Strategic Learning and Capability Development Challenge: The Case of Thai Auto-Part Firms

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Declaration Statement

I certify that this thesis is wholly my own original work. This study contains no material which has previously been accepted for the award of any other degree at any other university. To the best of my knowledge, this study contains no material previously published or written by any other person, except where due reference is given in the text.

Chaiwat Chitravas
Canberra – October 19, 2006

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Abstract

The objective of this thesis is to investigate the competitive and learning strategies of Thai auto-part firms, in particular the impact of the differences in strategies on the firms' learning activities and mechanisms. The study finds that firms' strategies, learning activities, and learning mechanisms interacted to form either a fast or slow rate of firm capability accumulation. The conceptual and analytical framework integrates four components: 1) the changes in the external meso-environment, 2) firm competitive and learning strategies, 3) firm learning activities and mechanisms, and 4) firm capability development. In addition, the behavior of firm owners and its top managers were also explored. The frameworks are used to build a causal model to explain how different firm strategies contribute to different types of learning activities and mechanisms, and finally how these systemic elements interacted together to shape the latecomer firms' capability accumulation pattern and finally their "capacity to learn".

The research adopted a qualitative multiple-case study approach, with cross-case comparisons, involving nine Thai auto-part firms. The primary data comprised semi-structured interviews and some direct observations, while the secondary data comprised many documents from both the nine firms and the supporting organizations. The use of a wide range of sources, including interviews with industry experts, contributed to the reliability of the assessments of firm level strategies, activities, and performance. The analysis comprised a painstaking *iterative* process of analyzing the interview transcripts, drawing analytical tables and figures, writing analytical memos, and consolidating these into nine detailed case study write-ups.

The analysis shows that the performance of these nine firms – in terms of growth, exports, product sophistication, etc. – diverged over time. The empirical evidence suggested that Thai auto-part firms' competitive and learning strategies evolved differently, and that those strategies were shaped by and influenced: 1) their *subjective* perception of changes within the meso-environment and 2) the firms' stock of accumulated capabilities. This impacted the way the firms chose their learning mechanisms and conducted their learning activities. Depending on the types of strategies (conservative or ambitious), the firm's learning activities progressed either gradually or swiftly from simple activities to more complex ones. Similarly, depending on the level of effort, coordination, and synergy achieved in concurrently managing strategies, learning activities and mechanisms, the firms either achieved a fast or a slow rate of capability accumulation. It is argued that regardless of firm differences, one thing remains crucial – the systemic learning property (i.e. the firm's "learning system"). Viewing the changes within the meso-environment as business opportunities, the "strong learner" firms tended to formulate aggressive competitive and learning strategies, engaged in a more diverse, complex (yet focused) learning activities, and achieved synergy between the passive and active learning mechanisms. In short, these firms had a well-aligned learning system. In contrast, the "weak learner" firms viewed the meso-level changes more as threats. They had conservative strategies, inadequate learning effort with poor transition to complex learning activities, and lack of synergy between the passive and active learning mechanisms. In short, these firms had a poorly-aligned learning system. Additionally, the role played by the Thailand Automotive Institute could be crucial to assist the weak learner firms to transition to become stronger, and avoid being "locked in" to a poorly-aligned learning system.

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List of Abbreviations

AAF	ASEAN Automotive Federation
ADC	Automobile Development Committee
AEDP	Automotive Experts Dispatching Program
AFTA	ASEAN Free Trade Agreement
AIC	Automobile Industry Club
AICO	the ASEAN Industrial Co-operation Scheme
APIC	Auto-Parts Industry Club
ARTC	Automotive Research and Testing Center
ASEAN	Association of South East Asian Nations
ATI	Association of Thai Industries
BOI	Office of the Board of Investment
BUILD	BOI Unit for Industrial Linkage Development
CAD	Computer-Aided Design
CAE	Computer-Aided Engineering
CAM	Computer-Aided Manufacturing
CBU	Completely Built Unit
CD	Capabilities Development
CKD	Completely Knock Down
CNC	Computer Numerical Control
CS	Competitive Strategy
DIP	Department of Industrial Promotion
DSD	Department of Skills Development
ERP	Enterprise Resource Planning
FDI	Foreign Direct Investment
FIBO	Institute of Field Robotics
FTI	Federation of Thai Industries
GM	General Motors
HRD	Human Resources Development
IE	Industrial Engineering
IPA	Investment Promotion Act
IRP	Industrial Restructuring Program
ISO	International Organization for Standardization
IT	Information Technology
ITB	Invigorating Thai Business
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JIT	Just In Time
LA	Learning Activities
LAM	Learning Activities and Mechanisms
LCR	Local Content Requirement
LFL	Latecomer Firm Literature
LM	Learning Mechanisms
LS	Learning Strategy
MMC	Mitsubishi Motor Corp
MOC	Ministry of Commerce
MOF	Ministry of Finance
MOI	Minister of Industry
MOSTE	Minister of Science, Technology and Environment
MTEC	National Metal and Materials Technology Center
NESDB	National Economic and Social Development Board

