. Seagate and Western Digital, aim to invest there in upstream activities, e.g. media and wafer activities, which require more sophisticated technologies. However, according to the interviews, they are being obstructed by inadequacy, both in terms of quantity and quality, of human resources with specialised skills in these technologies. This has forced Thailand to become more active in preparing an advanced skilled workforce to serve this shift in MNC activities and to build a strong base for supporting higher value-added activities within local firms. Also, a key challenge facing the Malaysian electronics cluster is the lack of a highly skilled workforce. Malaysia still lacks a critical mass of skilled workers to support intensive R&D by foreign electronics MNCs, which would like to locate design centres and advanced functions in Malaysia (Rasiah 2003b).

The Taiwanese semiconductor cluster, in contrast, is being confronted by the need to upgrade their technological capabilities to more advanced levels. Taiwan is now widely recognised as a world leader in the semiconductor industry, and it also a major investor in the industry at many locations worldwide. Nevertheless, to maintain its competitive position, Taiwanese firms are under pressure to keep upgrading their technological capabilities.

The Thai orchid cluster faces pressure both from more sophisticated international standards and from the changing platform of global competition. These forces have pushed the Thai orchid cluster to address the challenge of upgrading product quality and standards. This upgrading

will be key to increasing value-added and achieving a more sustainable competitive position in world markets.

In sum, the seven clusters in this study face major international forces. Under the new global rules set by international organisations and with the global competition platform shifting towards one which is based on innovation and knowledge creation, clusters are confronting ever more sophisticated challenges. These require a well-designed institutional modality to cope.

6.3.2 Roles of Each Cluster Actor in Identifying Competitive Challenges

The mechanism to identify competitive challenges in each the seven clusters basically involves three parties, namely, the government, firms (usually foreign MNCs or large local firms), and trade associations. Each actor plays a different role. Some might play a leading role, while others perform a coordinating/facilitating role or cooperative/supportive role. Table 6.2 summarises the role of each actor in identifying competitive challenges facing the cluster.

The *leading actor* strategically initiates forums or platforms for all related parties to discuss critical competitive issues confronting the cluster and to gear the direction and process of such discussions. The *coordinating or facilitating actor* usually responds to initiatives of the leading actor by helping the lead actor to coordinate or organise related activities to achieve the goals of the initiative. Actors playing a *cooperative or supporting* role cooperate with the leading actor and other actors only in activities that they find interesting or beneficial for them.

Table 6.2 shows that in all clusters, except the Taiwanese orchid cluster, the government takes the lead in identification of competitive challenges facing the clusters. The government may utilise either an existing public mechanism or other semi-governmental/government-supported mechanisms to carry out this task. The different dominant actors in cluster governance are an important factor in bringing about the distinct mechanisms of identifying competitive challenges in the clusters. The actor that has control over key resources in the cluster is likely to directly or indirectly dominate these mechanisms and processes.

Table 6.2
Main Roles of Each Cluster Actor
in Identifying Competitive Challenges of the Clusters

Cluster	Leading Roles	Coordinating/ Facilitating Roles	Cooperative/ Supportive Roles
Thai hard disk drive (HDD) cluster	Government (Hard Disk Drive Institute (HDDI)/NECTEC)	Government (HDDI/NECTEC)	• Foreign MNCs
Malaysian electronics cluster	Government (MITI)	Government (MITI/MIDA)	• Industry association (MAEI) • Foreign MNCs
Taiwanese semiconductor cluster	Government (ITRI)	Industry association (TSIA)	Local leading firms
Thai automotive and auto-parts cluster	Government (TAI/Ministry of Industry)	Industry associations (TAPMA/TAIA)	• Industry associations (TAPMA/TAIA) • Foreign MNCs
Malaysian automotive and auto-parts cluster	Government (MITI)	Industry association (MAA)	• Industry association (MAA) • Local leading firms
Thai orchid cluster	Government (DOAE)	• Government (DOAE) • Local farmers' network	• Industry associations (TOEA, TOGEA) • Local farmers' network
Taiwanese orchid cluster	Industry associations (TFDA, TFEA, TOGA, TPA)	Industry associations (TFDA, TFEA, TOGA, TPA)	• Government (COA) • Local farmers/firms

Source: Summarised from the seven case studies (see more details on CD-ROM)

In the Taiwanese semiconductor cluster, the specialised research institute designated by the government has the leading role in this regard. Similarly, in the Thai HDD and Thai automotive and auto-parts clusters,

the government created new government-supported agencies to perform this role. For the Malaysian automotive and auto-parts and electronics clusters and the Thai orchid cluster, the government uses existing governmental agencies to initiate discussions among pertinent parties to identify cluster challenges.

Unlike the other clusters, the lead agency in the Taiwanese orchid cluster is not the government, but industry associations. The government has supported and empowered these associations to actively play this role by providing them with a budget and autonomy to manage key resources. Normally, each association organises monthly and annual meetings of members to identify key problems that they confront. Urgent problems that require immediate support are immediately raised to the government. Longer term problems are usually raised at the annual association meetings or at the regular meetings of related associations, to find solutions together. There is one central association actively involved in collecting and analysing data and information related to domestic and international markets to support planning for the orchid industry (see case study 7 on CD-ROM).

In Malaysia's electronics cluster and automotive and auto-parts cluster, government has played a pivotal role in identifying competitive challenges. By organising the 'Annual Industry Dialogue' it has provided a forum for industries to share their concerns or problems with government and to bring about close collaboration between the public and private sectors. Local leading firms, foreign MNCs, industry associations and related public organisations are invited to participate in the Dialogue. In addition, the concerned government agencies regularly organise meetings with key industries, such as the electronics industry or the automotive and auto-parts industry, to discuss strategies and actions to deal with specific issues. Industry meetings usually take the form of a working group or small committee (see case study 3 and 5 on CD-ROM).

In the Thai HDD cluster, identification of critical issues is done by a government-supported agency, which has also set up a joint public-private committee, called 'the Hard Disk Drive Cluster Committee', to serve as a core mechanism or platform to manage key common issues and to steer the development direction of the cluster. On top of this, the HDD Cluster Centre was established under NECTEC to drive the HDD development action plan and projects (see case study 1 on CD-ROM).

For the Thai automotive and auto-parts cluster, the process and mechanism for identifying competitive challenges facing the industry is public-private dialogue, but led by an industry-specialised agency under supervision of the government. Here, industry associations play the role of coordinator/facilitator, compiling key problems/issues arising at their internal meetings. They then raise the issues to government through the specialised agency. However, this agency still has limitations in terms of capabilities and resources to pursue this task effectively, due to the discontinuity of government policies (see case study 4 on CD-ROM).

Similarly, in the semiconductor cluster in Taiwan, the government-supported research institute has the lead in identifying critical issues facing the cluster. Leading firms, industry associations and related agencies are always invited to participate in the drafting of a technology development plan, which is organised by this research institute annually to make proposals for government support. Local leading semiconductor firms can propose projects which need support from the government either through the industry association or via this specialised research institute (see case study 2 on CD-ROM).

Note that the role of the industry association in the Taiwanese semiconductor cluster is, to some extent, similar to that in the Thai automotive and auto-parts cluster and the Taiwanese orchid cluster. In each of these cases the industry association represents the needs and interests of firms in the cluster. However, the Taiwanese semiconductor cluster industry association is less active in driving solutions for the cluster's challenges than the associations in the other clusters. Perhaps this is because the specialised research institute has established its strengths through government support and long-term relations with firms, so that firms have high trust in the effectiveness of this mechanism to drive collective action for the cluster.

Regarding the Thai orchid cluster, the government, via the Department of Agricultural Extension (DOAE), has the lead in identifying critical issues facing the cluster. The National Orchid Committee was set up and the National Orchid Industry Development Plan was endorsed in 2007. However, this process is not constantly or continuously executed, unlike the planning process in the semiconductor cluster. Rather, here it occurs *ad hoc* in line with political urges. The National Orchid Board has as yet made little progress due to the changeable political situation in Thailand. Thus, it can be said that there is no systematic mechanism to

take the lead in identification of competitive challenges in the Thai or-
chid cluster (see case study 6 on CD-ROM).

In many developing countries, government has a key role in creating a
platform for enabling active dialogue among parties involved in a cluster,
by either direct or indirect means. However, the key is to encourage ac-
tive collaboration among all parties concerned to effectively respond to
the competitive challenges identified. The next section elaborates on this
issue.

6.4   Relationships between Cluster Governance and the Institutional Modality of Cluster Intervention

As discussed in chapters 4 and 5, actors in a cluster are interdependent.
An individual actor alone might be unable to make a structural change or
to intervene in cluster development, because other actors might not have
the same vision or interest and hence move in directions other than the
change desired by the one (Chang 2003). Structural change in clusters
requires coordinated or collective mechanisms or institutions, involving
more than one concerned party. The difficulty is to make the relevant
actors aware of all possible alternatives for change and of the goal of the
desired change. This requires an agency to act as a pivot of change or
intervention in the cluster development process.

This study's analysis of the institutional modality of cluster interven-
tion focuses on four basic questions regarding the roles of key cluster
actors: (1) Who initiates the intervention? (2) Who drives implementa-
tion or takes the lead in such initiatives? (3) Who finances implementa-
tion? (4) Who has awareness of ownership in cluster development? Table
6.3 presents an overall picture of relationships between the competitive
challenges, cluster governance and the institutional modalities of cluster
intervention applied in the seven clusters.

Table 6.3
Cluster Governance and Institutional Modality of Cluster Intervention

Key Identified Competitive Challenge	Cluster	Type of Cluster Governance	Institutional Modality of Cluster Intervention	Initiator of Intervention	Driver of Implementation	Sponsor/Financial Supporter of Implementation	Awareness of Ownership in Cluster Development
Market Expansion/ Intense International Competition	• Taiwanese orchid	• Local intermediary institution-coordinated (local industry association-coordinated)	• Collective action through industry associations	• Industry associations (TFDA, TFEA, TOGA, TPA)	• Industry associations (TFDA, TFEA, TOGA, TPA)	• Government (COA)	• Industry associations
	• Malaysian automotive and auto-parts	• State-controlled	• Public action	• Government (MITI)	• Government (MITI)	• Mainly government • Co-financed by local leading firms in some projects	• Government (MITI) • Local leading companies
Human Resource & Skill Development	• Thai hard disk drive (HDD)	• MNC-dominated and government-coordinated	• Public action	• Government (HDD Cluster Centre/NECTEC)	• Government (HDD Cluster Centre/NECTEC)	• Mainly government • Co-financed by foreign MNCs in some projects	• Government (HDD Cluster Centre/NECTEC)
	• Malaysian electronics	• MNC-dominated and government-coordinated	• Private-led collective action	• Initially by government (PDC) and foreign MNCs	• PSDC with the collective effort of foreign MNCs and local leading firms	• Mostly private sector • Government sponsors some projects	• PSDC and private firms
	• Thai automotive and auto-parts	• MNC-dominated and government-coordinated	• Public-private partnership led by industry association	• Government (TAI) and industry associations	• Industrial associations (TAPMA/TAIA)	• Co-financed by foreign MNCs, some local firms and government	• Industry associations (TAPMA/TAIA) • TAI
Upgrading Towards Advanced Technology and Higher Quality and Standards	• Taiwanese semi-conductor	• Local intermediary institution-coordinated (specialised research institute-geared)	• Public-private partnership through specialised research institute	• Government (MOEA) • Specialised institute (ITRI)	• ITRI in collaboration with industrial associations (TSIA) and universities	• Government (MOEA) and ITRI • Co-financed by local leading firms in some projects	• Specialised institute (ITRI) • TSIA
	• Thai orchid	• Local intermediary institution-coordinated (emerging informal network-catalysed)	• Public-private partnership driven by private local network	• Local orchid farmer network	• Local orchid farmer network with some support from DOEA	• Co-financed by local orchid farmers, related government agencies and universities	• Local orchid farmer network

Source: Summarised from interviews with key persons in the seven clusters (see details in the case studies on CD-ROM)

Table 6.3 overviews the effect of cluster governance on the clusters'
selected institutional modality of cluster intervention. A dominant actor
in governing clusters tends to influence decisions on the institutional
modality. For example, the state-governed cluster applied public action
to manage its competitive challenge. Since responses to competitive chal-
lenges are critical to sustainability and survival of the clusters, an actor
who has control over resources and dominant power in shaping relation-
ships among key actors in the clusters is likely to take action to influence
decision-making to respond to competitive challenges. The discussion in
this section focuses on how clusters deal with the challenges of market
expansion and international competition, human resource and skill de-
velopment, and upgrading towards more advanced technology and
higher quality and standards.

Interestingly, even though they have similar cluster governance and
face a similar challenge, the Thai HDD cluster, the Thai automotive and
auto-parts cluster, and the Malaysian electronics cluster have applied dif-
ferent institutional modalities to cope. This implies that beyond cluster
governance, other factors might impact the selection of the institutional
modality of cluster intervention. The analysis in this respect will be dis-
cussed in sections 6.4.1, 6.4.2 and 6.4.3.

6.4.1 The Challenge of Market Expansion and International Competition

Facing a similar challenge to expand market share and compete interna-
tionally, the Taiwanese orchid cluster and the Malaysian automotive and
auto-parts cluster have applied a different institutional modality to cope.
The Taiwanese orchid cluster applied the institutional modality of 'col-
lective action through industry association', while the Malaysian automo-
tive cluster employed the 'public action' institutional modality. Evidence
from both cases shows the important role played by government in set-
ting up an institution or mechanism to deal with the challenge, albeit
with different forms of organisation.

As discussed in chapter 5, industry associations have great influence
in governance of the orchid cluster in Taiwan (this cluster was classified
as having 'local industry association-coordinated governance'). Unsur-
prisingly then, industry associations play a pivotal role in handling the
competitive challenges facing the cluster. Based on the strong social
networks, the orchid industry associations work closely to carry out col-

lective actions for their respective cluster. Beyond representing the needs of members, each industry association actively cooperates with other associations to serve the overall requirements of the industry. This was observed during the interviews in that all of the industry associations identified the same critical challenges for their competitiveness. To some extent, this implies that they have shared goals in developing the cluster.

Evidence from this cluster reveals that industry associations have awareness of ownership in cluster development and play a leading role in initiating and driving actions to cope with the critical challenges the cluster faces. Besides cooperating in drafting the annual orchid development plan with the Council of Agriculture (COA), the associations share responsibility in monitoring each project in the development plan. When faced with immediate or unanticipated problems, the relevant associations organise an *ad hoc* meeting to find solutions together. However, the government, the COA in particular, is a main actor empowering these associations by providing financial and policy support for their activities and organisational management.

Besides providing specific support directly to the industry associations, the Taiwanese government also creates a sound business environment to enable development and cooperation in the orchid cluster. To encourage local agricultural entrepreneurs to speed up the structural adjustment towards more sustainable development in response to the challenges accompanying the WTO ascension, in 2004 the government declared phalaenopsis (the top orchid product of Taiwan) as the flagship agricultural product. This product was set to drive the floriculture industry towards making Taiwan the 'World-Class Flower Island'.[2] In line with this desired goal, various policies were implemented to encourage and support the orchid cluster to become more competitive internationally.

One policy was establishment of the Taiwan Orchid Plantation (TOP) with a budget of NT$2.06 billion (approximately US$62.7 million). TOP was established by the Tainan County Government in 2004 with the support of the central government. Its first phase was finished in 2005. TOP was designed to be the bio-tech park for the Taiwanese orchid cluster and to provide support to orchid entrepreneurs in planting, R&D, logistics, marketing and trade shows (see case study 7 on CD-ROM). Moreover, since 2005 the government has allocated funding for the Taiwan International Flower Show and Orchid Show every year at TOP and in Taipei.

Compared to Taiwan's orchid case, Malaysia's government provides greater support, in terms of funds and policy, to its automotive and auto-parts cluster to help it to overcome the challenge of international competition emanating from the AFTA and WTO agreements. The Malaysian state strongly dominates the governance of this cluster (as discussed in chapter 5). Automotive firms and industry associations there are therefore less motivated to become active in initiating or undertaking collective action in response to the challenge of international competition. Having long been reliant upon government protection, local auto-parts firms are not ready to compete globally and still lobby the government to continue protecting them.[3] With strong determination to build the national car industry to provide for more balanced economic prosperity among ethnic groups, the government is highly aware of its ownership in driving cluster development. It even attempted to extend its timeframe to comply with the WTO and AFTA agreements to liberalise the sector. For example, it requested extending the tariff reduction scheme for automotive products to 0-5% until 2008 (Fuangkajonsak 2006).[4]

In fact, AFTA requires the Malaysian automotive industry to be more open to investment by automotive manufacturers and competition from other ASEAN countries. Though Malaysia has gradually reduced its import tariffs under the WTO and AFTA agreements and has enforced new excise tax rates since 1 January 2004, the national car projects are still protected by preferential tax privileges. Proton and Perodua, Malaysia's national car companies, still enjoy an excise tax rebate of 50% and import duty on components of merely 25%. This government policy has reduced the likelihood of the cluster expanding its markets and overcoming international competition. Although both government and private firms in Malaysia are aware of the challenge of increasing international competitiveness and market expansion, there is as yet no specific mechanism to respond. Most action is taken by public agencies, through the setting of rules and regulations and implementing development plans.