NIEs	Newly Industrializing Economies
NSTDA	National Science and Technology Development Agency
OBM	Own Brand Manufacture
ODM	Own/Original Design Manufacture
OEM	Original Equipment Manufacture
OIE	Office of Industrial Economics
PSPT	Parish Structural Products Thailand
QC	Quality Control
QCD	Quality, Cost, and Delivery
QS 9000	Quality System (preferred by the US "Big Three")
R&D	Research and Development
REM	Replacement Equipment Manufacture
SET	The Stock Exchange of Thailand
SME	Small and Medium-sized Enterprise
SRBL	Strategic Resource-Based Literature
SUV	Sports Utility Vehicle
TAI	Thailand Automotive Institute
TAIA	Thai Automotive Industry Association
TAPMA	Thai Auto-Parts Manufacturers Association
TDRI	Thailand Development Research Institute
TISI	Thailand Industrial Standards Institute
TPI	Thailand Productivity Institute
TPOs	Thermoplastic Poly Olefins
TPS	Toyota Production System
TQM	Total Quality Management
TRIMs	Trade Related Investment Measures
TS 16949	Quality Management System (more modern than QS 9000)
UN	United Nations
UNIDO	United Nations Industrial Development Organization
US	The United States of America
WTO	World Trade Organization

Chapter 1 - Introduction

This chapter provides the background to the research problem, sets out the research objectives and the scope and focus of thesis, and provides a brief outline of each chapter.

1.1 Background and Motivation

In today's globalized world, one of the key strategic assets is knowledge (Winter, 1987) and the key process to acquiring knowledge is learning (Lundvall, 1996; Veras-Cruz et al., 2005); and furthermore, the truism is all firms need to learn and continuously change if they are to survive the competition (Bessant, 2003; Bessant and Francis, 1999). Consequently, "learning has become a key question for managers [and policy makers]" (Hakansson et al., 1999: 445), and many firms in the developing countries realize the importance of learning process, knowledge and capability development to their on-going success. Some firms, however, have not yet come to such a realization and face the grave consequences of becoming the casualties of globalization.

This research focuses on the management of learning process in Thai firms and specifically addresses the concepts of firm's competitive and learning strategies and the issue of firm capability development. Thailand is a latecomer country with much learning and technological catch-up remaining to be accomplished[1] (see for example, Khaosaat (1977), Santikarn (1981), Bell et al. (1982), TDRI (1989), Vongpanitlerd (1992), Chantramonklasri and Pfotenhauer (1994), and Arnold et al. (2000)). Moreover, the innovation (learning) system within Thailand is still highly fragmented with passive and slow technological learning firms, ineffective government policies and stand-alone education, and poor training institutes, and overall inadequate infrastructure support for firm-level development. These conditions have perpetuated over the past fifty years[2] (Amin, 2001; Intarakumnerd, 2004).

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[1] Both the technological capability of Thai firms and the country's secondary school enrolment rates lagged behind most countries in the region. In addition, the institutions and public programs targeted at upgrading firms' human resource training, skills development and formation of knowledge networks had been rather ineffective compared with other countries in the region (Ghani et al., 2002: 46).

[2] Intarakumnerd (2004) pointed out that Thailand's innovation (learning) system was in a crucial transition towards a more coherent and stronger system. The main actor spearheading the change was the Thaksin government (from 2001 to early 2006). Since mid-2006 when there was unrest in the Thai political system (which culminated in the military *coup d'état* in September 2006), the success of such transition remains highly doubtful. Consequently it could be said that it is highly likely that the fragmented, weak Thai innovation system will continue to persist in the near future.

Yet *paradoxically*, some Thai firms have managed to embrace the increased competitive pressure and started to acquire the "capacity to learn" and developed well-functioning "learning system" in order to attain competitiveness in certain product areas[3]. This paradox naturally provides an interesting question relating to firm strategies, in particularly how they overcome such immense odds (i.e. capability gap, lack of skilled human resources, fragmented industrial policies, poor innovation system, etc.) and finally develop the "capacity to learn". Consequently, the primary question this research sets out to answer is "within the poorly supported meso-environment, how can these Thai firms successfully acquire the 'capacity to learn' and increase the rate of capability accumulation."

Thailand is undergoing a period of transition:

> "...[The country] is not a highly successful 'tiger economy' such as Korea or Taiwan, nor is it a special case of a city state such as Hong Kong or Singapore – moreover, it currently finds itself in a '*sandwich position*' in respect to its competitive advantage. After having experienced remarkable growth in the decades prior to the Asian crises in 1997, Thailand is no longer a true low-wage country, but it is not a high-skill, knowledge economy either" [italics added] (Berger, 2005: 1).

It provides an excellent context for the study for three reasons (Abdulsomad, 2003: 6-7):

- Due to erosion of traditional comparative advantage, Thailand faced an increased pressure to transform the industry and move into higher value-added activities (Sheehan, 2005).
- Historically, there has been an intensification of export-led growth strategies that coincided with the withdrawal of state protection. These exports required higher levels of competitiveness in terms of product quality, lower cost, and on-time delivery, and to achieve these, higher-level of firm capabilities are required.