In sum, the Taiwanese orchid cluster and the Malaysian automotive and auto-parts cluster case studies highlight the significant role of the state in both clusters in coping with the challenge of the changing platform of global competition, albeit by different approaches. While the Taiwanese government plays a supportive role, the Malaysian government performs a directive role. The Taiwanese government mainly creates an enabling business environment and strengthens industry associa-

tions to support the orchid cluster in overcoming the challenge. This has allowed orchid firms and farmers to exploit their entrepreneurship more effectively. The state's role in the Malaysian automotive and auto-parts cluster is highly concentrated on achieving the national goal of social reform. This has led the state to play a dominant role in business activities and to protect local firms. The aim to overcome the key challenge facing the cluster is, however, bypassed or diluted.

6.4.2   The Challenge of Human Resource and Skill Development

Three of the study clusters face a similar challenge of human resource and skill development: Thailand's HDD and automotive and auto-parts clusters and the electronics cluster in Malaysia. However, to respond each cluster has applied a different institutional modality, reflecting the influence of its distinct brand of cluster governance.

The Malaysian electronics cluster in Penang is prominent, compared to counterpart clusters in other regions of Malaysia, with regard to the establishment of a systemic mechanism to deal with the challenge of human resource and skill development. The institutional modality applied by the Penang electronics cluster can be described as 'private-led collective action'. In the past, it was the government that initiated a mechanism to deal with the critical issue of skill shortages. In 1989, the Penang Development Corporation (PDC) attempted to gain the participation and collaboration of leading foreign electronics MNCs in Penang and the University Sains Malaysia to set up the Penang Skill Development Centre (PSDC). The PSDC is the first industry-led training centre in Malaysia and nowadays is a core agency linking with electronics firms in Penang to identify skill needs, to design training courses and to provide skill training courses that suit industry needs. Presently, PSDC is fully executed by a professional management team and led by the industry. It has a key role in filling in the skill gap of the electronics industry in Penang and in cooperating with local government and academic institutions to enhance human resource development for the industry. PSDC has initiated and conducted several training projects to support the growth of the Penang electronics cluster. With regard to financial support, at present the PSDC is self-sustained in financing its operations, though it still receives in-kind and cash support from the government through some development projects (see case study 3 on CD-ROM).

In contrast, the Thai HDD cluster has applied the 'public action' institutional modality in dealing with this challenge. In 2004, NECTEC, a semi-governmental agency, was mandated to stimulate development of the HDD cluster. The HDD Cluster Centre was set up under NECTEC to provide a core coordinating mechanism for driving the HDD Cluster Development Plan. As human resource development is one of the plan's key strategies, the Centre made efforts to link the four major foreign HDD makers and universities to cooperatively identify key training areas and develop specialised training courses accordingly. The activities and operations of this Centre are fully financed by the government through NECTEC.

However, unlike the PSDC, the HDD Cluster Centre remains nascent and more limited in terms of budget and personnel to carry out cluster development activities. This situation has certainly affected progress in driving HDD cluster development activities (see case study 1 on CD-ROM). Unlike NECTEC, PSDC was deliberately established to focus specifically on skill development, whereas the HDD Cluster Centre was formed to handle all development issues facing the cluster. This allowed PSDC ample scope to develop a specialisation in skill development.

In contrast, the Thai automotive and auto-parts cluster has applied the institutional modality of 'public-private partnership led by industry associations' to tackle this challenge. The government, via its Ministry of Industry, set up a specialised institute for developing the automotive industry, i.e. the Thailand Automotive Institute (TAI). However, due to organisational constraints, especially regarding personnel and budget, TAI has played a more supporting and coordinating role than that of the lead agency in driving collective actions of this cluster. Consequently, in recent years industry associations in this cluster have gradually increased their part in initiating and leading collective activities, particularly in response to the challenge of human resource and skill development. The Thai Auto-Parts Manufacturers Association (TAPMA) is active in coordinating with TAI and other relevant public and academic organisations to initiate projects to upgrade the skills of Thai auto-parts firms, such as the Automotive Human Resource Development Project (AHRDP), the Super Blue Collar Training Course and the Productivity Training Programme. Moreover, TAPMA is now committed to establishing longer term cooperation with the Department of Industrial Promotion, partici-

pating in drafting an annual plan for human resource development for Thai auto-parts firms (see case study 4 on CD-ROM).

The interesting point regarding the three clusters discussed above is why each chose a different institutional modality, even though they all have the same type of cluster governance. Furthermore, all of the clusters are in a technology-driven industry and have weak local firms that mostly rely upon foreign MNCs. These MNCs, however, find it difficult to cooperate with one another in collective actions for at least three reasons. *Firstly*, in most cases they have enough resources to handle their competitive challenges by themselves. For particular issues that are beyond their control (mostly related to the public sector), they prefer to work autonomously with government or universities, rather than with other companies, to protect their technology secrets. *Secondly*, MNCs have direct access to influence government policy. *Finally*, if an MNC experiences many obstacles in a host country, it might consider moving manufacturing plants elsewhere. Hence, investing in the long-term development of host countries might not seem a worthwhile solution.

With this in mind, a government might choose to take action to respond to a challenge facing a cluster, as seen in the Thai HDD cluster. However, even there, foreign MNCs remain highly influential in policy decisions related to the cluster, through the mechanism erected by government. A foreign MNC may decide to participate in a project of the HDD Cluster Centre only when the government also contributes and when the concerned MNC perceives that the effort is also beneficial to the company. Without the government acting as an intermediary for collaboration, it is hard to see joint efforts arising between foreign MNCs and public-private partnerships. Actually, government intervention in nascent clusters is common in developing countries. But, the key is that the government should establish trust among firms and strengthen a mechanism through which firms can work together in the long run, in addition to working with government. The Malaysian electronics cluster is progressing better in this respect. In this cluster, government action was initially implemented to tackle the competitive challenges facing the cluster. However, it coordinated with local universities and encouraged foreign MNCs to participate directly and take the lead through PSDC to address the challenge of human resource development.

The dominant power of foreign MNCs in handling the competitive challenge is seen in the Thai automotive and auto-parts cluster as well.

Here, the challenge is being addressed through industry associations, which are dominated by foreign MNCs either directly or indirectly. So, it can be stated that the institutional modality of 'public-private partnership led by an industry association' that is being used by the Thai automotive and auto-parts cluster is somehow influenced by foreign MNCs.

To conclude, the analysis of how the three clusters handle the competitive challenge of human resource and skill development support this chapter's key proposition that clusters having similar governance and contexts might apply different institutional modalities of cluster intervention. This contradicts the Business System Concept. According to this concept, business systems in each nation are likely to be similar as they function under similar institutional arrangements. Hence, the forms of economic coordination found among businesses operating under similar business systems and national contexts will tend to be alike. However, the two technology-driven clusters in Thailand, which are operating in the same national context and have similar cluster governance, applied different institutional modalities to overcome the same challenge. This phenomenon might be due to differences in the interplay between the roles of the government and the structure of the clusters. Since there are just a few local firms in the structure of the Thai HDD cluster, the government must take the lead to entice foreign MNCs to participate in developing the cluster. However, there are many more local firms involved in the Malaysian electronics cluster and in the Thai automotive and auto-parts cluster, so in these cases, government action to encourage the private sector to take the lead in developing the clusters can be more effective.

6.4.3 The Challenge of Upgrading towards Advanced Technology and High Quality and Standards

The case studies show the Taiwanese semiconductor and the Thai orchid cluster to be facing the same challenge of upgrading towards more advanced technology and higher quality and standards. Overall, the governance of the two clusters is geared by a local intermediary institution, and they apply the same institutional modality of 'public-private partnership' in dealing with this key challenge. Nevertheless, the dominant actors in the governance of these two clusters and the institutional modalities they apply are different. In the Taiwanese semiconductor cluster, the specialised research institute, ITRI, performs a leading role in initiating,

coordinating and driving R&D projects that serve the needs of semiconductor firms. For decades, ITRI has had the private sector's trust and recognition of its strength in technology and R&D. Hence, it is influential in guiding government and firm actions to respond to the competitive challenge facing the cluster.

As the development of the Taiwanese semiconductor cluster reached maturity and local firms gained international success, ITRI shifted its role towards that of a facilitator and supporter. When the cluster perceived the current competitive challenge of technology upgrading, ITRI coordinated private firms, universities, government and industry associations to work together to find solutions. ITRI is committed to developing the semiconductor cluster; and the industry association, TSIA, shares this goal. TSIA actively promotes R&D in semiconductor firms. It has set up working committees to help identify training and R&D requirements and to work on numerous R&D projects with ITRI and universities for strengthening local firms. However, in terms of finance, ITRI still relies on the government for about half of its revenue. Hence, it can be stated that the Taiwanese semiconductor cluster has applied the institutional modality of public-private partnership led by a research institute with government support (see case study 2 on CD-ROM).

Similarly, the Thai orchid cluster has employed the institutional modality of public-private partnership. However, the key actor playing a leading role in this cluster is a small group of local orchid farmers. Most orchid growers in Thailand are SMEs with limited access to government support, especially in terms of technological upgrading and financing. Due to the lack of strong state support in the past, Thai orchid growers have had to find their own solutions to their competitive challenges. The orchid cluster leader became a centre of coordination and a catalyst of cluster development when the cluster was confronted with the challenge of Taiwanese entrance. At first, he actively encouraged orchid farmers to work together to upgrade the quality and standard of their orchids. Since this took a long time and great effort, most growers were at first reluctant to follow this initiative. The cluster leader then coordinated with Thai exporters and an importer in the US to ensure that there would be markets for the high-quality orchids. Afterwards, many orchid growers began to believe in the strategy. The network of orchid growers committed itself to apply this new approach and grow high quality orchids.

Together with his small network, the cluster leader has persuaded universities and research institutes near the plantation areas to help orchid farmers with R&D to upgrade the quality of their products. Many joint industry-university/research institute projects funded by co-investment have thus gotten under way, and the results of some have already been applied on many orchid farms (e.g. results on insect control and a warning system using agrotonic technology for farm productivity improvement). Some projects are still ongoing, for example, on logistics improvements (see case study 6 on CD-ROM).

The local network of orchid farmers led by the cluster leader also stimulates and coordinates with national and provincial government agencies to support the cluster. At present, the government is more involved in orchid cluster development than in the past. Recently, the Cabinet endorsed the National Orchid Development Plan proposed by the National Orchid Board with a budget allocation of 625.5 million baht (approximately US$18.7 million) for three consecutive years (2008-10). This public-private partnership led by a local network of orchid growers aims to address the competitive challenge facing the cluster. The government and academic sectors play the role of supporters in cluster development. However, no strong awareness of ownership and commitment to cluster development has as yet taken root in the government and academic sectors. This is the key challenge for ensuring the sustainability of this local network.

In sum, the two clusters that face the challenge of upgrading towards more advanced technology and higher quality and standards share the same governance type and apply the same institutional modality to tackle the challenge, though via different types of organisations. The interesting point here is that the mechanisms that have taken the lead in finding solutions to the challenge were initiated by different approaches. The mechanism for cluster coordination in the Taiwanese semiconductor cluster was fully initiated by the government, while that of the Thai orchid cluster was formed by the private sector. This aspect led to differences in awareness of ownership of cluster development among the key actors in these two clusters. In the Taiwanese semiconductor cluster, the specialised research institute and government seem to be most aware of their role in driving and supporting cluster development initiatives, so they collaborate closely. In contrast, in the Thai orchid cluster, government's awareness of ownership of orchid cluster development is missing.

This is one obstacle, among others, to strengthening the role of the local private network to drive cluster initiatives more effectively.

6.5   Concluding Remarks

This chapter discussed how clusters deal with their competitive challenges, or rather, the institutional modality of cluster intervention. The key proposition discussed was that clusters having a similar form of governance and operating in the same sector may apply different institutional modalities to overcome a particular competitive challenge. The analysis revealed three critical challenges identified by the seven clusters: (1) market expansion and international competition, (2) human resource and skill development and (3) upgrading towards more advanced technology and higher quality/standards. These challenges are driven by the new rules and agreements of international trade organisations and the changing platform of global competition towards one that is more knowledge-based and innovation-oriented.

Empirical evidence from the case studies proved the chapter's proposition to be true and revealed three interesting points. *First,* in most cases, the government plays a significant role in initiating a core mechanism for cluster coordination and influences the solutions to the competitive challenges faced by clusters, either directly or indirectly. *Second,* the Thai HDD and automotive and auto-parts clusters and the Malaysian electronics cluster face a similar competitive challenge of human resource and skill development, but they apply different institutional modalities to cope with it. One possible reason is the differences in the interplay between the roles of the government and the structure of clusters. The cluster structure affects the actions taken by government in managing the challenges facing clusters. In a cluster that is structured as a small number of local private firms that have difficulty uniting to conduct collective actions, a government is likely to take a leading role. Meanwhile, in a cluster comprised of many local firms and where some private collective agencies – like industry associations – are already in place, government is more likely to encourage the private sector to take the lead in addressing challenges.

Third, the different institutional modalities of cluster intervention applied by the HDD cluster and the automotive and auto-parts cluster in Thailand reveals that even clusters operating under a similar business system or national context do not necessarily behave or interact alike in

response to a challenge. This contradicts expectations of the Business System Concept. These distinct responses are perhaps due to the influence of the different industry-specific contexts of these two clusters. HDD technologies are more rapidly changing than those of the automotive cluster. Moreover, the supply chain of the automotive cluster is longer and involves a larger number of local suppliers than does the HDD cluster. This allows wider scope for the emergence of industry associations of local auto-suppliers. The auto-parts industry association then becomes a core agency for cluster coordination. In contrast, there is no local association specifically representing local HDD parts suppliers. Hence, the government has to take the lead in coordinating collective activities in this cluster.

However, the essence of implementing an institutional modality of cluster intervention is not only who takes lead. It is also about how to encourage active and committed participation of all relevant actors in concerted efforts that are effective in overcoming competitive challenges. This issue is discussed in chapter 7.

Notes

[1] Source: Taiwan's Council of Agriculture (COA), Measures and Strategies in Response to the WTO Impact on Taiwan's Agriculture, from the website: www.coa.gov.tw.

[2] Source: Central News Agency, March 22, 2009

[3] Proton Vendors Association (PVA) proposed formulation of a national automotive policy that would maintain many of the protectionist policies for local part suppliers, e.g. (i) continuing the rebate/discount on the excise duty for auto-parts and components produced by Malaysian vendors and (ii) providing more financial support to local firms.

[4] In fact, according to AFTA agreement, Malaysia was supposed to cut off tariff rate on all automotive products to 0-5 percent by 2003. Nevertheless, the government of Malaysia requested to prolong the action to bring 218 automotive tariff rates under the tariff reduction scheme of AFTA until 2005. Moreover, Malaysia was granted to extend the reduction of AFTA tariff rates on automotive products to 0-5 percent until 2008 (Fuangkajonsak 2006).

7 Effectiveness of the Institutional Modality of Cluster Intervention

7.1   Introduction

This chapter looks into the effectiveness of the institutional modalities of cluster intervention, that is, of the mechanisms that clusters use to respond to their competitive challenges. It should be noted at the onset that this study views cluster development as a 'process' not as a 'project'. It therefore concentrates on investigating the effectiveness of the process of cluster intervention, to learn about pitfalls and possible missing elements in cluster development processes. This is unlike a focus on the end-results/outcomes of cluster policy as a whole, which are usually assessed using quantitative data (e.g. productivity, export growth, number of newly established firms, employment and value-added). In other words, this study does not intend to evaluate effectiveness in terms of performance but focuses on process effectiveness.

There are two main reasons for this focus. *Firstly*, it is unwieldy to compare the performance of interventions in clusters that face different types of challenges, have dissimilar industrial natures and operate in different contexts – like comparing apples and pears. According to Rodrik

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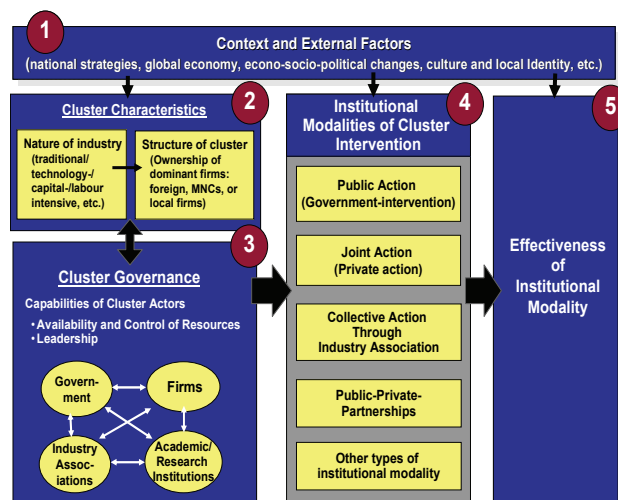
(2007), specifying the right process of industrial policy is more important than specifying the outcome.

Secondly, all of the competitive challenges identified by the seven clusters in this study are complex and require a long period of time to produce observable results. Thus, present outcomes and results are more likely to reflect past policy actions and institutional modalities than the institutional modality being used at present. This chapter's focus on the process effectiveness of the institutional modalities of cluster intervention will provide policymakers, particularly those in developing countries, with a greater understanding of the cluster-level learning process and thus contribute to further cluster policy development.

Likewise, this study does not propose to deeply evaluate which institutional modalities of cluster intervention are better than the others by using statistical testing methods or comprehensively designed sets of indicators. Rather, the aim is to discuss interesting dimensions of the effectiveness of institutional modalities in relation to the other elements in the analytical framework. Indeed, this study's analytical framework designates effectiveness of institutional modality as a key element in a holistic view on cluster policy. Yet future research could advance this line of study further by developing a comprehensive set of indicators to more deeply evaluate the effectiveness of institutional modalities of cluster intervention.

Focusing on effective processes by which to sustain long-term cluster development, the main proposition of this chapter is as follows: *An institutional modality is effective (1) when it creates or enhances processes for collective efforts among all related cluster actors to address a current critical challenge facing the cluster and (2) when it prepares a foundation for coping with future competitive challenges.* Nevertheless, it should be noted that ineffectiveness of an institutional modality does not necessarily signify a wrong choice or inappropriateness of interventions. Rather, it might be due to pitfalls in the process of implementing the intervention. This aspect is also incorporated in this chapter's analysis. Basic indicators have been compiled for analysing the effectiveness of institutional modalities. These are classified into two groups, further called 'elements', to avoid confusion with the comprehensive indicators usually perceived by policymakers.

The two groups of 'elements' for evaluating the effectiveness of institutional modalities of cluster intervention are (1) the practical prerequisite element and (2) the real commitment and effort of key cluster actors.

These two groups of elements are complementary. If either is lacking, an institutional modality that a cluster is using will come up short in achieving effectiveness (see also chapter 2, section 2.4.5).

1) *Practical prerequisite element.* This element is a crucial precondition for every cluster to successfully deal with a coordination problem. It includes three sub-elements:

- *Presence of a core mechanism/institution for long-term cluster cooperation and development.* Since a cluster involves many actors which are interdependent while having different interests and goals, the coordination problem always occurs in cluster development. Hence, in many clusters, a core coordinator emerges to connect all of the key actors to work together. This coordinator can take various forms: an agency, an organisation, a network or even an individual.

- *Ability to create a shared/common goal or development direction among key cluster actors.* As mentioned, clusters often suffer a coordination problem. To be successful in driving cluster development, it is necessary for most key parties in a cluster to have at least a shared/common goal or development direction. This gives cluster actors a basic common ground for co-development and complementary interaction to achieve collective actions. Information sharing/exchange is also essential. Among other things, mutual trust among cluster actors provides a foundation for intensive or deep information sharing/exchange in clusters.

- *Distribution of responsibilities and co-investment in solutions between the public and private sectors.* Solving critical challenges in a cluster cannot be accomplished by the efforts of one actor alone. It requires concerted effort among all concerned parties. In fact, tackling a single competitive challenge usually calls for many activities and actions, carried out by multiple actors. Willingness and clarity in responsibility sharing and co-investment among the actors demonstrates their degree of commitment to implementing solutions to the competitive challenges they face.

2) *Real commitment and effort of key actors in a cluster* includes two sub-elements:

- *Ability to play a catalytic role to create commitment or ownership of cluster actors.* Policy planning processes usually assign the organisation closest to a particular issue the lead in implementing the related policy. But, in real practice, the mandated organisation might not take its assigned role seriously or put insufficient effort into taking appropriate action. Hence, strong commitment and ownership of key organisations and cluster ac-

tors are critical for effective implementation of cluster policy interventions. An institutional modality of cluster intervention should be able to create commitment and a feeling of ownership among cluster actors to collectively drive cluster development forward.

  - Ability to create collaboration in evaluating projects and readjusting cluster strategies. Reviewing and evaluating cluster policy implementation is critical for readjusting strategies to make them better suited to the changing environment. Collaboration of key actors in evaluating cluster projects provides an effective check-and-balance system to ensure achievement of common goals and to reflect accountability of the concerned parties.

  The use of these sets of elements to examine the effectiveness of institutional modalities reveals some diversity in effectiveness in relation to cluster governance and cluster characteristics. Three conclusions can be drawn based upon the analysis. *Firstly*, the different degrees of effectiveness of institutional modality appear to be influenced by distinctions in business systems and sectoral conditions. *Secondly*, the characteristics of the core agency matter in efforts to effectively implement a specific institutional modality of cluster intervention. *Lastly*, the effectiveness of the institutional modality can be impacted by the complexity of the competitive challenge facing the cluster and by whether there is a missing role of particular actors in the cluster.

  The following sections provide a comparative analysis of the overall effectiveness of the institutional modalities applied by the clusters based on these five elements. The discussion then turns to the three conclusions mentioned above.

7.2   Overall Comparison of the Effectiveness of the Institutional Modality of Cluster Intervention

The institutional modalities used by six of the seven study clusters were found to be effective, at least to some extent, in response to a current competitive challenge. However, there were distinctions in degree of effectiveness. This study differentiates four levels of effectiveness of institutional modality of cluster intervention:

1) *'Effective'* refers to an institutional modality that was designed to manage multiple issues related to development of a particular cluster and presently functions well in dealing with the current specific competitive challenge facing that cluster. It also has the potential to address other types of competitive challenges in the long run.

2) *'Selectively effective'* refers to an institutional modality that was designed to handle merely one specific type of challenge and is presently functioning well in managing that challenge. However, it would seem difficult or unsuitable for use in addressing other types of cluster challenges.

3) *'Moderately effective'* refers to an institutional modality created to manage multiple facets of cluster development. It is now at least able to deal with a specific competitive challenge facing the cluster, but still has inadequate capability or requires improvements in many respects to be able to tackle the long-term competitive challenges facing the cluster.

4) *'Not effective'* means that an institutional modality that a cluster has used is presently failing to cope with or even to address a competitive challenge that the cluster faces, and it will likely be incapable of dealing with other types of or future challenges.

The analysis of the seven cases based on the two groups of elements mentioned in the previous section reveals that the institutional modalities of three clusters are considered 'effective', i.e. those of the two orchid clusters in Thailand and Taiwan and of the semiconductor cluster in Taiwan. The case exhibiting a 'selectively effective' institutional modality is the Malaysian electronics cluster. Its modality is effective only when used to manage the challenge of human resource and skill development. The modalities employed by the two clusters in Thailand, i.e. the automotive and auto-parts cluster and the HDD cluster, are effective at the 'moderate' level. Only the case of the Malaysian automotive and auto-parts cluster reflects an institutional modality that is 'not effective'. Table 7.1 summarises the key results of the analysis of all cluster case studies (see details in each case study on CD-ROM).

Table 7.1
Effectiveness of Institutional Modality of Cluster Intervention

Key Competitive Challenge	Clusters	Institutional Modality of Cluster Intervention	Effectiveness of Institutional Modality of Cluster Intervention		Elements for Analysing Effectiveness Institutional Modality of Cluster Intervention				
					Practical Prerequisites			Commitment and Real Effort of Key Actors	
			Current effective-ness	Improvement required for effectiveness in the long run	Presence of core institution/ mechanism for long-term development	Ability to create shared/common goals for solution or development direction among key cluster actors	Distribution of responsibilities and co-investment for solutions between the public and private sectors	Ability to play a catalytic role to create commitment and ownership of cluster actors	Ability to create collaboration in evaluating projects and readjusting cluster strategies
Market Expansion/ Intense International Competition	Taiwanese orchid	Collective action through trade/ industry associations	Effective	Need to be more self-reliant in terms of finance	• Yes (existing local associations)	• All related associations share common goal to overcome competitive challenges	• Still relies mainly on government financial support, both direct and indirect • Responsibility sharing happens among industrial associations and with other government agencies, e.g. COA, TOP	• Industrial associations link relevant actors to participate in common activities, e.g. international floriculture exhibitions • Government shows strong commitment by financing and supporting annual international flower shows in Taipei and Tainan and abroad	• Orchid-related associations and other organisations from the public and academic sectors meet annually to review the cluster's critical issues and project implementation
	Malaysian automotive and auto-parts	Public action	Not effective (misleading response to the challenge)	Need a specific core agency with more independence from heavy government support to deal with the challenges of the cluster	• No specific core agency to handle the challenges facing the cluster	• Cluster firms and other related agencies have followed the direction of the New Automotive Policy (NAP) of the government	• Key development strategies are almost fully reliant on government policy and financial support	• Main activities are initiated by government, aiming to protect local automotive firms and to promote Bumiputera participation in the automotive sector	• The National Automotive Policy (NAP) was reviewed and adjusted three and a half years after its launch (in 2006) by the Ministry of International Trade and Industry (MITI) with involvement of local private firms and related agencies

Table 7.1
Effectiveness of Institutional Modality of Cluster Intervention (Continued)

Key Competitive Challenge	Clusters	Institutional Modality of Cluster Intervention	Effectiveness of Institutional Modality of Cluster Intervention		Elements for Analysing Effectiveness Institutional Modality of Cluster Intervention				
					Practical Prerequisites			Commitment and Real Effort of Key Actors	
			Current effectiveness	Improvement required for effectiveness in the long-run	Presence of core institution/ mechanism for long-term development	Ability to create shared/common goals for solution or direction among key cluster actors	Distribution of responsibilities and co-investment for solutions between public-private sectors	Ability to play a catalytic role to create commitment and ownership of cluster actors	Ability to create collaboration in evaluating projects and readjusting cluster strategies
Human Resource & Skill Development	Thai hard disk drive (HDD)	Public action	Moderately effective (but it may be best solution at the moment, as the cluster is in the nascent stage)	More involvement & commitment is needed from the private sector and other concerned parties	• Yes (HDD Cluster Centre/ NECTEC)	• Able to organise a regular platform for all leading foreign MNCs to cooperatively share concerns and to set the direction and formulate the development roadmap for the cluster • Other public agencies and academic sectors still have little involvement	• The operation of the core agency is fully funded by government • Some projects are co-financed and share responsibilities with private firms (foreign MNCs), but only when the government provides funding or support • There is no cooperation between firms	• The HDD Cluster Centre is the main agency initiating, coordinating and driving cluster initiatives, in accordance with the role it was assigned by NECTEC • More involvement of academic institutes can be obtained due to the attractiveness of funding of the HDD Cluster Centre / NECTEC	• The HDD Cluster Centre regularly organises meetings of the HDD Cluster Committee to review and follow up the implementation of projects • Systematic evaluation, especially of outcomes of actions, is not yet well-established
	Malaysian electronics	Private-led collective action	Selectively effective (only effective on the skill development issue)	Involvement of local academic institutes should be improved	• Yes (PSDC)	• Skill training programmes mostly are customised to serve the needs of individual firms, and are not for the cluster as a whole • No shared goal of development has as yet been settled on among all parties concerned	• Limited distribution of responsibilities between the core agency (PSDC) and the local university • The core agency is mainly self-financed, but still gets partial support from government	• PSDC can gain the commitment of key foreign MNCs and large local firms to participate in quick-win solutions for the challenge • But, it still cannot gain the committed involvement of local universities for long-term solutions to upgrading local capabilities	• PSDC has no role in overall evaluation of cluster projects • An evaluation by a consulting firm for the Penang State Government indicated that the process to improve quality of technical human resources has made no significant progress

Table 7.1
Effectiveness of Institutional Modality of Cluster Intervention (Continued)

Key Competitive Challenge	Clusters	Institutional Modality of Cluster Intervention	Effectiveness of Institutional Modality of Cluster Intervention		Elements for Analysing Effectiveness Institutional Modality of Cluster Intervention				
					Practical Prerequisites			Commitment and Real Effort of Key Actors	
			Current effective-ness	Improvement required for effectiveness in the long-run	Presence of core institution/ mechanism for long-term development	Ability to create shared/common goals for solution or development direction among key cluster actors	Distribution of responsibilities and co-investment for solutions between public-private sectors	Ability to play a catalytic role to create commitment and ownership of cluster actors	Ability to create collaboration in evaluating projects and readjusting cluster strategies
Human Resource & Skill Development	Thai automotive and auto-parts	Public-private partnership led by industry association	Moderately effective	Involvement of SMEs and REMs should be improved. TAI should improve its role in supporting the cluster development	• Yes (TAI and local associations)	• Associations work closely and are highly influential in setting the cluster's development goals and strategies through the official core agency (TAI) • The identified common needs and solutions still concern OEMs only, while REMs get less focus	• The HRD project is co-financed and responsibility is shared by the public and private sectors (MNCs or large local firms) • Many projects beneficial for auto-parts SMEs, e.g. on productivity improvement and testing facilities, are still sponsored mainly by government	• With its close connection with Japanese firms, TAI in collaboration with local automotive associations, can induce Japanese firms to help local firms develop their capabilities and invest more in more advanced activities • Government is supportive in terms of policy for overall cluster development, but it shows weak commitment to driving the implementation of the defined policy	• Both TAI and local automotive associations remain weak in creating collaboration among the concerned parties to evaluate implementation of automotive development projects

Table 7.1
Effectiveness of Institutional Modality of Cluster Intervention (Continued)

Key Competitive Challenge	Clusters	Institutional Modality of Cluster Intervention	Effectiveness of Institutional Modality of Cluster Intervention		Elements for Analysing Effectiveness Institutional Modality of Cluster Intervention				
					Practical Prerequisites			Commitment and Real Effort of Key Actors	
			Current effective-ness	Improvement required for effectiveness in the long-run	Presence of core institution/ mechanism for long-term development	Ability to create shared/common goals for solution or development direction among key cluster actors	Distribution of responsibilities and co-investment for solutions between public-private sectors	Ability to play a catalytic role to create commitment and ownership of cluster actors	Ability to create collaboration in evaluating projects and readjusting cluster strategies
Upgrading Towards Advanced Technology & Higher Quality and Standards	Taiwanese semi-conductor	Public-private partnership through specialised research institute	Effective	Effective (ITRI is now firmly established and well-known worldwide as one of most effective research institutes)	• Yes (ITRI)	• The core agency (ITRI) links firms, government and academic experts to cooperate in identifying critical issues and to set the annual development plan for the industry	• Many R&D projects are co-invested by the research institute/ universities and firms • The research institute cooperates with universities and firms to develop technology educational curriculum and training courses	• ITRI has created a strong foundation and platform for collaboration between local firms, industrial associations and universities to enhance the capabilities of local firms • Government is highly committed and acts as a supporter or facilitator for technological upgrading of local firms	• ITRI collaborates with the Ministry of Economic Affairs (MOEA) in evaluating the projects • ITRI reorganised its internal structure and renewed its research direction in 2006 to serve the dynamic business environment
	Thai orchid	Public-private partnership driven by private local network	Effective	Presently, the cluster still relies upon the actions of the cluster leader and his network. For more sustainability of development, a more firmly established institution/ organisation is needed	• Yes (informal network of local farmers)	• The cluster leader and his orchid grower network initiate many activities to persuade all parties to collaborate to overcome the challenge, but still have limitations in terms of resources	• The cluster leader actively persuades universities/ research institutes/ public agencies to participate and co-invest with local farmers in projects to upgrade skills and quality of orchids	• Particular local universities and research institutes are highly committed members of the cluster and actively support the cluster in upgrading skills and R&D • Government is supportive in terms of policy, but still weak in driving policy implementation	• No overall and systematic evaluation of cluster development projects has as yet been done

Source: Summarised from interviews with key persons in the seven clusters, relevant factual data and the author's own observations (see details in each case study on the CD-ROM)

Based on the reviews of the effectiveness of the institutional modalities depicted in table 7.1, a number of aspects can be highlighted for further analysis. *Firstly,* both clusters in Taiwan, i.e. the orchid and semiconductor clusters, applied institutional modalities that were able to effectively handle their key challenges, even though the two clusters differ in industrial nature. When looking at the clusters in Thailand and Malaysia, the results show a diversity of effectiveness. The two clusters in Malaysia are alike in that each is technology-driven; however, the institutional modalities they chose are dissimilar. The modality applied by the automotive cluster is ineffective, while that used by the electronics cluster is considered selectively effective. In Thailand, the two technology-driven clusters – i.e. the HDD and automotive and auto-parts clusters – are moderately effective in applying the selected institutional modalities, whereas the institutional modality used by the Thai orchid cluster is effective. *Are these differences in degree of effectiveness of the institutional modalities applied by these clusters the result of the influence of the business system, which in Taiwan may enable actors to be more adaptive and cooperative than that in Thailand and Malaysia?*

Secondly, in the technology-driven clusters, the degree of effectiveness of institutional modalities varies; however, in both of the natural resource-based clusters, i.e. the two orchid clusters, the institutional modalities rate 'effective'. *Is this the result of a coincidence of social cohesiveness characteristics in the Thai and Taiwanese orchid clusters or of the difference between the industrial nature of technology-driven and natural resource-based sectors?*

Thirdly, in all six clusters that implemented institutional modalities effectively, a core agency or mechanism acts as a 'third party' for cluster coordination, though this third party takes a variety of forms. Only in the Malaysian automotive and auto-parts cluster was there no core agency/mechanism for cluster coordination. This contributed to the ineffectiveness of the institutional modality applied in this cluster. Core agencies/organisations used to conduct cluster inventions took the form of formally established organs, e.g. an association, research institute, skill development centre or industry-specific agency, or were informal, as in the network of local entrepreneurs of the Thai orchid cluster.