[3] This claim is supported by the recent research findings on transnational corporations and innovation systems upgrading in Thailand: "there is *clear* evidence that Thai based firms have gradually developed TCs [technological capabilities] in due course of industrialisation and are currently in the stage of overcoming intermediate to advanced thresholds [i.e. the movement from craft-based technician skills to design engineering (include reverse engineering) and technology research and development]. While sector affiliation and historic developments have strongly influenced these developments, the core driving force seems to be the competitive pressures associated with a liberalised world economy" [italics added] (Berger, 2005: 110). In addition, an example of a globally competitive product produced from Thailand is the one-ton pick-up trucks (Anonymous, 2006c; Zagaroli, 2005); "Thailand has a strong and growing position for pick-up trucks in the world market ... Thailand is the second largest producer of pick-up trucks worldwide behind the United States" (Porter, 2003: 24).

- The new competition, as a result of globalisation and liberalisation, created both challenges as well as opportunities for the local Thai firms.

Hence, it could be said that Thai manufacturing firms currently face a grave imperative to upgrade, to successfully move out of the "sandwich position", into a higher skill knowledge-based position and engage in higher value-added production activities.

Within Thailand, the automotive industry is particularly interesting since it has quite a long history of technological development, spanning roughly four and half decades. The industry underwent significant "swings of the pendulum" (i.e. sequence of changes in market factors, public policies as well as business opportunities and challenges) (Chitravas, 2005a; Higashi, 1995; Poapongsakorn and Wangdee, 2000; Terdudomtham, 2004; Thanamai, 1985). In addition, during the financial crisis the automotive industry suffered the most severe impact (Dollar and Hallward-Driemeier, 2000). Certainly, the sequence of industrial-level changes impacted firm's perception of opportunities and challenges, and in turn, affected the formulation of firm-level for capability development. Hence the automotive industry offered a rich ground for exploratory research on issues such as the dynamics of firm-level strategies, its interaction with firm learning activities and capability development.

1.2 The Research Problem and Key Assumptions

To understand how some Thai firms successfully learn (or fail to learn) and develop their capabilities, the sequence of changes in the macro- and meso-environment must be taken into account. Similarly the disaggregation of firm-level learning processes must be made to attempt to build an inductive model capable of explicating firm-level competitive and learning strategies, their role in shaping the rates and types of capability development. With these overall objectives, the research focuses on three key questions:

1. What were the competitive and learning strategies of Thai auto-part firms?
    a. How did these firms perceive the opportunities and challenges arising from changes in the macro- and meso-environment?
    b. How did firms respond, in terms of their firms' competitive and learning strategies, to these external changes?
2. To what extent can the differences in firm learning activities and mechanisms be explained by the differences in firm competitive and learning strategies?

3. What are the implications of the firm "learning system" – the dynamic alignment (and re-alignment) between the key characteristics of firm competitive and learning strategies and the learning activities and learning mechanisms – on the rate of firm capability accumulation?

In answering these questions, there are two key assumptions:

First a starting point for the research is the concept of firm heterogeneity derived from the resource-based perspective (see for example, Penrose (1959), Helfat (2000), Nelson (1991), Rumelt (1991), Teece and Pisano (1994) and Malerba (2002)). Even if the firms are experiencing the same sequence of historical changes within the Thai automotive industry, they are assumed that they may have different perceptions of business opportunities (and challenges) and hence, different competitive and learning strategies, different types of learning activities, and different rates and types of capability accumulation.

The second assumption is that firms with superior coordination and adaptation of their strategies, learning activities, and learning mechanisms are said to have higher-level of "capacity to learn" and thus will achieve faster rates of accumulation of capabilities. Having stated these assumptions, the overall research aim is to attempt to explain the differing rates of capability accumulation among Thai firms, in terms of their heterogeneous learning and competitive strategies and learning activities.

1.3 Objectives of the Research

In line with the three research questions and the main aim, this thesis pursues the following five objectives:

- To elaborate the sequence of policy, market and institutional changes within the Thai automotive industry since its inception in the early 1960s;
- To link the sequence of meso-level changes with the dynamics of firm-level competitive and learning strategies, aiming to differentiate "strong learner" firms from the others
- To discuss the impact of differences in firm competitive and learning strategies on the firm-level learning activities, again aiming to differentiate "strong learner" firms from the others

- To explore and explain the issue of the dynamic alignment (and re-alignment) among three key conceptual variables – 1) firm strategies, 2) learning activities (and mechanisms) and 3) firm capability development – and how such multiple alignments could lead to accelerating or slowing down the rate of capability accumulation, again aiming to differentiate "strong learner" firms from the others
- To provide a normative framework for latecomer firm's business managers facing the crucial issue of formulating firm competitive and learning strategies, aiming at a higher rate of capability development

1.4 Scope and Focus

The scope of this study is the Thai auto-part sector, which supplies auto-parts to both the replacement equipment manufacture (REM) and original equipment manufacture (OEM) markets. It focuses on a selected set of case study firms and in particular on their important historical transition periods in business activities (e.g. transition from replacement equipment manufacture (REM) auto-part trader to a manufacturer of original equipment manufacture (OEM) auto-parts, similarly the transition of OEM to ODM[4] and OBM[5], if any had occurred). The ownership of these firms is dynamic and some firms are currently within large corporate groups comprising many diversified businesses. Such firms are viewed at the group level (or at least the auto component and related parts of the group) in order to capture the "learning spillovers" and the sharing of the parent firm's competitive and learning strategies within the corporate group. In addition, the dynamics of each firm as it grew from a small family-owned to a large multinational firm is captured. Consequently the focus is also on the historical transitions of these learning activities, learning mechanisms, human resources formation and development, and crucial firm resource acquisition and access to external resources. All these factors have an impact of firm-level strategies and capability development.