As referred to in chapter 6 and as gleaned from the detailed analyses of the seven clusters (on the CD-ROM), most of the cluster cases have a core coordinating agency/organisation that was set up by government, or a so-called 'public-initiated agency'. Only in two clusters was the core

coordinating mechanism initiated by the private sector, i.e. in the Thai and Taiwanese orchid clusters. However, the analysis shows the institutional modalities undertaken through private-initiated mechanisms to be effective in handling the critical competitive challenges facing the clusters, whereas mechanisms created by the public sector led to more varied levels of effectiveness. The key question is then *whether the difference in the origination of a cluster's core coordinating mechanism matters in determining the degree of effectiveness of the institutional modality of cluster intervention.*

Lastly, the seven case study clusters face different critical competitive challenges. These challenges are, moreover, distinct in their degree of complexity. The clusters facing the human resource and skill challenge applied different institutional modalities to cope, which brought about effective results but only at the 'moderate' and 'selective' level. Both clusters confronting the challenge of technology and quality upgrading applied the institutional modality of public-private partnership. Despite differences in the types of organisations, both institutional modalities achieved similarly effective results. *Are differences in the effectiveness of institutional modality affected by the complexity of the competitive challenges or by the presence/absence or level of capabilities of particular actors in cluster governance?* These four broad questions are analysed in sections 7.3, 7.4 and 7.5.

7.3 Business Systems versus Sectoral Differences: Impacts on the Effectiveness of the Institutional Modality of Cluster Intervention

The main discussion in this section concerns the first two questions raised above: the influence of business systems and of sectoral characteristics on the effectiveness of institutional modalities of cluster intervention. The analysis of the effectiveness of the seven institutional modalities reveals that both the business system and sector differences impact the effectiveness of institutional modalities. Table 7.2 provides a simple overview of the results on the effectiveness of the seven institutional modalities.

Table 7.2 shows that the two clusters in Taiwan applied institutional modalities effectively, though in two sectors with different industrial natures. The institutional modalities applied by the clusters in Malaysia and Thailand vary in their effectiveness. The effectiveness of both Taiwanese clusters can be attributed to some extent to the country's effective business system, which allows actors in the clusters to effectively play their

roles in economic activities. However, it is not only the effective business system of Taiwan that renders the institutional modalities in the two clusters effective. The role of sector differences also has to be taken into account.

Table 7.2
Differences in Business Systems and Sectors and the Effectiveness of
Institutional Modality of Cluster Intervention

Country \ Sector	Taiwan	Malaysia	Thailand
Orchid	Effective	_	Effective
Electronics	Effective	Selectively Effective	Moderately Effective
Automotive and Auto-Parts	_	Not Effective	Moderately Effective

Let us consider the clusters that demonstrated effectiveness in implementing institutional modalities, i.e. the two clusters in Taiwan and the Thai orchid cluster. In fact, many distinctions can be found between government industrial policies towards technology-driven and natural resource-based clusters in these two economies. In this light, two points can be made. *Firstly*, since in Thailand and Taiwan technology-based industries have been highly prioritised as high-potential or strategic industries, business systems are heavily shaped by government policies supporting technology-driven clusters. Hence, most technology-driven clusters in these two economies can be characterised as policy-driven. *Secondly*, unlike the technology-driven clusters, the business systems of the natural resource-based clusters in Taiwan and Thailand are largely driven by cultural and social aspects of the locality, due to the absence of government support in the past. These two observations are elaborated further below.

7.3.1 Role of Government and Influence of Business Systems on the Effectiveness of Institutional Modality in the Technology-Driven Clusters

As discussed in chapter 3, Taiwan's business system evolved under a strong political desire to be independent from the control of mainland China. In fact, the authoritarian and pragmatic characteristics of past governments in Taiwan owe much to this aspiration. The Taiwanese government has continually pursued liberalised economic development, strengthening local SMEs and building local capabilities. It was strongly committed to creating a strong economic foundation and sound business environment to support local businesses. To this end, it put great effort and investment in developing national human resources and technological capabilities.

The semiconductor cluster was highlighted as a strategic industry in Taiwan's industrialisation policy. Realising that technology capability was a critical success factor for the semiconductor cluster, government invested in establishing and strengthening many local industry-supporting institutions, e.g. specialised research institutes, technology-based universities, vocational and technical colleges, financial institutions for SMEs and venture capital providers. These local institutions have functioned effectively to enhance the competitiveness of local firms, not only in the semiconductor industry but also in other high-tech industries (see details in chapter 3 and case study 2 on CD-ROM). Moreover, local firms were encouraged and supported by various government policies to export and get exposure to global competition. As a result, local firms in the Taiwanese semiconductor cluster are capable of making efficient use of foreign technologies to upgrade their capabilities and to advance their innovative capacity, while at the same time having strong export capabilities.

The commitment of the Taiwanese government to drive the nation's economic prosperity was a key factor in easing the coordination problem confronting clusters in Taiwan. The coordination problem is a basic dilemma in economic development, as well as in cluster development. At the early stage of cluster development, no coordination mechanism is as yet well-established. Many firms might face similar problems or difficulties, but they are unable embark on coordinated action to address the problems due to information asymmetry, limited resources, lack of mutual trust and so on. Furthermore, it is more costly to invest in high-tech industries than in traditional or natural resource-based ones. Hence, at

the onset of entering a high-tech sector, local entrepreneurs with limited resources are reluctant to invest in coordination activities, which are potentially costly. They tend to wait until somebody invests. Then, they might also make an investment or might continue to wait, enjoying positive externalities emanating from the investments made by others. Under these circumstances, private sector investments in an industry's common activities/needs might be limited and coordination failures or free-rider behaviours could occur.

Evidence from the Taiwanese semiconductor cluster reveals that in the past the government was right in choosing to create a core mechanism, i.e. ITRI, to manage the coordination problems of the cluster and simultaneously to provide common facilities for technology and R&D upgrading for local firms. This feature of Taiwan's business system is missing in Thailand and Malaysia. However, this does not mean that the Thai and Malaysian government did nothing to manage the coordination problems facing their technology-driven clusters. Rather, they undertook activities that had less impact on cluster development. In Malaysia, the government's policy choice was grounded in a determination to alleviate ethnic tensions and to restructure society. A key problem of the resulting business system, which obstructs the effectiveness of the institutional modality of cluster intervention, is the highly protective government policy towards high-tech industries, especially the automotive and auto-parts industry. The coordination problem cannot be solved by simply providing protection to a particular industry. Moreover, such protection may limit the willingness and effort of local firms to upgrade their technological capabilities (Rodrik 2007).

Similarly, the business system in Thailand has limited the effectiveness of the institutional modality of cluster intervention, for various reasons. The Thai government has continuously pursued a liberal economic policy and focused on promoting high-tech sectors, as has the Taiwanese government. However, the policy focus of the Thai government in the past was not to create a foundation for technology upgrading and for leveraging human capital, but rather only to attract FDI. Moreover, reflecting the short duration of government administrations, a key problem of the Thai business system is a discontinuity of policies and a weak bureaucracy to support local businesses. As a result, the key technology-driven clusters, i.e. the HDD and the automotive and auto-parts clusters,

remain reliant on foreign MNCs, which also dominate the choice of the institutional modalities of these clusters.

The Thai government attempted to address the coordination problem of the two technology-driven clusters by creating agencies to do this task, though under existing bureaucratic bodies. However, the two core agencies still have limited authority and capability to accomplish their mandate. Both agencies are heavily dependent on government (see case study 1 and 4 on CD-ROM); and the frequent changes in government policy have discouraged staff and smothered motivation to pursue their tasks effectively and efficiently. These core agencies have therefore merely reacted in accordance with assignments and not been driven by real commitment. To execute effective industrial policy, implementing agencies must have autonomy, accountability and the strong commitment of high-level policymakers who have a clear view of the desired development outcomes (Rodrik 2007). In the existing business system, the institutional modalities applied by both technology-driven clusters in Thailand have resulted in only moderate effectiveness.

7.3.2 Role of Local Entrepreneurs and Influence of Business Systems on the Effectiveness of Institutional Modality in the Natural Resource-Based Clusters

Table 7.1 unveils similarities in the effectiveness of the institutional modalities used by the two orchid clusters, i.e. in Thailand and Taiwan. Even though the two orchid clusters operate in different business systems, their institutional modalities are effectively applied. This leads to the question of why this coincidence occurred. These two clusters have two key common conditions: lack of policy support in the past and tight social cohesion in the community (see details in case study 6 and 7 on CD-ROM). These similar contexts certainly influenced the choice of institutional modality of cluster intervention in the two clusters, and hence led to similarly effective results of these interventions.

Unlike the technology-driven industries, the orchid industries in Thailand and Taiwan were not a focus of government policy in the past. The lack of adequate policy support at the initial phase of development was key in stimulating private initiatives and collective efforts to solve the common challenges faced by the clusters. Although the government did provide some public facilities to support the clusters – mostly concerning general R&D, information and basic skill training – this support was

limited and inadequate in serving the specific needs of the orchid farmers. Orchids are not a major product contributing high value-added to GDP, unlike high-tech products or other agricultural products. Moreover, by nature the orchid industry is neither capital-intensive nor labour-intensive. Politicians basically gave more attention to quick-wins and large outcomes that could promote their popularity. The orchid sector was considered a minor player without political significance in terms of either income generation or employment. Hence, past Thai and Taiwanese governments were uninterested or reluctant to invest significantly in the orchid industry (see case study 6 and 7 on CD-ROM).

Under these circumstances, orchid growers in both Thailand and Taiwan could not merely rely upon state support when faced with a significant competitive challenge. They had to find a way to solve common problems on their own. This is paradoxically a 'benefit' of being neglected. Certainly, the two orchid clusters also faced the coordination problem, as did the technology-driven clusters. However, the knowledge and technology used in the orchid industry is not as complicated as that in technology-driven industries and its capital requirements are not as high. Thus, the risk of investment in coordination is probably lower than in the technology-driven clusters. Orchid entrepreneurs were therefore likely to be more amenable to putting effort and investment in collective activities to develop the cluster as a whole.

The absence of foreign firms is another characteristic of the orchid clusters that differs from the technology-driven clusters and contributed to the effectiveness of the chosen institutional modality of cluster intervention. Without foreign firms, orchid entrepreneurs enjoyed strong cultural homogeneity, which is a basic factor in trust building. The orchid industry is local or community-based and involves entrepreneurs who have long-term social relationships based on kinship/friendship ties. This makes them more likely to undertake collective action to cope with their challenges.

In Taiwan, a good foundation in the overall business environment and suitable human capital enabled entrepreneurs in the orchid cluster to build a strong local network in the form of industry associations to coordinate solutions to common problems. As discussed in chapter 6, after facing a serious market challenge when Taiwan entered into the WTO, the orchid-related associations negotiated and urged the government to be more supportive in promoting the industry. In response, the Taiwan-

ese government identified the orchid as a high-potential agricultural product and invested in supporting the orchid cluster, e.g. establishing the Taiwan Orchid Plantation (TOP) in Tainan County to provide facilities for industry-related activities, allocating funds for the activities of orchid associations, helping the industry to organise international floriculture/orchid shows and sponsoring and encouraging local universities to do research for the orchid industry. This led to effective collaboration between the public and private sectors in the policy process for orchid cluster development. However, it also created a potentially negative effect, as the industry associations became increasingly reliant on government support. This might be harmful for the further development of the cluster in the future, if the government withdraws its support (of which there are some signs at present).

The Thai orchid cluster, like its Taiwanese counterpart, is driven by local entrepreneurs but in a different form. Development of the Thai orchid cluster is powered by a local orchid farmer who has taken the lead in forming a group of orchid growers to develop the cluster together. Though the institutional modalities implemented at present by both the Thai and the Taiwanese orchid clusters have been effective in response to the challenges they face, some evidence suggests that the Taiwanese orchid cluster is developing faster than the Thai orchid cluster. For example, the Taiwan Orchid Plantation (TOP) now supports nearby Taiwanese orchid growers, and many international floriculture/orchid shows are organised each year in Taiwan, while the Thai orchid cluster has as yet received limited support from the government.

The Thai government did recently approve a project to establish an orchid industry park to function as a learning centre for the orchid industry, and a location for the park was agreed in 2008. In addition, the government approved a national orchid development plan and a budget for implementing the plan. However, up until now no high-impact activity has as yet been implemented. Most of the significant activities generating high impact on Thai orchid cluster development have been driven by the efforts of the orchid cluster leader and his network. Orchid entrepreneurs in Thailand and Taiwan started developing their orchid industries using a cluster approach at about the same time, in 2002. But the fast progress achieved by Taiwan's orchid cluster reveals the effects of the high commitment of the Taiwanese government in developing the cluster. Moreover, the overall business system of Taiwan provides a

strong foundation and local capabilities to support local industries. Hence, another challenge for sustainable development of the Thai orchid cluster is how to enhance the participation of government and related local institutions to develop the cluster. A more firmly established institution is needed to drive the cluster development process continuously and systematically for effective long-term cluster development.

7.4   Characteristics of Core Agencies for Cluster Coordination and the Effectiveness of Institutional Modality of Cluster Intervention

This section discusses the significance of the core agency in determining the effectiveness of institutional modalities of cluster intervention. As discussed earlier, the presence of a core agency for cluster coordination is important to drive cluster development effectively, since the coordination problem is a key issue in every cluster. For easy comparison, table 7.3 summarises the characteristics of the core agencies for cluster coordination as well as the effectiveness of the applied institutional modalities of cluster intervention. Detailed characteristics and roles of each agency are explored in the case studies on the CD-ROM.

Table 7.3 shows that almost all of the clusters have managed their challenges through core agencies, except the Malaysian automotive and auto-parts cluster. These core agencies vary in type of organisation and range from a public agency to a private network. This study views the informal network of orchid growers in the Thai orchid cluster as an 'agency', though it is not constituted as a legally-based entity. This is because this network functions as a kind of institution performing a role like that of a core agency. More importantly, it performs this role effectively. Given that the existing local orchid-related associations in the Thai orchid cluster remain weak in playing a coordinating and catalytic role in cluster development, the orchid cluster leader and his informal network of orchid growers emerged and have come into play to drive the collective activities of the cluster (see case study 6 on CD-ROM).

Table 7.3

Characteristics of the Core Agencies for Cluster Coordination and the Effectiveness of Institutional Modality

Clusters	Characteristics of the Core Agency for Cluster Coordination		Effectiveness of Institutional Modality
	Type of Organisation at Present	Origin	
Thai Orchid	Informal private network	Private-initiated	Effective
Taiwanese Orchid	Private association	Private-initiated	Effective
Thai HDD	Semi-governmental organisation	Public-initiated	Moderately Effective
Taiwanese Semiconductor	Government-supported organisation	Public-initiated	Effective
Malaysian Electronics	Private non-profit society	Public-initiated (by the state government through PDC)	Selectively Effective
Thai Automotive and Auto-Parts	• TAI: Specialised institute under government • TAPMA: Private association	• Public-initiated • Private-initiated	Moderately Effective
Malaysian Automotive and Auto-Parts	No core agency: Main activities driven by government	Can be judged as 'public-initiated'	Not Effective

The type of organisation of the core agencies is significant in that it influences the behaviour and motivation of the people working within these agencies. Hence, it affects these core agencies' commitment and real actions in cluster development. In addition, most of the core agen-

cies are older, well-established entities, in existence for ten years or more. A small number of agencies were newly founded for the explicit purpose of developing a particular cluster. Examples of newer core agencies are the HDD Cluster Centre in the Thai HDD cluster and the local network of the Thai orchid growers. Note that while the HDD Cluster Centre is relatively new, it was founded under NECTEC, which is an older, more established semi-governmental organisation. The origin of the core agency – i.e. whether its establishment was a public or private initiative – also matters in influencing its role and its relationships with other institutions. For example, an agency that used to belong to the government but has now become an independent private agency may still retain close ties with government and somehow be indirectly influenced by the government, as seen in the case of the Malaysian electronics cluster (see case study 3 on CD-ROM).