1.5 Outline of the Thesis

The research is reported in nine chapters (see Table 1.1).

[4] Own design manufacture
[5] Own brand manufacture

Table 1.1 The Structure of the Thesis

	Chapter	Content / Argument
Part I	1. **Introduction**	• Background, Research Problem and Key Assumptions and Scope and Focus
	2. **Literature Review**	• Review of Latecomer Firm Literature • Review of Strategic Resource-based Management Literature • Brief review of Innovation System Literature (for developing country)
	3. **Conceptual Framework**	• Proposed framework comprising meso-level and, three key conceptual variables – learning strategy, learning activities, and capability development
	4. **Methodology** Research Method and Design	Case study method used aiming at cross-case comparison Operationalized variables: • Competitive strategy – competitive goals, product-market position, capability-market position • Learning strategy – learning goals, capability gap, internal vs. external, today vs. future, degree of aggressiveness • Learning activities – "what to learn" and "how to learn" • Technological and organizational capability – technical functions and level of complexity
Part II	5. **Findings & Analysis –** Thailand Automotive Industry	• Describing the evolution of the Thai automotive industry • Summary on the increasing importance of the key research issues
	6. **Findings & Analysis –** Firm-level Strategies	• Report of firm-level competitive and learning strategies • Summary contrast the firm differences in strategies in terms of goals, competitive positions, capability gaps, etc. • Mapping firms: internal vs. external, today vs. future, balanced aggressiveness vs. conservative
	7. **Findings & Analysis –** Firm-level Learning Activities and Capability Development	• Report of firm-level learning activities and mechanisms for capability development • Summary contrast the firm differences in learning activities in terms of object of learning and learning mechanisms • Mapping firms: continuity and level of capability in each technical function
Part III	8. **Discussion -** An Inductive Explanatory Model	• The alignment between firm-level strategies and meso-level changes: contrast "strong learner" and "weak learner" • The issue of dynamic multiple alignments among firm strategies, learning activities and capability development contrasting the "strong learner" and "weak learner" firms
	9. **Conclusions**	• Contributions to literature and implications for managers and policy and possible future research

Source: own elaboration based on the research

Overall the thesis is divided into three parts. Part I starts with the Introduction followed by Chapter 2, which describes the relevant literature along two main lines: strategic management and economic development literatures. The strategic management literature will focus mainly on the capabilities view of the firm, with emphasis on the "modern" resource-based thinking such as the concept of core competencies, dynamic capabilities, and competence-based strategy. The economic development literature will focus on the issue of learning and capability development, using mostly the latecomer firms' perspective. Other literatures locate at the periphery of these fields is related to Thailand's innovation system development and the concept of absorptive capacity. Chapter 3 synthesizes the findings from the literature review in terms of three key conceptual variables (firm strategies, learning activities and mechanisms and firm capability development) situated within the meso-environmental changes. The synthesis provides justification for the analytical framework at the end of the chapter. Chapter 4 elaborates on the multiple-case study research method and defines the operationalized variables used in the study. The chapter also elaborates on the definition of the various indicators used to operationalize the conceptual constructs.

Part II contains the analytical history of the learning and capability building processes of the nine Thai auto-part firms. Chapter 5 describes the sequences of changes in market, policy and institutional factors within the Thai automotive industry. The purpose is to provide sufficient background on meso-level developments, to link with the development of firms' competitive and learning strategies. Then Chapter 6 elaborates on how different firms' strategies have co-evolved with the changes in opportunities and challenges at the meso-level. The aim is to discern the different patterns of firms' competitive and learning strategies, isolating the "strong learner" firms from the others. Chapter 7 reports on firm-level learning activities and learning mechanisms used for capability accumulation. Again, the aim is to isolate the "strong learner" firm patterns from those of other firms.

Part III comprises two final chapters: Chapter 8 analyzes the characteristics of firms' strategies, the differences in firms' learning activities (and combination of learning mechanisms) and differing rates and types of firms' capability accumulation. The aim is to highlight the alignment (or misalignment and re-alignment) among the three and how this leads to slowing down or accelerating the rate of capability accumulation. The alignment between firm-level strategies and changes in the meso-environment is also examined. Chapter 9 concludes with the main features of the firm-level learning system, to explain how firm strategies and learning activities work together to achieve the accumulation of capability. It also presents a more fundamental issue related to firm-level learning, the "capacity to learn" and firm "leaning system", which arises out of the case study analysis. In addition, the chapter summarizes the research contributions, empirically and theoretically, and the significant implications for practicing business managers.

Chapter 2 – Review of the Related Literature

The main purpose of this chapter is to review the literature both on the development of "latecomer" firms[6] and on strategic management, particularly that from a resource-based perspective. The objective is to identify overlaps and complementarities in these two sets of literature, in relation to the question of firm competitive and learning strategies and capability development. It is also the objective of this chapter to identify gaps in relation to that question and hence the opportunities to develop a more comprehensive and integrated analytical framework.

There are **three** main sections. The **first** section discusses the latecomer firm literature and assesses with the strengths and limitations of this work for this study. The **second** section discusses the strategic management and resourced-based literature with particular emphasis on firm learning strategy. It shows that historically this literature has been preoccupied with the strategy "content" issues. Very little work has been conducted on the role played by firms' learning strategy, efforts and learning activities (i.e. the strategy "process" issues), especially for the latecomer firms[7]. The **last** section summarizes the "reciprocal" knowledge gaps that exist in both bodies of the literature, highlighting that neither bodies of literature on its own are sufficient to fill such gaps. Consequently it is argued that there is a need to build a more integrated, holistic conceptual framework that is capable of capturing the dynamics of latecomer firms' capability development, and hence is relevant for strategic learning issues.

2.1 The Latecomer Firm Literature (LFL)

This section reviews the origins of learning and technological capability concepts; the taxonomies used in categorizing technological capabilities (including the extension to cover the non-technological functions); the important lessons learned from numerous empirical studies about the characteristics of learning and capability development; and finally, the role of absorptive capacity in latecomer firms' learning. The section concludes

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[6] Hobday (1995a) uses the concept of "latecomer firm" to described how firms in the newly industrialized economies attempted to catch up.

[7] The latecomer firms' viewpoint is lacking in not only the strategic resource-based literature (SRBL), but also in the strategic management literature in general since most research within this literature originated from the First World context.

with the important points that could be drawn from the literature along with the existing limitations.

2.1.1 Origins of Technological Capability and Learning Concepts

2.1.1.1 Technological Capability Concepts

During the 1950s, 1960s and the first-half of the 1970s, much of the latecomer firms' development literature neglected the need for (and the importance of) the creation of the indigenous technological activities in the developing countries (Abdulsomad, 2003: 11), and most literature emphasized the effort devoted to the transfer of technology in terms of choosing an appropriate foreign technology and technology transfer[8] per se. Then in the latter half of the 1970s and the early 1980s, the concept of technical change within the developing country context had shifted to focus more on the accumulation of "domestic" technical resources and the link to the creation of "indigenous technological capability" (Bell, 1984; Fransman and King, 1984; Teubal, 1984; Westphal et al., 1985). This led researchers in international technology transfer (from industrialized to developing countries), to focus more on determining the factors that impacted the development of indigenous capabilities in the late industrializing and developing countries (see for example: Enos and Park (1988) and Amsden (1989) on the case of Korean industrialization; Amsden and Kang (1995) on the case of Korean automotive industry; Scott-Kemmis and Bell (1988) on the case of India; and Bell et al. (1982) on the case study of inadequate learning in Thailand's infant industry). Due to increased interest, more definitions related to technological capability were developed[9].

Since the late 1970s, this concept of technological capabilities and learning has been a primary focus of LFL for nearly three decades (Kim and Nelson, 2000b: 1). A particular concern of the early work was the specification of the technological capability concept. One of the first definitions of technological capability during the early 1980s was "the

[8] Regarding "technology transfer", Nelson (1990: 78) noted that this phrase is a misnomer and the use of the terms "technological learning" is more appropriate. This was because the transfer recipient, the developing country, did not passively receive the imported technology as it is handed down from the industrialized country. Instead the recipient countries need to actively engage in a complex and costly technological learning process, to learn to achieve mastery of the imported technology.

[9] For example, another definition of technological capability included Enos (1991), who described the three main components of technological capability: 1) human skills (i.e. the knowledge residing in the firm's engineers and operators), 2) the institution (i.e. this allows human skills to be brought together and put to use), and 3) the common purpose (i.e. the knowledge necessary to absorb, adapt and improve on the technology).

ability to make effective use of technological knowledge … in production, investment and innovation" (Westphal et al., 1985: 171). Fransman and King (1984: 10) identified six different (technological) capabilities related to the production processes: 1) search for available alternative technologies, 2) selection of the most appropriate technology, 3) mastering the technology, 4) adaptation of the technology, 5) institutionalized search with the development of research and development facilities and 6) conduct basic research.

Later the definition of technological capabilities included additional concepts of technical change and specialized resources; for example Bell and Pavitt (1995: 71) defined technological capabilities as "domestic capabilities to generate and manage *change* in technologies used in production, and these capabilities are based largely on *specialized resources*" [italics added]. Today this definition of technological capabilities had been extended to empirically analyze the technological development in many different industrial contexts (see for example: petroleum industry (Acha, 2000); Brazilian steel industry (Figueiredo, 2001); Japanese and European optoelectronics industry (Miyazaki, 1994); and electronics industry (Ariffin and Figueiredo, 2001)). Others have broadened the definition of technological capabilities to include the *non*-technical dimensions such as: marketing functions (Ernst et al. (1998a), Tran (1999)); technology linkage capability (UNIDO, 2002; Virasa, 2005); and managerial and organizational function (Weinstein and Azoulay, 1999: 43). In addition, Virasa (2005: 98-99) pointed out that the process of a firm's technological capability development is not limited to just the technical dimension per se, but rather it is highly related to the non-technical dimension such as the firm's business model[10].