Only three of the clusters have core agencies that originated from private initiatives. These are the Thai and the Taiwanese orchid cluster and the Thai automotive and auto-parts cluster. Before discussing this further, some key points associated with the core coordinating agency in the Thai automotive and auto-parts cluster should be explained. Presently, two agencies are involved as core agencies in the automotive and auto-parts cluster, i.e. the Thai Automotive Institute (TAI) and the Thai Auto-Parts Manufacturers Association (TAPMA). TAI is a specialised agency under the Ministry of Industry, whereas TAPMA is a purely private association. TAI was established by the government and is officially recognised as a core agency to promote overall development of the automotive industry in Thailand. TAPMA represents a collaboration of private firms in the auto-parts industry in Thailand and is now active in coordinating with TAI and other agencies to drive the collective activities of the cluster – sometimes even taking an initiating role. Nowadays, TAPMA puts more effort into coordinating cluster substitutions for the limitations and weaknesses of TAI (see case study 4 on CD-ROM).

This study found that cluster interventions were implemented effectively in the two orchid clusters – both of which had core agencies that were private-initiated. The other cluster cases had public-initiated core agencies. The Malaysian electronics cluster is somewhat exceptional in that its core agency for skill development-related issues was established as a public initiative (by the Penang State Government through the Penang Development Corporation), but was eventually transformed to

become a fully private agency (though operated on a not-for-profit basis). The analysis shows that most of these public-initiated agencies have achieved only moderate or selective effectiveness, except in the case of the Taiwanese semiconductor cluster. This suggests that core agencies emerging from the private sector may have better potential to identify and respond to real needs of industries, compared to entities created by the public sector. Nonetheless, the key is that the core agency should be both efficient and adaptive to the existing social and economic environment of a particular industry (Roland 2004).

Also, as mentioned in section 7.3.1, governments are more likely to set up core agencies for cluster coordination for technology-driven clusters, for at least two reasons: (1) These clusters are high priority on the government's policy agenda, especially in terms of the economic contributions they might make. (2) In most technology-driven clusters, foreign MNCs are involved as a dominant player, and government is often requested – or obliged to some extent – to become the 'third party' to protect the interests of local firms and to facilitate links for technology transfer. The need for government to take action to set up a core agency perhaps also reflects a lack of local capabilities or weaknesses of local firms to do this collaboratively. A public-initiated core agency can possibly bring about effective results in cluster intervention. The role of the Taiwanese government in development of its semiconductor cluster is a good example in this regard. The key is that the government should strengthen a core agency so that it is able to elicit the real needs of the cluster and activate committed participation of private-sector actors towards fulfilling those needs. This will enable industrial policies and cluster interventions to realise a higher level of effectiveness (Rodrik 2007). Nevertheless, to achieve this task, strong commitment and significant effort by government and policymakers are required.

7.5 Influence of Type of Competitive Challenges and Presence/Absence of a Particular Actor on the Effectiveness of Institutional Modality of Cluster Intervention

This section discusses the influence of the complexity of competitive challenges and the presence/absence of a key cluster actor on the effectiveness of institutional modalities of cluster intervention, as introduced in section 7.2. The clusters in this study encountered different types of

challenges, including expanding market share and responding to intense international competition, human resource and skill development, and upgrading towards more advanced technology and higher quality/standards. These challenges are distinct in terms of their degree of complexity. Though this study does not aim to comprehensively measure and compare the complexity of such challenges, it does want to shed light on possible factors that can influence the effectiveness of institutional modalities of cluster intervention. A more in-depth study of these factors is a task for future research.

This study estimates the complexity of competitive challenges by focusing on the diversity of activities that are required to respond to them. Thus, the human resource and skill development challenge seems to be less complicated than the challenges of technology and quality upgrading and market expansion. Possible solutions to cope with the challenge of human resource and skill development involve a relatively narrow range of activities, e.g. training, adjusting educational curricula, providing incentives, and attracting experts to fulfil immediate needs. In contrast, the challenge of technology and quality upgrading encompasses a more diverse set of issues, e.g. human resource development, R&D, capital investment, incentive regulations, standard settings, and elevating technological know-how. Similarly, to cope with the market expansion challenge, a wide array of activities are needed, e.g. market knowledge/intelligence, quality upgrading and standardisation, logistics management for delivery reliability, and capability building for creating high value-added products/services.

Note that human resource and skill development is, in fact, an important base for the solutions to the other challenges. For this reason, too, cluster actors may find it easier to agree upon solutions and be more willing to participate in collective efforts to cope with the challenge of human resource and skill development. Sharing costs for common skill training is beneficial to all parties, reducing costs as long as the necessary conditions and common rules are set and fully committed to by the relevant actors, e.g. commitment among firms involved in a collective training not to recruit one another's employees.

Table 7.4 depicts the types of competitive challenges faced by the seven clusters and the effectiveness of their institutional modalities of cluster intervention.

Table 7.4
*Types of Competitive Challenges and the Effectiveness of
Institutional Modality of Cluster Intervention*

Critical Challenges	Clusters	Institutional Modality of Cluster Intervention	Effectiveness of Institutional Modality
Human Resource and Skill Development	Thai HDD	Public action	Moderately Effective
	Thai Automotive and Auto-Parts	Public-private partnership	Moderately Effective
	Malaysian Electronics	Private-led collective action (led by industry association)	Selectively Effective
Market Expansion/ Intense International Competition	Taiwanese Orchid	Collective action through industry associations	Effective
	Malaysian Automotive and Auto-Parts	Public action	Not Effective
Upgrading Towards Advanced Technology & Higher Quality and Standards	Taiwanese Semiconductor	Public-private partnership (through specialised research institute)	Effective
	Thai Orchid	Public-private partnership (driven by private local network)	Effective

Interestingly, table 7.4 shows that three of the clusters (the Thai HDD cluster, the Thai automotive and auto-parts cluster and the Malaysian electronics cluster) face the same challenge (human resource and skill development), but applied different institutional modalities to deal with it. Furthermore, the institutional modalities used by these clusters achieved only a moderate or selective level of effectiveness. The question then arises of why the results were so similar, even though the three clus-

ters used different institutional modalities. To answer this question, it is necessary to look at the roles of key actors in the governance of these clusters.

To overcome some competitive challenges, strong and committed involvement of particular actors is essential. For instance, tackling the challenge of human resource development is beyond the private sector sphere since educational development is a public good that the private sector cannot supply on its own. Education requires active participation and strong commitment from the government and academic sectors. In contrast, for market expansion, it is vital to have involvement of the private sector, firms in particular. The private sector has to take a leading role in directing and implementing responses to this challenge, as it has more knowledge and interest in solutions than the public sector. For the challenge of technology and quality upgrading, efforts by producers/firms are crucial, especially to guide and control the direction of upgrading.

Perhaps this means that the absence of the academic sector in the response to the human resource and skill development challenge in the three clusters is responsible for the ineffectiveness of the institutional modalities chosen to solve the challenge. Indeed, in the three clusters, the academic sector has shown little commitment to and participation in cluster development (see chapter 6 and case study 1, 3 and 4 on CD-ROM). Effective human resource development requires a concerted effort by government, industry and the academic sector. The Malaysian electronics cluster has been quite successful in managing a response to skill development deficiencies. This has taken the form of private-led collective action through a local skill development centre. Nonetheless, a study by Penang Skill Development Centre (PSDC) for the Penang State Government confirmed that insufficient quality and availability of workers with high-technology skills remains a critical development constraint for Penang's electronics cluster. Throughout the history of the development of the electronics industry in Penang, creation of linkages between universities and industry has proven to be very difficult. PSDC's survey results point out that the competencies of university graduates still do not meet the standards required by companies, and university lecturers have limited exposure to industry (Penang Skill Development Centre 2006).

In the case of the Thai HDD and automotive and auto-parts clusters, academic institutes have played a weak role in developing human capital for the industries. In the Thai HDD cluster, the core coordinating agency, i.e. the HDD Cluster Centre, is attempting to persuade universities to cooperate with key HDD companies in R&D and human resource development by providing funding to universities and co-investing in research projects and training programmes with HDD firms. However, this effort is at an early stage. True commitment of the academic sector is not yet firmly established (see case study 1 on CD-ROM). Similar attempts have been made in the Thai automotive and auto-parts cluster. However, efforts there are being made to stimulate collaboration involving foreign MNCs, local parts suppliers and government to upgrade labour skills in the industry. University lecturers are being invited to participate in designing training programmes and to conduct training courses. Still, attempts to adjust curricula so as to upgrade the human resource supply for the industry in the future are as yet inadequate (see case study 4 on CD-ROM). Note that this observation is derived from the interviews and based on a limited amount of empirical data. It would be worthwhile to conduct an in-depth study of industry-university linkages in developing human resources for cluster development in the future.

7.6   Conclusion

This chapter looked into the effectiveness of institutional modalities of cluster intervention. It focused on the effectiveness of processes to help sustain cluster development in the long run, rather than on measures of effective performance or outcomes. Indeed, the purpose of this study is not to comprehensively evaluate the effectiveness of the various institutional modalities of cluster intervention, since it is only one of the key elements in the analytical framework. Rather, it aims to provide a holistic view of cluster policy in all of its complexity.

Two groups of elements were defined with which to assess the effectiveness of institutional modalities of cluster intervention: (1) the practical prerequisite element and (2) the real commitment and effort of key cluster actors. The first group comprises three sub-elements: (1) presence of a core mechanism/institution for long-term cluster cooperation and development, (2) ability to create a shared/common goal or development direction among key cluster actors, (3) distribution of responsibili-

ties and co-investment in solutions between the public and private sector. The second group is composed of two sub-elements: (4) ability to play a catalytic role to create commitment or ownership of cluster actors and (5) ability to create collaboration in evaluating projects and readjusting cluster strategies.

Based on these five elements, this study found three institutional modalities that can be considered 'effective'; i.e. that of the two orchid clusters in Thailand and Taiwan and that of the Taiwanese semiconductor cluster. The Malaysian electronics cluster reflects a 'selectively effective' institutional modality, which is effective specifically in managing the challenge of human resource and skill development. The Thai automotive and auto-parts cluster and the Thai HDD cluster implemented an institutional modality effectively but at the 'moderate' level. Only the institutional modality applied by the Malaysian automotive and auto-parts cluster was shown to be 'not effective' in handling its challenge.

Three conclusions can be drawn from the analysis. *Firstly*, the differences in business systems and sectors do affect the degree of effectiveness of institutional modalities. In the technology-driven clusters, government policy has been highly influential in shaping the business system, which consequently has led to distinctively effective institutional modalities within these clusters. In the natural resource-based clusters, local entrepreneurs with relatively high cultural homogeneity and social cohesion were highly influential in shaping their specific business system, which has impacted the effectiveness of intervention within these clusters.

Secondly, a core agency for cluster coordination is an important enabling factor to allow the clusters to implement an institutional modality effectively. A core agency initiated by the private sector seems able to achieve a higher level of effectiveness than one that is public-initiated. However, a core agency created by government can obtain effective results in cluster intervention, if there is high government commitment and the right processes for gaining private-sector participation.

Lastly, to deal with a particular type of competitive challenge, clusters require the active participation or involvement of certain actors. Absence of a particular actor that is key for implementing an intervention is a major factor lowering the level of effectiveness of an institutional modality. The clusters facing the challenge of human resource and skill development provide a good example in this respect. Here, the absence of active

participation by the academic sector in cluster development limited the effectiveness of the cluster interventions implemented by government and the private sector. A more comprehensive and systematic evaluation of the effectiveness of institutional modalities of cluster intervention would be an interesting topic for future research.

8 Conclusions and Policy Implications for Cluster Development

8.1 A Holistic Framework for Analysis of Cluster Policy

Cluster development is of growing interest to policymakers in various countries and is now a widely applied strategy for industrial development and competitiveness enhancement. Industrial policy in many countries in East and Southeast Asia is characterised as state-led. However, experiences in cluster development show that many clusters in this region have faced difficulties in the process of implementing cluster policy, and some policies have failed to achieve the desired goals, especially regarding the long-term sustainability of cluster development. This suggests that there may be common pitfalls in cluster policy choices and processes of cluster development.

This study views the process of formulating cluster policy as crucial to effective policy implementation. Better policy formulation processes will lead to better policy choices and better implementation. Nevertheless, evidence from developing countries suggests that there are pitfalls at the formulation stage. Given that governments, particularly politicians, are likely to be concerned with their political popularity, governments in developing countries have tended to view cluster development as a 'project' with a finite time span for implementation and to give highest priority to quick-win targets and measurable outcomes of cluster policy to increase national competitiveness. Furthermore, cluster policy formulation in developing countries has tended to be issue-oriented, focusing on a response to, say, market dynamics, infrastructure needs, human resource development and technology advancement. The formulation of cluster policy has thus underemphasised the complex and dynamic aspects of cluster development as a *process*.

In fact, cluster development is a complex and continuous development process, not a project. It involves numerous interdependent actors.

Interactions among key actors in clusters are crucial to the success of cluster policy, since the actions of one actor affect other actors' performances and behaviours. Mutual influences, moreover, create positive and negative externalities in a cluster and certainly impact the overall performance of a cluster. Cluster development, furthermore, involves various external and internal factors which function under dynamic circumstances and can affect the process of developing clusters, shifting the outcomes of cluster policy. Yet the cluster theory of Michael E. Porter and many cluster-related studies did not clearly mention the interaction of actors in clusters and the effects of such interaction on the success of cluster policy.

Based on these major problems in the real practice of cluster policy formulation and the missing issue of interaction in cluster theory, the core proposition of this research is that *cluster policymakers should focus more on the interplay of the various elements related to cluster development and the interactions of different cluster actors when analysing cluster policy and seeking ways to drive cluster development.* A better understanding of the different conditions and dimensions of cluster development should open more opportunities for effective implementation of cluster policy. This study proposed an integrated analytical framework for cluster development policy. This framework includes five elements relevant to cluster development in a complex and dynamic competitive environment. It also takes account of the interplay between these elements in influencing cluster development processes. These elements are (1) context and external factors, (2) cluster characteristics, (3) cluster governance, (4) institutional modality of cluster intervention and (5) effectiveness of institutional modality of cluster intervention. The framework should contribute a more insightful understanding of the complexity of cluster policy, which will be beneficial to close gaps between the formulation of cluster policy and the implementation of that policy.

A case study approach and a multi-dimensional comparison of clusters across national contexts and across sectors were applied, using the analytical framework to empirically investigate cluster development. Seven clusters in three sectors and in three economies were selected as case studies. These case studies represent clusters in technology-driven and natural resource-based sectors, including three high-potential clusters in Thailand (the HDD, the automotive and auto-parts and the orchid clusters), two clusters in Taiwan (the semiconductor and orchid

clusters), and two clusters in Malaysia (the electronics and the automotive and auto-parts clusters).

The focus period of study is between 2002 and 2006. Given the different histories of the selected economies, the study also took into account relevant historical aspects that affect cluster governance, institutional modalities of cluster intervention and effectiveness of the applied institutional modalities. The findings of this study may not provide a formula for cluster development that can be replicated everywhere. However, they do provide insights and lessons to help clusters adapt faster in creating competitive advantages and to guide policymakers in more effective formulation and implementation of cluster policy – or at least avoiding pitfalls experienced by other clusters. This chapter starts by reiterating the key empirical findings in answer to the research questions posed early on. It then moves on to discuss the lessons learnt from the cluster case studies and subsequently draws out policy implications for cluster development. The final section presents the limitations of this study and challenges for future research.

8.2   Main Empirical Findings

This section discusses the empirical findings that provide the answers to the first two research questions of this study:

1. How does the interplay of context, cluster characteristics and cluster governance affect cluster development and selection of the institutional modality of cluster intervention?

2. To what extent are the institutional modalities used by the clusters effective in responding to their competitive challenges, and in what contexts and conditions are such modalities effective?

8.2.1 Interrelations between Contexts, Cluster Characteristics and Cluster Governance Can Influence the Selection of Institutional Modality of Cluster Intervention

Using the designed analytical framework to analyse the seven clusters in the three selected economies reveals that cluster characteristics, cluster governance and the choice of institutional modality of cluster intervention are interrelated and are considerably affected by contextual factors. The contexts surrounding the operation of clusters have country-specific as well as industry-specific aspects. Both play a major role in shaping the

structure and governance of the clusters, which eventually leads to differences in choices of institutional modality for cluster intervention.

Influence of Context on the Structure and Governance of Clusters

Table 8.1 compares the industrial structure and type of cluster governance for the seven study clusters in a simple form to clarify the different effects of country-specific and industry-specific context. The study reveals three key findings regarding the relationships between contexts, structure and governance of clusters.

Table 8.1
Industrial Structure and Cluster Governance of the Seven Clusters

Sector	Thailand	Taiwan	Malaysia
Electronics (technology-driven cluster)	• *Industrial Structure:* Cluster of subsidiaries of MNCs and local suppliers • *Governance:* MNC-dominated and government-coordinated	• *Industrial Structure:* Cluster of large national firms and local suppliers • *Governance:* Local intermediary institution-coordinated (research institute-geared)	• *Industrial Structure:* Cluster of subsidiaries of MNCs and local suppliers • *Governance:* MNC-dominated and government-coordinated
Automotive and Auto-Parts (technology-driven cluster)	• *Industrial Structure:* Cluster of subsidiaries of MNCs and local suppliers • *Governance:* MNC-dominated and government-coordinated	– –	• *Industrial Structure:* Cluster of large national firms and local suppliers • *Governance:* State-controlled
Orchid (natural resource-based cluster)	• *Industrial Structure:* Cluster of SMEs • *Governance:* Local intermediary institution-coordinated (emerging informal network-catalysed)	• *Industrial Structure:* Cluster of SMEs • *Governance:* Local intermediary institution-coordinated (by industry associations)	–

First, clusters in the same sector are likely to have a similar structure due to the influence of industry-specific context. In technology-driven clusters, the nature of the industry (or industry-specific context) allows high involvement of foreign MNCs in the structure of the clusters. Three of the five technology-driven clusters in this study have a similar structure, named for this study's purposes a 'cluster of subsidiaries of MNCs and local suppliers'. Only the Taiwanese semiconductor cluster and the Malaysian automotive and auto-parts cluster have a different structure. Large national firms and local suppliers played greater roles in the structure of these two clusters, though foreign MNCs were also involved. This was due to the influence of government policy and the national context, which altered the structure of the clusters. This phenomenon is examined further under the third key finding below.

The case of natural resource-based clusters reflects a different influence of industry-specific context. These industries basically rely on local resources and local tacit knowledge; thus, the natural resource-based clusters, i.e. the orchid clusters in Thailand and Taiwan, had a limited presence of foreign firms. The structure of these clusters comprised many local firms and entrepreneurs, in this study called a 'cluster of SMEs'.

Second, cluster governance is likely to be aligned with the structure of the cluster. Foreign MNCs are significant players in the structure of technology-driven clusters, so governance in these clusters also tends to be dominated by MNCs, directly or indirectly, while revolving around power relations between government, foreign MNCs and local firms. In contrast, in natural resource-based clusters, governance is more influenced by interactions among local actors, i.e. government and local entrepreneurs/firms. Actors in these different types of clusters have different goals and interests, which may conflict. Based on the case studies, a role hence emerges for a local intermediary institution to coordinate fulfilment of the common interests of all key actors in the clusters. In technology-driven clusters, these local intermediary institutions tend to be created by government, either directly or indirectly, albeit in different forms.

In the natural resource-based clusters, local intermediary institutions tend to be formed by local firms or the private sector. However, a local intermediary institution is not always a newly established organisation; it might be an existing organisation that suits the specific context of a clus-

ter. In the Taiwanese orchid cluster, existing local industry associations played the role of intermediary, whereas a network of local entrepreneurs was recently established to perform this role in the case of the Thai orchid cluster. However, two cases -- i.e. the Taiwanese semiconductor cluster and the Malaysian automotive and auto-parts cluster -- are exceptional in this regard. The structure and governance of these two clusters are not aligned with each other. This is due to the influence of country-specific context, as described under the third key finding below.

Third, country-specific context, or national context, can alter the governance of a cluster, shifting it away from the type that would be expected according to the industry-specific context. It does this by intervening in local capabilities (i.e. the aggregate capabilities of local actors in a cluster). National context thus can reshape cluster governance to create either more enabling or more obstructing conditions for the cluster to effectively implement an institutional modality. The former is seen in the case of the Taiwanese semiconductor cluster and the latter is reflected by the Malaysian automotive and auto-parts cluster. Note that the country-specific context in Taiwan stands out from those of other countries. The context in Taiwan has helped to strengthen the role of local actors in governance of both the semiconductor cluster and the orchid cluster. Although these two clusters have very different structures and natures, both have a similar form of cluster governance, which is dominated by a local intermediary institution. Taiwan's national context is very supportive to strengthening and developing local capabilities. Local firms and institutions in Taiwan have high capabilities, owing to efforts of the government to build local capabilities via two channels: i.e. setting up and strengthening local institutions to support cluster firms and encouraging local firms to upgrade their capabilities.

Relationship of Cluster Governance and the Institutional Modality of Cluster Intervention

Basically the decision by a cluster to utilise a particular institutional modality of cluster intervention depends on two factors: (1) the type of challenge faced and (2) cluster governance. Key competitive challenges perceived in the seven study clusters are market expansion, human resource development, and technology and quality upgrading. This study found that clusters operating in the same sector and facing the same competitive challenge do not always choose the same institutional modality to cope with their challenge. The two technology-driven clusters in

Thailand, i.e. the HDD and the automotive and auto-parts clusters, face a similar challenge of human resource and skill development. The two clusters also share a similar nature of industry and have the same type of cluster governance, i.e. 'MNC-dominated and government-coordinated governance', and they operate in the same national context. However, they applied different institutional modalities to tackle the challenge of human resource and skill development. The Thai HDD cluster applied the 'public action' institutional modality, whereas the Thai automotive and auto-parts cluster used 'public-private partnerships led by industry associations'.

This finding seems to deviate from that suggested by the Business System Concept, originated by Richard Whitley (1994). The Concept highlights the importance and influence of institutional context at the national level on the economic coordination and organisation of businesses in a nation. According to this concept, business systems in a nation are likely to be similar, as they share common national institutions and contexts, leading to commonalities in the composition and structure of industries. Thus, behaviours and interactions of economic actors towards economic coordination and organisation within a national context are usually alike (Whitley 1994). If this is true, why did the HDD cluster and the automotive and auto-parts cluster in Thailand use different modalities to cope with the same challenge? In this respect, two points can be made.

First, although the HDD and the automotive and auto-parts clusters operate in the same national context and supposedly under the same business system, according to the Business System Theory, their industrial structures and industry-specific contexts are rather dissimilar, which has certainly influenced the different choices of institutional modality of the two clusters. Differences in the composition of actors in the structure of the two clusters led these clusters to select a different institutional modality. In the Thai HDD cluster, almost all firms in the cluster are foreign MNCs. The small number of Thai-owned firms participating in the HDD cluster limits local firms' motivation and interest in performing collective activities. Hence, a local industry association is absent in the HDD cluster. However, the longer supply chain and moderately fast-changing technology in the automotive and auto-parts industry has allowed a relatively large number of local firms to be involved in the industry. Here, local firms are more motivated to form industry associa-

tions to represent their common needs and interests. In the Thai automotive and auto-parts cluster, the local private sector – through its industry associations – is active in cooperating with the government in driving responses to the challenge of human resource and skill development.

Second, even though governance of the HDD and the automotive and auto-parts clusters is similarly dominated by foreign MNCs, there is a difference in the nationality of the dominant MNCs. The Thai HDD cluster is dominated by US-based MNCs, while the Thai automotive and auto-parts cluster is dominated by Japanese MNCs. As widely documented, the US and Japanese styles of management and inter-firm relations are very different. The American style of management and inter-firm relations usually takes the form of control to achieve a particular standard and quality in accordance with contracts and agreements. US-based firms thus have little interest in investing in long-term development of local supplier firms for the good of the industry. In contrast, Japanese MNCs generally pay great attention to developing mutual trust and long-term relationships with local suppliers. They show more interest in investing in upgrading their local suppliers for the long-term development of the industry in the host country.

These different attitudes translate into differing degrees of involvement in response to competitive challenges facing the clusters. In fact, the government is also involved in the institutional modality of cluster intervention in these two clusters, albeit to different degrees, depending on the relative capability and involvement of local firms and foreign MNCs. Cooperation between government, local firms and Japanese MNCs on common long-term development issues and in response to current competitive challenges is easier and more effective than that involving a US-firm-dominated cluster, like the Thai HDD cluster. In the HDD cluster, the Thai government must play a catalytic and coordinating role in managing common issues and collective activities so as to facilitate the foreign MNCs' participation and to maintain the competitiveness of the industry. This led the two clusters to select a different institutional modality to deal with the challenge of human resource and skill development.

8.2.2 Factors Influencing the Effectiveness of Institutional Modality

Evidence from many countries shows that governments tend to assess industrial and cluster policy by paying primary attention to the achievement of targeted outputs and outcomes. This is because every government is driven to demonstrate its efficient and effective use of public money in order to maintain its popularity. A missing aspect in the evaluation of cluster development policy is then process evaluation, which in fact is critical to understand key factors (and their interrelations) contributing to the success or failure of cluster policy. If government can specify and implement better processes for industrial development, it is highly plausible that it will achieve better outcomes and sustain the competitiveness of industries (Rodrik 2007). This study's analysis of the effectiveness of institutional modalities of cluster intervention, hence, shifts the focus from the outcomes of cluster policy towards the process of cluster development. This should provide beneficial guidance for cluster policy in the future.

The study reveals three interesting findings that at the same time underline the main ingredients for effective cluster development policy processes. *First,* differences in the level of effectiveness of the institutional modality of cluster intervention can be attributed to differences in business systems and sectors. The business system in Taiwan clearly provides a more enabling environment for cluster actors to effectively implement cluster policy than those in Thailand and Malaysia. The effectiveness of the institutional modality selected by the semiconductor and orchid clusters in Taiwan is evidence of this. Their success can be attributed in part to the proactive stance of the Taiwanese government in developing a strong base of local capabilities. Note that while the Taiwanese government, through its industrial policies, has played a vital role in constituting a sound business system for the development of technology-driven clusters, it has played a lesser role in supporting natural resource-based cluster development.

In natural resource-based clusters, the effectiveness of institutional modality of cluster intervention is more likely a result of efforts of local entrepreneurs and the effect of homogeneity of culture and local identity. Clusters that have relatively more cultural homogeneity and stronger local identity are likely to be able to communicate more effectively and build trust, which are key ingredients for collective action. The Thai and

Taiwanese orchid clusters reflect this. The two clusters are community-based, with only a handful of foreigners involved. Moreover, key actors in these clusters share the same culture, language and norms. So, it is easier to get people faced in the same direction, compared to clusters with a greater variety of ethnicities or foreigners involved. In the more culturally heterogeneous Malaysia, local cluster actors have more difficulty in blending their efforts. In the Malaysian automotive and auto-parts cluster, trust and integration between Chinese and Malay ethnic-based firms is difficult to build upon, due to the long history of ethnic conflict. This translates into less effective cluster intervention. Though the government in Taiwan hardly supported the Taiwanese orchid cluster early on, to some extent the overall business system combined with strong generic local capabilities created by the government, e.g. high-quality human resources and a ready research infrastructure, allowed scope for the orchid cluster to develop.

Second, the degree of effectiveness attained by the chosen institutional modality is influenced by the characteristics of the core agency for cluster policy coordination. Both the type of organisation and its origination are significant in influencing its behaviours and actions, leading to different degrees of effectiveness of the applied institutional modality. The analysis of the core agencies in the seven clusters reveals the difficulty of effectively implementing cluster policies without a core agency to coordinate collective actions towards cluster development, as seen in the case of the Malaysian automotive and auto-parts cluster. Core agencies initiated by the private sector seem to be more effective in implementing cluster policy interventions. However, those initiated by the public sector can also be effective, if the government has strong commitment and strategically involves the private sector in cluster policy processes.

Third, the complexity of the competitive challenge and the presence or absence of key actors can influence the effectiveness of the institutional modality chosen for cluster intervention. Particular types of competitive challenges require active participation and the strong commitment of particular actors. For instance, the challenge of human resource and skill development requires the involvement and commitment of the educational sector with continuous government support and close collaboration with industry. Missing a critical actor reduces effectiveness in the implementation of a particular institutional modality of cluster intervention. This is evidenced by the Thai HDD cluster, the Thai automo-

tive and auto-parts cluster and the Malaysian electronics cluster in dealing with their human resource and skill development challenge.

8.3   Key Lessons Learnt and Policy Implications for Cluster Development Policy in Developing Countries

This section answers the third main research question of this study: *Based on the case studies, what can be learnt from comparing choices of institutional modalities for cluster intervention and what are the differences in effectiveness of these modalities?* Three lessons can be drawn from the comparative analysis of the seven clusters in Thailand, Taiwan and Malaysia. These lessons cover key issues related to the policy cycle for cluster development, which includes formulation, implementation and evaluation of cluster policy. They will therefore be beneficial for many industrial policymakers in developing countries.

First, in cluster policy formulation, besides considering the complexity of the interplay between the elements and processes concerned in cluster development, policymakers should consider formulating cluster policy that suits the developmental stage of each cluster, as clusters at different stages of development require different institutional and policy support.

Second, to effectively implement cluster policy, the role of government cannot be neglected. Government's role should be (1) to strengthen local firms' ability adapt quickly in a fast-changing global business environment, (2) to create an enabling domestic business environment and (3) to support institutions to upgrade local capabilities.

Third, in the evaluation of cluster policy, government should take more account of assessments of the 'process effectiveness' of cluster development to gain more insight into how cluster development can successfully be promoted.

8.3.1   Stage of Development and Institutional Modality of Cluster Intervention: Implications for Cluster Policy Formulation

The first policy implication derived from the comparative analysis of the seven clusters is that formulating cluster policies suitable to the stage of development of each cluster strengthens the effectiveness of cluster policy implementation. The seven study clusters were at different stages of development. These differences in developmental stage were reflected in the selection of the institutional modality for cluster intervention and the

effectiveness of the chosen modality. Figure 8.1 provides an overview of the current developmental stage of the seven clusters in this study. However, three key remarks should be made at the outset. *First*, the positioning of the clusters in this figure is not derived from statistics-based economic performance measures of the clusters. The drawing simply illustrates the comparative positions of the seven clusters based on judgments from the key findings of this study, especially regarding cluster governance and institutional modality of cluster intervention. In addition, the length of time of cluster formation and/or the intensity of clustering activities are taken into account in identifying the stage of development of each cluster.

Second, at first, a distinction should be made between the terms 'industry development' and 'cluster development'. If considering 'industry development', some industries might have developed for long period of time in a particular country and can thus be justified as being in the 'growth' or 'mature' stage. But if one is speaking of their development in terms of 'clustering', they might have just become established. For example, considering the period of establishment and current economic performance of the HDD industry in Thailand, it can be stated that the HDD industry is in the 'growth' or 'mature' stage. However, the Thai HDD sector has just recently been targeted for development through the cluster approach. Hence, the HDD cluster can be considered a 'nascent' cluster, at a very early stage of development.

Third, clusters in the nascent stage will not necessarily develop similarly or follow the development direction of more advanced clusters. The positioning of the clusters in the figure merely provides an indication of developmental stage in relation to the chosen institutional modality of cluster intervention, cluster governance and the effectiveness of the selected institutional modality.

The three stages identified in figure 8.1 are based on a combination of two concepts: the endogenous process of industry development concept by Sonobe and Otsuka (2006) and the concept of cluster lifecycle by Bergman (2007). Sonobe and Otsuka (2006) looked at industrialisation in various developing countries, particularly in East Asia, finding an 'East-Asian model' of cluster-based industrial development. These authors proposed three stages in the endogenous process of industry development: (1) initiation, (2) quantity expansion and (3) qualitative improvement. Meanwhile, Bergman's study focused on a cluster lifecycle, at-

tempting to provide a better understanding of how clustering firms in dynamic environment come to dominate certain technologies and markets with growth and innovation. His synthesis uses the concept of Maskell and Kebir[1] as a key basis, elaborating on this by adding sub-stages to each stage of development. Bergman differentiated the lifecycle of clusters into three main phases: (1) existence, (2) extension and (3) exhaustion.

Figure 8.1
Developmental Stage of Clusters and Institutional Modality of Cluster Intervention
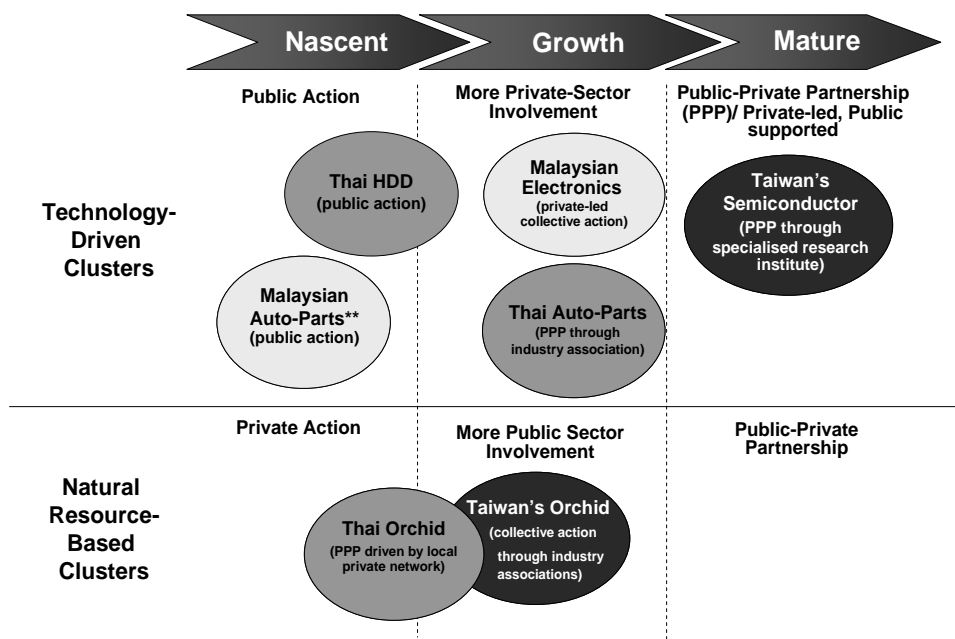
Note: Stage of development in this chart does not present the performance of the clusters, but the progress of cluster development process.
** Malaysia automotive and auto-parts cluster is in a liberalisation process after being protected under national policy since 1985.