Regardless of its origins and development, almost all of the conceptual definitions regarding technological and organizational capability stress the importance of skills, knowledge, and the role of conscious investment in the firm-level acquisition of capability. In addition, embedded within the capability acquisition process are the learning processes and the use of such processes to acquire the necessary knowledge to manage technical change. Consequently, it appears that firm learning process could be defined as the process of knowledge acquisition and conversion whereby firm can develop the technological and organizational capability.

[10] He based his ideas on the Thailand's National Innovation Survey (2000 and 2002), which stated that there are three types of business model: locally-owned brand manufacturer (OBM), locally owned original equipment manufacture (OEM) supplier, and locally-owned niche-focused venture.

2.1.1.2 Learning Concepts

Historically, prior to the early 1980s, most of the learning and technical change research had been conducted in industrialized countries and little is known about learning within the developing country context (Bell et al., 1982). In addition, the learning concept was mainly concerned with the concept of a the mechanistic "learning curve" or Boston Consulting's "experience curve" or economist's "learning by doing" (Arrow, 1962). These concepts proposed that learning is automatic and it is a by-product of production experience.

In the mid-1980s, this concept of "automatic" learning by doing was rejected by various scholars. For instance, Bell (1984) stated that learning is not automatic and that generally there are two types: doing-based and non-doing-based learning. The latter requires more conscious investment in efforts. He argued that the doing-based learning per se is insufficient for successful development of capability. Similarly, Bell and Scott-Kemmis (1990) found that the predicted efficiency and cost savings outcome from "automatic" learning by doing did not occur and it was probably because of the failure to invest in sufficient learning effort and other factors such as lack of properly managed structure and poor learning conditions. Later this concept of costly learning was applied into the firm-level study on technological accumulation, capability acquisition and development (Bell and Pavitt, 1993; 1995).

Today, it is clear that building firm-level capabilities requires purposeful management of the firms' learning processes (Dutrenit, 2000; Kim, 1997a; Lall, 1987). As Bell and Pavitt (1995: 100) have succinctly pointed out that

> "Technological [and organizational] capabilities are *not* acquired as an *automatic* by product of investment and production activities. They are accumulated through conscious and continuous investment by firms in specialized, change-generating [or learning] activities, comprising product design, production engineering, quality control, training and linkages to foreign sources of technology … [italics added]"

Purposive learning processes are a "a pathway to accumulate certain types of technological capabilities" (Figueiredo, 2001: 31). Rush et al. (2004) draw on Bell and Pavitt (1993), Lall (1992), Kim (1997a) and Cohen and Levinthal (1990), in proposing a model of an "extended learning processes" comprising eight key elements[11]:

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[11] These eight elements were developed as categories in an audit tool for firms.

- Awareness and willingness of the need to change
- Searching for triggers for change
- Regular audits of existing competencies (or capabilities) including core ones
- Development of technology strategy based upon core competence
- Assessment and selection (exploration) or range of technological options
- Acquisition of technology
- Implementation and absorption of technology
- Learning through development of internal capabilities (Rush et al., 2004: 328)

This extended learning concept assisted in categorizing firms' learning ability according to their degree of awareness of the need to change and the degree of their preparedness and readiness to change (Ibid.).

Since learning is not merely automatic "learning by doing", but requires investment of effort (Bell, 1984; Kim, 1998; 1999) and effort put into learning activities are consciously designed to improve performance (Pavitt, 2002). In addition, at times several learning mechanisms are to be executed concurrently to achieve successful accumulation of innovative capabilities (Kim, 1998; Tran, 1999). These authors *implicitly* suggest that the investment in the formulation and implementation of the firm learning strategy is important. All of all these studies point towards the importance of learning strategy in directing (and coordinating) firms' diverse learning activities and keeping them in focus.

An *explicit* learning strategy could play a key role in maintaining a firm's continuous learning activities through time. This concept of firm competitive learning strategy has not been thoroughly developed in the literature. Moreover, it is not clear how such strategy would relate to the latecomer firm's learning activities and the issue of capability development. One notable exception would be Rush et al's (2004) "extended learning process", it discusses the formulation of technology strategy based upon firm core competencies. However such discussion is restricted to technology strategy per se and does not provide a comprehensive framework for a firm competitive and learning strategy.