Nonetheless, the stages of development as defined in this study do not include a declining stage (that termed by Bergman as 'exhaustion') because none of the cluster cases studied are at a declining stage of development. Most were recently established and still at an early stage. Sonobe and Otsuka's concept (2006) seems fit to the analysis, especially

for clusters in Asian developing countries. Hence, stages of cluster development identified in this section are mainly based on the concept of Sonobe and Otsuka, combined with some aspects from Bergaman.

The stages of cluster development are (1) nascent stage (initiation), (2) growth stage (quantity expansion) and (3) maturity (quality improvement). At *the nascent (initiation) stage*, clusters mostly manufacture simple parts, components and final products by adopting or imitating foreign technology directly through MNC firms. Cooperation among firms is mainly based on production linkages. Collaboration with government agencies and other related institutions may appear but is always through formal procedures and practices. Clusters farther along enter the second stage of development, i.e. the *growth (quantity expansion) stage*. At this stage, a spin-off process usually occurs. Clusters expand, due to their ability to attract traders, parts suppliers, skilled workers and engineers. Firms and non-firm actors cooperate more closely to pursue cluster development strategies. Mutual trust and visions shared by the different groups of actors are more firmly established.

When the productivity growth of a cluster stagnates or even turns negative, cluster profitability also declines, since high productivity leads to oversupply and falling prices. The cluster is then said to have reached the *'mature stage'* and needs to shift its focus to *quality improvement*. At the mature stage, innovative entrepreneurs start to improve production by employing higher skilled labour. Management of cluster firms is improved and marketing channels and brands are established. Most successful entrepreneurs at this stage are more highly educated than the old-generation founders of the businesses. Knowledge exchange and spillovers have occurred at different levels both within and among organisations. Educational and research institutes have worked with firms systematically and closely participated in cluster development. Based on this definition, one might observe that the developmental stage of a cluster is related to the capabilities of local firms to rapidly adapt in a changing business environment and to develop their own strengths to increase their competitive advantages.

Figure 8.1 shows some differences in the development paths of technology-driven and natural resource-based clusters. Technology-driven clusters in many developing countries are basically policy-driven clusters, so their development paths mostly start with a public-led approach. Afterward, when a cluster has grown, involvement of the private sector

gradually increases. Finally, cooperation between the public and private sectors is more firmly established when a cluster reaches maturity. Yet, the natural resource-based clusters in this study started from a private-led initiative. After the clusters had increased their productivity and demonstrated high potential, the government then came into play in providing support. However, neither of the two orchid clusters has reached the mature stage of development. If the pattern of development of natural resource-based clusters were similar to that of technology-driven ones, it might be expected that greater public involvement will eventually be transformed into public-private partnerships for cluster development, which could be led by either the private sector or the public sector.

The Taiwanese semiconductor cluster is the only cluster at the mature stage (figure 8.1). Nowadays, local firms in this cluster are strong in technology and have a strong foundation for upgrading their advanced and innovative capabilities. The technology-driven Thai HDD cluster and Malaysian electronics cluster remain highly dependent on foreign technologies and have limited capability to develop their own technological strengths. The Malaysian electronics cluster is considered to be a growth cluster. Close collaboration between electronics firms and local government in human resource and skill development is now firmly established, even though the cluster remains weak in other types of developmental activities. Of the two automotive and auto-parts clusters, the Thai cluster is more advanced than its Malaysian counterpart. Thailand has conducted more activities for cluster development with close collaboration between the public and private sectors. Meanwhile, progress in the Malaysian automotive and auto-parts cluster remains in the hands of the government, with the private sector having a rather limited role in driving cluster development initiatives.

The development patterns of the Thai and Taiwanese orchid clusters are alike, i.e. initiated by local private farmers/entrepreneurs. The two clusters were formed at about the same time, in 2002, but this analysis reveals the faster development of the Taiwanese orchid cluster, due to the quick shift of the Taiwanese government's role in supporting cluster development. So, the Taiwanese orchid cluster can be judged as more advanced than the Thai orchid cluster.

The analysis of the five technology-driven clusters in this study suggests that the government plays an essential role in developing clusters, especially technology-driven clusters at the nascent stage of develop-

ment. These clusters require strong state support since by nature they have high heterogeneity of actors involved. Technology-driven clusters in developing countries generally exhibit some assemblage of power relations including foreign MNCs of various nationalities, local firms and government. Governments, in these cases, seem to be a neutral actor that can connect or compromise common interests of the other two parties. Moreover, due to weaknesses of local firms in nascent technology-driven clusters, government is usually requested to support local firms in all respects. This situation forces government to take action and devote significant effort to developing technology-driven clusters early on.

However, the key for government is to strategically attract increasing involvement of the private sector in cluster development, while simultaneously creating a local supporting institution to be the core agency coordinating cluster development activities in the longer term. A core agency must exhibit high adaptability in the fast-changing environment of clusters. When a cluster reaches the mature stage, government must shift gears, to become a facilitator and let the private sector take the lead in cluster development. In this regard, the Taiwanese semiconductor cluster represents an outstanding case in which government successfully developed a high-performance technology-based cluster. In addition, the Malaysian electronics cluster shows effective efforts by government in gaining private-sector participation in developing the human resources of the cluster.

In the Thai HDD and automotive and auto-parts clusters, the government created a core agency to coordinate cluster activities. But these core agencies need further strengthening in order to perform their desired roles. If a government remains protective of a cluster, maintaining a dominant role in driving cluster development without encouraging the private sector to be more actively involved, it is hardly possible for the cluster to grow and shift to a more advanced stage of development, as seen in the case of the Malaysian automotive and auto-parts cluster. The Malaysian government has protected this cluster since 1985. No core agency for cluster coordination has been established and the capabilities of local firms remain weak.

In contrast, in the two natural resource-based clusters in this study, the government played a limited role at the nascent stage of cluster development. Rather, local entrepreneurs were the key movers/drivers of advances. However, government actions are still necessary, especially to

speed the growth of clusters, as demonstrated by the Taiwanese orchid cluster. The fast progress in development of that cluster is largely due to the shifting role of the government towards being more supportive and facilitating of cluster development.

In addition, public-private collaboration is an essential ingredient of successful cluster development. Clusters at different stages of development involve various actors and require a variety of supporting institutions to effectively cope with competitive challenges. To formulate effective cluster policy, policymakers should pay attention to the dynamic relationships among the relevant actors, while realising that these may change at different stages of cluster development. The result will be policy support that suits the specific requirements of clusters at different stages of development.

8.3.2 Refocusing the Role of Foreign MNCs and Local Capabilities in Cluster Development

One pitfall of cluster policy in many developing countries is a too exclusive focus on promoting exports and attracting FDI with the aim of upgrading technology and increasing national competitiveness. From the analysis, one observation is that clusters with high involvement of foreign MNCs face more limitations in effectively implementing their institutional modalities than the clusters with less involvement of foreign MNCs, as seen in the three technology-driven clusters (i.e. Thai automotive and autoparts, Thai HDD and Malaysian electronics clusters). However, it is too quick to simply judge foreign MNC involvement as an obstacle to cluster development. The key in this regard concerns the interplay between the role of the host country government and that of foreign MNCs.

The findings of this study underscore that policy to promote exports and attract FDI for cluster development is necessary but not sufficient. Another key to developing the competitiveness of clusters is strong local capabilities. The role of the government is crucial in strategically leveraging the active participation of foreign MNCs to enhance capabilities of local firms. Governments in many developing countries, including Thailand and Malaysia, have tended to focus on creating an attractive business environment to facilitate FDI firms, while underemphasising development of the capabilities of local firms and local institutions (or 'local capabilities'), especially in the industrialisation era. This has limited the

capability of local firms to capture benefits from foreign MNCs to create their own strengths.

The result demonstrated by the Taiwanese semiconductor cluster is distinct from those of the three MNC-dominated clusters in Thailand and Malaysia. Since the starting point of its industrialisation, Taiwan's government has substantially invested in developing local capabilities through two approaches: (1) directly enhancing the capabilities of local actors to rapidly adapt in the changing global business environment and (2) creating technology-supported infrastructures and strengthening local supporting institutes to provide an enabling technological- and research-based environment for firms to be highly productive and innovative. Consequently, nowadays local firms in the Taiwanese semiconductor cluster are freer from foreign technology dependence. This feature is not only seen in technology-driven but also in natural resource-based sectors in Taiwan. Taiwanese local firms in both sectors have strong technological capabilities and can innovate to strengthen their competitive positions internationally.

The Thai and Malaysian governments, in contrast, have come to realise the fragility of their comparative advantages just recently, after facing new and fast-growing low-cost competitors from China, India and Vietnam in the global markets. With limited capability to compete in high-end segments that require advanced technology and intensive innovation due to their high reliance on foreign MNCs, local firms in many sectors in Thailand and Malaysia have been struggling to seek strategies to release themselves from the position of being stuck in the middle (neither maintaining a low-cost leadership strategy, nor competing in the high-end innovative segments).

The strategic shift of the Thai and Malaysian governments towards enhancing their clusters by upgrading local capabilities is a good sign. But, these governments need to put more effort into driving the strategies by leaps and bounds; otherwise they will be unable to overcome this serious challenge. Establishing a strong foundation of local capabilities requires a powerful commitment and continuous effort by government and other concerned parties. However, at present, both Thailand and Malaysia are in the midst of an uncertain political crisis. This might affect the continuity and commitment of government agencies to pursue cluster policies. Local private firms and industry associations may have to be more actively involved in driving cluster development. The case of the

automotive and auto-parts and orchid clusters in Thailand show that the private sector, through associations and local entrepreneurs, do not have to wait for government actions. These entities can take a leading role in driving cluster development and upgrading local capabilities, especially regarding human resources.

8.3.3   Importance of Process Evaluation for Effective Cluster Policy Implementation

In developing countries, most policy evaluations conducted by governments are rather traditional assessments of achievements in terms of the outputs and outcomes identified as policy goals. As discussed in chapter 7, while output/outcome evaluations are necessary, they largely disregard pitfalls of policy implementation. Following the notion of Rodrik (2007) regarding process-focused industrial policy, this study's assessment of the effectiveness of institutional modalities of cluster intervention, hence, focused on process evaluation rather than an output/outcome evaluation. The aim was to gain a better understanding of what has been done wrong and what is missing in the cluster policy process. To make this assessment, two groups of indicators, called 'elements', were designed. The first group is the *practical prerequisite element* and includes three sub-elements: (1) presence of a core mechanism/institution for long-term cluster cooperation and development, (2) ability to create a shared/common goal or development direction among key cluster actors and (3) distribution of responsibilities and co-investment in solutions between the public and private sectors. The second group is *real commitment and effort of key actors in a cluster,* comprising two sub-elements: (4) ability to play a catalytic role to create commitment or ownership of cluster actors and (5) ability to create collaboration in evaluating projects and readjusting cluster strategies.

Even though this study used only simple indicators to assess the effectiveness of the institutional modalities of cluster intervention, it did find some diversity in the effectiveness of the selected modalities and a variety of influential factors. These include (1) the business system and sectoral conditions, (2) characteristics of the core agency for cluster co-ordination and (3) the presence/absence of particular cluster actors to deal with certain competitive challenges. These aspects cannot be illuminated with an output/outcome evaluation. Based on the traditional means of policy evaluation, policymakers will likely follow an approach

that has proven effective (according to outputs/outcomes) in developing a certain cluster without having a clear understanding of the factors affecting the policy implementation process. Hence, policies for cluster development in many developing countries usually underemphasise issues that are in fact key to effective implementation of cluster policy, e.g. building and strengthening a dynamic mechanism for cluster coordination, creating commitment among cluster actors to upgrade capabilities and so on. This study's results suggest that a process evaluation is crucial, first, to more deeply understand the pitfalls of cluster development and, second, to significantly contribute to learning by government, policymakers and the private sector. Such learning should eventually lead to more effective processes of cluster development and more successful cluster policy implementation.

8.4   Theoretical Reflections and Contributions to the Literature

Key findings and lessons learnt from this study can be cast as suggestions for improving cluster and related theories and contribute to the literature, especially that on cluster and industrial policy and on the Business System Concept.

8.4.1   Contributions to the Cluster and Industrial Policy Literature

Main contributions of this study to the cluster and industrial policy literature concern the policy- and process-oriented approach to cluster development. The *first contribution* relates to the role of government policy in cluster formation. A common fallacy of cluster theory is that clusters should be developed based on existing, established or emerging industries and that government should not try to create a newly established cluster from scratch or in an entirely new industry. Moreover, Porter's cluster theory seems to distrust government intervention and the role of the academic sector in leading clusters:

> Cluster initiatives must be motivated by the desire to achieve results; they should not be driven by academic institutions, think tanks, or government agencies that see research as an end in itself (Porter 1998).

However, this study provides some observations that contradict this aspect of Porter's cluster theory. Evidence from the Taiwanese semiconductor cluster shows that with massive and strategic government efforts,

a highly successful cluster can be created. At the beginning of establishment of its semiconductor cluster, Taiwan was still reliant upon its agricultural sector. Highly technology-based sectors had not yet become established in the country. The Taiwanese government attempted to shift the island towards an industrialised economy, using the semiconductor industry as a spearhead of economic growth. For more than 30 years, the government put tremendous effort into establishing strong local institutions, especially in relation to technology and human resource development to support semiconductor firms. As a result, the semiconductor cluster became well-established and earned great international success. At present, the Taiwanese semiconductor cluster has evolved to a mature stage and government has been shifting its role to a more supportive one in facilitating this cluster's development.

The key implication from this case study is that government can create a successful cluster from scratch, but strong government commitment to long-term cluster development is required. Beyond the typical role of creating sound business conditions to support the productivity of firms, as emphasised by cluster theory, government should be strongly committed to institutionalising a mechanism for long-term development of clusters. Notwithstanding, the success of the Taiwanese government in initiating and driving the semiconductor cluster might be an exceptional or unique case driven by a specific national context. Perhaps it cannot be replicated elsewhere. However, this one case in the current study did show results that seem to contradict the conventional expectations of cluster theory.

The *second contribution* of this study relates to the process focus for effective cluster development. To some extent, this fills a gap in cluster theory. This study's findings demonstrate that to successfully develop a cluster, the essence is not merely the matter of *'what'* strategy is applied, but also *'when'* the strategy should be implemented. Government should pay more attention to sequence, implementing selective cluster policies at the right time to suit the developmental stage of the cluster concerned. Moreover, to enable effective concerted efforts by all relevant actors in clusters, it is essential to understand the rationales and motivations underlying actions and the relative capabilities of each cluster actor. These factors affect power relations and interactions among them, as well as their decision-making and commitment to participate in cluster activities. The formulation of cluster policy that takes into account of 'right time'

and 'sequences' in implementting cluster policy will allow more effective cooperation of cluster actors and hence lead to more successful cluster development.

8.4.2   Contributions to the Business System Concept

As discussed earlier with regard to the relationship between cluster governance and institutional modalities of cluster intervention, evidence from this study contrasts with a core argument of the Business System Concept, originated by Richard Whitley. The Business System Concept (Whitley 1994) expects economic actors within the same business system to behave and interact similarly in terms of economic coordination and organisation. The findings from this study reveal that this is not necessarily the case. Clusters facing similar challenges and operating in the same business system might respond to the challenge differently, as seen in the case of the Thai automotive and auto-parts cluster and the Thai HDD cluster (see details in chapter 7, section 7.5). This study suggests that to investigate the relations between business systems and economic coordination by the Business System Concept, it is necessary to incorporate an analysis of the composition of economic actors (e.g. foreign versus local) and the industrial structure and nature of the industry, which influence inter-firm relations. Adding these elements to the framework for analysing business systems will deepen understanding of the interplay between the industry-specific context and the national context in constituting a particular form of economic organisation and coordination.

8.5   Limitations and Challenges for Future Research

Although this study has revealed a number of ways in which cluster theory and cluster policy processes can be improved, there remain some topics that would benefit from further research.

First, admittedly, this study has its limitations in terms of depth of analysis of two main elements influencing cluster policy. These elements are (1) leadership, which is part of the capabilities of cluster actors, and (2) culture and local identity, which is part of the national context. A deeper analysis of the influences of these two elements on cluster development, as well as knowledge of sociology and anthropology, could produce a greater understanding of the sociological and psychological dimensions of cluster actors. To analyse these relationships, it would be necessary to develop a specific framework with which to explore how

these two social elements impact cluster development. This is a challenge for future research which could fill another gap in cluster policy theory.

Second, it would be worthwhile to apply Principal-Agent Theory in the analysis of cluster governance and of interactions among cluster actors. Applying Principal-Agent Theory to investigate cluster governance would paint a more complete picture of interactions among key actors within the public sector and between the public sector and the private sector towards cluster development. In so doing, it would require a more detailed analysis from a political economy perspective, which is outside the scope of the current study. Moreover, a systematic framework would need to be specifically designed for such an analysis. In fact, the Principal-Agent Theory was applied in the study by Ouyang (2006) on the development of Taiwan's semiconductor industry. However, Ouyang's study focused on explaining technology policy to develop the semiconductor industry. It did not look into the cluster aspect of the semiconductor industry and focused mainly on explaining agency problems on the government side. In other words, it viewed this matter from the government's perspective, rather than from the private sector's perspective. It would be fruitful to study principal-agent relations within the public sector, within the private sector and between both sectors, to sketch how mutual advantages enable or mobilise actors with different interests to unite in collective efforts (Davis 2003, p.70-71). A comparative study applying Principal-Agent Theory to cluster governance in many clusters from different sectors would be beneficial for advancing cluster theory as well.

Third, this study made a few observations related to the positioning of the seven clusters based on their developmental stages. However, it would be beneficial to study these based on cluster development path, so as to obtain knowledge of how clusters emerge, grow, evolve and decline and of the conditions or factors necessary at each stage of their evolution. Understanding the specific conditions and needs of clusters at each developmental stage would contribute to more effective and efficient industrial and cluster policy, as it would assist policymakers and practitioners in the formulation and implementation of generic and specific cluster policies. Moreover, it may provide some guidance for government, or at least reveal policy pitfalls that should be avoided.

Notes

1 See more details in Maskell, P. and Kebir, L. (2005). What Qualifies as a Cluster Theory?, DRIUD Working Paper No. 05-09, Department of Industrial Economics and Strategy, Copenhagen Business School.

Appendices to the Book

Appendix 1: Methodology for selecting the case studies

The process of selecting the case studies started with an exploration of clusters located throughout the world. Although there are a myriad of cluster studies, no one knows the exact number of clusters in the world. This study's case study selection started with a search using the Internet and secondary sources of where clusters are located and how they are characterised. Three cluster databases were found from well-recognised organisations, namely the Institute for Strategy and Competitiveness (ISC), the Competitiveness Institute (TCI), and the European Commission (EC). Of these three sources, the Cluster Meta-Study conducted by ISC, Harvard Business School in 2002[1] covers the largest number of clusters. ISC's 2002 report records 833 clusters, covering a wide range of sectors in 49 countries (Van der Linde and Porter 2002). To obtain as much information as possible, this study consulted all three of these sources and other cluster-related literature.

A systematic process for screening cluster cases was designed, divided into two major steps and sub-steps. The first step was a short-listing and the second step was a feasibility assessment (see figure below).

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[1] More information can be downloaded from ISC website: www.isc.hbs.edu

Steps in Selecting Cluster Case Studies

Short-listing Step

1. List of clusters in Thailand, grouped by industry natures and sectors

2. Literature reviews of clusters in East and Southeast Asia

3. Make a short list of cluster cases
- Match clusters in Thailand and those in other countries in East and Southeast Asia, considering diversity of sectors and natures of clusters, i.e. traditional and high-tech.
- Identify potential cases.

Feasibility Assessment Step

4. Screen countries where the clusters in the short-list located, based on their national economic/international trade structures that are highly similar to those of Thailand.
5. Evaluate the cluster cases in the short list based on the key elements indicated in the analytical framework, i.e. cluster characteristics, cluster governance, institutional modalities, and national contexts.
6. Evaluate feasibilities of field studies based on availability of data/information and accessibility to information and key persons.

In the *first step*, a list of clusters in Thailand from a survey of the Cluster Mapping Project[2] provided the main base for selection. This survey found 122 clusters, scattered in every region of the country and representing every economic sector, from agricultural/natural resource-based to manufacturing (low-tech and light industry as well as high-tech and heavy industry) and the service sector. Of these clusters, 11 were identified as high-potential clusters prioritised as key strategic clusters in Thailand's industrial policy.

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[2] Thailand's cluster mapping project was the joint study between Office of the National Economic and Social Development (NESDB) and Kenan Institute Asia. Is objectives were to identify and gather information on clusters, to assess a potential of selected clusters and to review strategic challenges facing these clusters and ways of identifying those challenges as a prelude to possible pilot projects to support those clusters in the future.

The *second step* was the search for clusters in East and Southeast Asia. There was however no source or database specifically collecting data on clusters in these two regions. Thus, the list of clusters in these regions was mainly derived from secondary sources, e.g. reports, journal articles, websites, books, newspapers, etc., and also from the TCI and ISC databases. Among the 117 clusters recorded in the TCI list, only two are in Southeast Asia and none are in East Asia. The ISC list recorded 12 clusters in 4 Southeast Asian countries and 16 clusters in East Asia. Apart from these two lists, 77 clusters in East and Southeast Asia were found from literature and documents from various sources.[3]

The *third step* was to make a short list of potential cluster cases, giving priority to clusters matching existing clusters in Thailand. The results found 10 feasible clusters, located in 6 countries besides Thailand (Singapore, Malaysia, Vietnam, Taiwan, China and Japan).

The *fourth step* was to the screen clusters in countries with an economic context similar to that of Thailand, based on three criteria: (1) similar economic or international trade structure, (2) comparable to existing clusters in Thailand, especially in the same sector as the indicated high-potential clusters in Thailand,[4] and (3) representing high-tech and traditional/natural resource-based sectors. The results showed that Malaysia, Taiwan and Vietnam have a similar economic and international trade structure to that of Thailand. However, after obtaining more insight on clusters in these three economies, it appeared that the clusters in Vietnam no longer existed.[5] Hence, Vietnam's clusters were eliminated.

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[3] Other clusters in East and Southeast Asia might be recorded or mentioned in other literature. However, due to time constraints, only 77 clusters were found.

[4] The high-potential clusters identified in Thailand's cluster mapping project are in various sectors, including the following: automotive and parts, electronic, vegetable/agriculture, gems and jewellery, ceramics, flowers and livestock.

[5] Vietnam Competitiveness (VNCI) is an international organisation actively driving cluster initiatives in Vietnam It is funded by the US Agency for International Development (USAID). Cluster development was first applied by VNCI in 2003 as a major tool to strengthen SMEs. VNCI had been driving five clusters in Vietnam, i.e. Ha Long tourism, ICT/software cluster in Hanoi, ICT/software cluster in Ho Chi Minh City, home accessories cluster in Hatay and dragon fruit cluster in Binh Thuan. Nevertheless, according to in-

The electronics and orchid clusters in Taiwan and the electronics and automotive parts clusters in Malaysia were viewed as comparable to high-potential clusters in Thailand.

The *last stage* was to ensure at the onset that the selected cluster cases fit the analytical framework. A preliminary investigation of cluster characteristics, governance and institutional modalities in these seven clusters was conducted based on available secondary data. This aimed to assess whether the seven cases were different in major aspects from the designed analytical framework. A critical step was to compare the effectiveness of cluster intervention among them. The feasibility to conduct fieldwork was also assessed, particularly accessibility to key informants and necessary information. Thus, the seven clusters appeared suitable for further study to answer the core research questions.

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formation from VNCI, in 2004 cluster initiatives in Vietnam were completely stopped. Cluster initiatives seem not to work well in the Vietnamese context, mainly due to low levels of trust among industry players. The short period of funding by USAID was another factor leading to the rushed implementation of cluster development projects with a little care for properly implementing sequences. VNCI engaged related pubic agencies, mostly local governments, in cluster projects, but they were seldom proactive. There was no specific government policy to support cluster development. Similar things could be said with regard to academic institutions. Currently, except the ICT cluster in Hanoi, the other clusters no longer exist. The Hanoi ICT cluster could hardly be considered a working cluster, as no activity had been initiated or implemented by cluster members. It merely served as a networking tool for industry players.

Appendix 2: Interviews with Key Stakeholders

Cluster	Number of interviewed key stakeholders				
	Firms/ Entre- preneurs	Govern- ment	Industry Associa- tions	Academic/ Research/ Specialised institutes	Total
Thailand					
1. HDD cluster	9	6	2	8	25
2. Automotive & auto-parts cluster	18	8	3	4	33
3. Orchid cluster	11	9	2	3	25
Taiwan					
1. Semiconductor cluster	3	2	1	6	12
2. Orchid cluster	3	1	8	2	14
Malaysia					
1. Electronics cluster	4	7	1	8	20
2. Automotive & auto-parts cluster	3	4	2	1	10
Total	**51**	**37**	**19**	**32**	**139**

Appendix 3: Characteristics of four major institutional modalities

Institutional Modality of Cluster Intervention	Characteristics
Public Action	• Initiatives to solve particular problems or handle competitive challenges of clusters are generated by government or public agencies.
	• Budget for cluster development is fully funded by the government. Private sector's contribution in terms of finance is very limited.
	• The implementation of strategies/policies has been done by government alone or with limited participation from private sector, either because of lack of awareness of private sector or obstructive conditions created by government.
	• Interventions and cluster activations are undertaken through mechanisms set up by government, e.g. science/industrial parks, government's projects, specialised institutes, etc.
	• Private sector is not aware of their important roles in contributing to cluster activation.
Joint Private Action	• A limited number or a small group of firms join hands to solve a specific problem that an individual firm alone cannot solve successfully. Joint activities might be in a form of equipment sharing, order sharing, joint research project, etc.
	• Source of fund or finance to handle such challenge is mainly contributed by allied firms in that joint initiative.
	• At the beginning, joint efforts tend to be done by a limited number of firms. Afterward, it can be developed towards public-private partnerships modality, if it involves more other participants, e.g. government agencies, academic and research institutes, or other supporting and related industries, in a process of handling their competitive challenges.
	• Private firms participating in joint activities are co-responsible or accountable for results or outcomes of such activities.
Collective Action through Trade/ Industry Association	• For this study, collective action refers to actions that are done through business/trade/ industrial associations to create collective efficiency for firms in a particular industry.
	• Business associations provide common services to serve needs of industries, e.g. information sharing, training, marketing, etc. In some literature, these activities may be called 'real services' (Knorringa and Meyer-Stamer 1998).
	• Interactions, practices, or behaviours of members of associations are governed by shared/common goals, rules, standards, or codes of conduct.
	• Business associations play a key role in creating platforms for firms in clusters to collaborate in tackling particular cluster problems.
	• Formal and informal discussions take place regularly among cluster firms (especially among firms initiating such cooperation).
	• Collective actions are traditionally done by lobbying of trade associations for more favourable policies from government and other related organisations, e.g. educational or research institutions.
	• Trade associations usually actively participate in forums for shaping locational advantages (Knorringa and Meyer-Stamer 1998). However, this modality can be developed towards more productive ways of collaboration like public-private partnership.

Institutional Modality of Cluster Intervention	Characteristics
Public-Private Partnership	• Public-Private Partnership (PPP) is based on ideas of mutual added value and mutual development. In a partnership, involved actors are really dependent on each other. Cooperation through PPP provides benefits for all parties involved, i.e. public and private actors. Benefits can be in various forms, e.g. financial/profits, working space, accessibility to transport, convenience in business transaction, etc., or more intangibly, such as image, knowledge development, and so forth. • Both public and private actors perceive values of co-operation and expected benefits, so that they link their interests and problems, then pursue mutually interesting solutions and will to invest in such cooperative efforts. • A government service or private business venture is funded and operated through a partnership of government and one or more private companies, or in a form of cost sharing. • Government and private firms in a cluster synergise their efforts in tackling particular problems. Particular responsibilities or tasks are formally assigned to each party. This might be done in many forms, such as MOU (Memorandum of Understanding), contract, or other types of agreement. • A management system, comprising both related public agencies and private companies, might be set to facilitate implementation. • In some cases, government may invest or co-finance in setting up a mechanism and let private sector operate or execute that mechanism. • Nevertheless, it could also be possible that private firms invest or contribute some budgets to set up a specific mechanism/agency to deliver them specific services, e.g. training, standard testing, information centre, etc.

Appendix 4: Summary of responses to the questions related to roles of key organisations in the cluster development

Questions		Number of responses*				
	Local Leading firms	MNCs	Government	Associations	Academic Institutions	Specialised Intermediary Institutions
1. Thai HDD Cluster				IDEMA		NECTEC
Organisation that takes a leading role in initiating and driving cluster development policies and activities		22	9			5
Organisation that has high degree of involvement in cluster policy processes		21	19	1		15
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes		21	17			6
Organisation that plays cooperating or supporting roles in cluster policy processes			12	2	6	18
2. Malaysian Electronics Cluster				MAEI		PSDC
Organisation that takes a leading role in initiating and driving cluster development policies and activities		16	15			6
Organisation that has high degree of involvement in cluster policy processes	2	16	16	14		6
Organisation that has high influence (direct and indirect) in decision making in the cluster policy processes		16	16	9		5
Organisation that plays cooperating or supporting roles in cluster policy processes		2	16	5	3	12
3. Taiwanese Semiconductor Cluster				TSIA		ITRI
Organisation that takes a leading role in initiating and driving cluster development policies and activities	3		3			10
Organisation that has high degree of involvement in cluster policy processes	4		10	3		10
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes	5		10	1		10
Organisation that plays cooperating or supporting roles in cluster policy processes	5		7	5	10	8

Questions	Number of responses*					
	Local Leading firms	MNCs	Government	Associations	Academic Institutions	Specialised Intermediary Institutions
4. Thai Automotive and Auto-parts Cluster				TAPMA & TAIA		TAI
Organisation that takes a leading role in initiating and driving cluster development policies and activities		23	23			
Organisation that has high degree of involvement in cluster policy processes		23	23	19		18
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes	1	23	20	10		6
Organisation that plays cooperating or supporting roles in cluster policy processes	6	9	11	15	5	12
5. Malaysian Automotive and Auto-pars Cluster				MAA		
Organisation that takes a leading role in initiating and driving cluster development policies and activities	2		8	2		
Organisation that has high degree of involvement in cluster policy processes	6	2	8	6		
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes	6	1	8	2		
Organisation that plays cooperating or supporting roles in cluster policy processes	4		4	5		
6. Taiwanese Orchid Cluster				TOGA and others		
Organisation that takes a leading role in initiating and driving cluster development policies and activities			2	10		
Organisation that has high degree of involvement in cluster policy processes	2		9	10	4	
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes	2		9	10		
Organisation that plays cooperating or supporting roles in cluster policy processes	3		8	9	6	

Questions	Number of responses*					
	Local Leading firms	MNCs	Government	Associations	Academic Institutions	Specialised Intermediary Institutions
7. Thai Orchid Cluster						**Cluster leader & local network**
Organisation that takes a leading role in initiating and driving cluster development policies and activities			5	1		20
Organisation that has high degree of involvement in cluster policy processes	7		20	13		19
Organisation that has high influence in decision making (direct and indirect) in the cluster policy processes	5		18	10		16
Organisation that plays cooperating or supporting roles in cluster policy processes			10	7	9	13

* Note: One count represents one response of each interviewed key person (more than one interviews might be conducted in some organisations) that identifies the key cluster actor actively participating and having high influences in cluster policy processes (one person might identify more than one actors), regardless the type of such interviewed organisation. For example, when asking a firm about an influential organisation in cluster policy processes and its answer was the Ministry of Trade and Industry and MNCs, the count will be put in the box of 'the government' and 'MNCs'.

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Born in Bangkok, Thailand, Piyanit Onoparatvibool earned her first BA degree with honours in political science (major in sociology and anthropology) from Chulalongkorn University, Bangkok, Thailand, in 1992. After graduation, she worked at a multinational corporation, Pacific Telesis (Thailand) Co, Ltd, as a recruitment and training assistant officer for one year. She left the company to pursue a master's study in public administration (major in public policy) from the same university and graduated with distinction in 1995. From 1995, she worked as a policy and plan analyst at the Office of the National Economic and Social Development Board (NESDB), a national planning agency of Thailand, where she is still employed at present. At the start of her policy planning career at NESDB, she worked in the National Accounts Division and then in the State Enterprise Section, Government and Private Co-operation Division, dealing with investment approval for infrastructure projects of state-owned enterprises in Thailand.

In 1999, she received a scholarship from the Netherlands Fellowship Programme (NFP) to do her master's in business administration (major in corporate strategy and economic policy) at the Maastricht School of Management (MSM), in the Netherlands. Since then, she has been interested in competitiveness and industrial development. After returning home in 2000, she continued working at NESDB and has been involved in industrial policy and competitiveness strategy planning.

Her interest in cluster development started in 2001 when she was assigned to the joint NESDB-private sector research project "Cluster Development for Thailand's Competitiveness: The Case Study of Tiger Prawn and Phuket Tourism", under the supervision of Prof. Michael E. Poter. Thereafter, she was involved in the study "Thailand's Competitiveness Development: The Cluster Approach Application in Thailand's Five Global Niches", which was a joint project involving NESDB, Harvard Business School (Prof. Michael E. Porter) and Sasin Graduate School (Chulalongkorn University). Experience in strategic planning for industrial development and involvement in the development of many clusters in Thailand inspired her to pursue a PhD study and conduct this research to find ways to improve cluster policy processes and development in Thailand. She again received a scholarship from the Netherlands

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