2.1.2 *The Taxonomies of Technological and Organizational Capabilities*

There are many ways to categorize firm-level technological capabilities. One taxonomy for classifying technological capabilities provided by Lall[12] (1992: 166). Lall (1992) classifies firm's technological capabilities into three levels of complexity (simple routine capabilities, adaptive/duplicative capabilities, and innovative capabilities) and six operational areas (pre-investment, project execution, process engineering, product engineering, industrial engineering and linkages). Based on this classification, it was possible for a firm to have different or uneven accumulation of level of capabilities for each operational area. Similarly, Bell and Pavitt distinguished between "production capacity" and "technological capability", stating that the latter involves more effort in the generation and management of resources pertaining to technical change and involving the management of knowledge, skills and experience (Bell and Pavitt, 1995: 78). Importantly they also note that technological capabilities also involve the management of institutional structures and linkages, both intra- and inter-firm (Ibid.). With this distinction, they developed taxonomy of technological capabilities comprising three main technical-functions (investment, production, and supporting) and within each there are four levels of complexity (a level of basic routine production and three levels of technological capabilities: basic, intermediate and advanced) (Ibid.: 84). The Lall (1992) and Bell and Pavitt (1995) taxonomies have two similarities:

- Both focus on two similar major dimensions: technical functions and levels of complexity of capabilities.
- Both acknowledge that the movement from simple (basic-level) to advanced (innovative-level) capabilities is not automatic and requires purposeful investment in complex learning processes involving the management of technical change.

Despite the similarities, there is also an important difference:

- By disaggregating the levels of firm technical capabilities into four levels, Bell and Pavitt's taxonomy clearly distinguishes between the ability to exploit the existing production technology and routine production activities (the first level indicates the "production capacity") versus the capability to manage and generate technical

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[12] This idea was derived from Katz (1987), Dahlman et al. (1987) and Lall (1987).

change (the latter three levels indicate "innovative technological capability")[13]. This was done to emphasize the dynamic aspect of technical change since production capacities are static attributes and technological capabilities, on the other hand, are more dynamic and crucial to successful management of technical change[14] (Albu, 1997: 7). In contrast, Lall's technological capability framework comprises three levels of technological capability (basic, intermediate and innovative) and implicitly addresses the above issue.

Other taxonomies extended the "technological" aspect of capabilities to include other *non*-technical element, such as marketing capabilities (Ernst et al., 1998a; UNIDO, 2002), the inclusion of these capabilities was necessary because they were pre-requisites (in some industries) to the successful build-up of technological capabilities (Ibid.). Apart from the addition of marketing and technology linkage capabilities, the UNIDO framework[15] (UNIDO, 2002: 96) utilizes the same matrix structure as described by Lall (1992) and Bell and Pavitt (1995).

The significant insight provided by the many taxonomies above is the fact that as a given firm moves up the capability ladder (i.e. from the routine/basic production capabilities to the innovative/advanced capabilities), it is possible that two or more technical-functions could differ in the depth as well as the rate of accumulation of capabilities. Also the distinction between the routine production capabilities and the innovative technological capabilities is the key issue, since at each stage it is likely that the accumulation of these two different capabilities requires different managerial functions on the management of firm strategies that often involve two aspects: 1) the varying degree of technical change (which to a certain extent dependent on the environmental factors impacting the firm) and 2) the types and sequence of capabilities that must be accumulated, with respect to firm's strategies. Here in this study, it is argued that these two issues would

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[13] Historically, this distinction was elaborated by Bell (1987) as three categories of technology flows: Flow A, Flow B and Flow C. Flow A deals with ordinary importation of capital goods, technology, engineering and services, and Flow B comprises the skills and know-how to operate and maintain the established production technology. It is only in Flow C that the knowledge and expertise for implementing technical change was discussed; Flow C also refers to the "know-why" dimension of technology.

[14] "A firm with no technological capabilities at all, would be rigidly unable to adapt to any changes in its environment, and would not survive long. However, the fact that a firm has a limited set of technological capabilities, and uses these to gradually improve production capacity, may not always be adequate either. In the long run, such a firm may not be able to change radically enough to bridge the discontinuities that occasionally arise in technical change, and may be out-competed by those that can" (Albu, 1997: 9).

[15] Berger (2005) pointed out that this UNIDO framework on firm technological and organizational capability is one of the latest developments on the concept.

also involve the crucial role played by firm competitive and learning strategy. Unfortunately, these "matrix type" taxonomies of capabilities provide very little in terms of explicating the concept of firm competitive and learning strategies and its role in firm capability accumulation (Chitravas, 2005b: 1-2).

2.1.3 Technological Capabilities and Learning: Lessons from the Empirical Studies

Most latecomer firm empirical studies focus primarily on the learning activity characteristics and how these contribute to technological capability accumulation. Hobday (1995), focusing on the East Asian electronics industry in four countries[16], found that firms must engage in a painstaking, costly learning processes (a "hardslog") in order to build technological capabilities. He found that as firms learned to increase their export activities (i.e. export-led technological learning); they progressed gradually from simple to complex process and product technology. These latecomer firms learned in a cumulative and path-dependent manner, from original equipment manufacture (OEM), then to original design manufacture (ODM) and finally to original brand manufacture (OBM) (Ibid.: 1184). This did not imply the simple (automatic) linearity of learning progression, but suggested that technological catch-up occurred cumulatively, when each capability was successively learned by the latecomer firms.

Later Hobday (2000) engaged in a comparative analysis study between two types of learning: the East Asian "OEM system" and the Southeast Asian "TNC-led" development. He found that the two had more similarities, despite their differences. Though these frameworks provided useful insights into the process of latecomer firms' learning, innovation and capability development, the OEM-ODM-OIM/OBM[17] model was criticized as being too simplistic (i.e. focused on product upgrading per se) and did not fully capture the various other types of upgrading (i.e. process, organizational, etc.) that could possibly occur in the latecomer firms context (Berger, 2005: 29-30), see also Wong (1999).

Other recent empirical studies include Figueiredo (2001), who extended Bell and Pavitt (1995)'s framework to explain the differences in the rate of technological capability accumulation and operational performance in two large Brazilian steel firms[18]. He

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[16] These four countries are South Korea, Hong Kong, Singapore and Taiwan.
[17] OEM = Original Equipment Manufacture; ODM = Original Design Manufacture; OBM = Original Brand Manufacture; OIM = Original Idea Manufacture (Hobday, 2000)
[18] These two firms are USIMINAS and CSN.

conducted a pair-comparison between two firms by constructing the technological capability development paths and corresponding learning processes and found that because USIMINAS engaged extensively in effective knowledge acquisition as well as knowledge conversion processes[19], it was able to achieve a faster rate of technological capability accumulation, and in turn achieve better operational performance, when compared with CSN. This finding illustrated the crucial importance of the proper management of intra- and inter-firm learning processes (in particular, the knowledge acquisition and conversion processes), implying the critical role that could be played by firm competitive and learning strategy in guiding such processes.

Dutrenit (2000) studied the "transition problem" faced by a large Mexican glass production firm[20]. She examined why a large corporation, such as Vitro Glass Containers, despite having achieved innovative capability in almost all the technical functions[21], did not successfully acquire the "strategic capability". She argued that the firm expended insufficient learning effort in a system to manage the knowledge conversion, creation and integration processes. Again it is implied that if this firm put in place a properly-managed "learning strategy" that could assist in directing the resources to be invested in such knowledge management processes (i.e. knowledge conversion, creation and integration), then it is highly likely that the transition process would be successful.

In contrast to Dutrenit (2000), recent positive developments of latecomer firms' innovative capabilities were illustrated by Ariffin and Figueiredo (2001), who studied the technological and innovative capabilities in electronics industry in Malaysia and Brazil (Manaus). They found that the majority of the electronics firms surveyed had achieved the "intermediate innovative capability"[22]. They concluded that the widely held negative view about these developing country's electronics industries consisting solely of "screw-driver" plants is misleading and misplaced. Similarly, for successful spin-off case, Xie and White (2004) offered to explain the interactive process of firm competitive strategy, sequential

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[19] Here Figueiredo (2001; 2002b) defined "effective" knowledge acquisition and conversion processes as processes that possess the following four key features: 1) sufficient variety, 2) continuous intensity, 3) good/excellent functioning and 4) strong interaction among the processes.

[20] This "transition problem" is the challenge to manage the transition from advanced innovative capabilities to strategic (knowledge management) capabilities at the global frontier. Due to poor knowledge management system, the firm failed to fully complete this transition process (i.e. there was a pre-matured truncation).

[21] This achievement was assessed using the matrix taxonomy of technological capabilities provided by Bell and Pavitt (1995: 84).

[22] Their capabilities were at level 4, with level 6 being the highest level.

learning activities, and capability development of the Chinese Lenovo Group[23]. The case illustrates that it is possible for a latecomer firm to challenge the incumbents and competes head-on with the multinational firms (Ibid.: 418).

Another latecomer firm empirical study was conducted by Gammeltoft (2004), who studied the technological capability development in the Indonesian electronics industry. Drawing on the TDRI's (1989) framework, he delineated firm technological capabilities into four main types: process acquisitive, process operative, process change, and product change. The latter two deals with the "change capability," in terms of process and product adaptation and innovation. In his study, he concluded by rejecting the idea that within the Indonesian electronics industry there are only two types of firms (i.e. domestic market-oriented companies and foreign export-oriented ones). This study provides fruitful insights into the firm categories and the capability development; however it did not highlight the resulting firm heterogeneity as arising from the issue of differences in firm-level competitive and/or learning strategies and their capability development.

Similar in the overall objective in understanding firm-level technological capability development, but situated in a different context, Tran (1999), who focused on the Vietnamese electronics and textile industries, found that effective learning outcomes were most likely when the local firms used a combination of several learning mechanisms. In particular, the study found that interactive learning between foreign and local firms (i.e. user-producer interaction) was a crucial source of technical knowledge for the local firms (Tran, 2002). The study concluded that relying on only one learning mechanism will highly likely lead to poor accumulation of firms' technological capabilities.

Although not discussed in great details, Tran also acknowledged that "*Firms' strategies are key* ... for their TC [technological capabilities] accumulation and learning" [original italics] (Tran, 1999: 295) and

> "carefully designed [firm-level] strategy, well-thought plan of action and investment for learning [i.e. learning strategy] should help the firms know how to become more competitive" (Tran, 2002: 26).

However the author limited the analysis to only two types of firm competitive strategies: diversification and specialization; very little attention was paid to the role played by firms' learning strategy, in particular the issue related to firm strategic goals and capability gaps

[23] This group is a successful personal computer manufacturer, who recently has successfully taken over IBM in China and started to produce Lenovo-brand computer.

were not discussed. The same criticism applied to all the other empirical studies discussed above; the *explicit* treatment of the generic firm-level competitive and learning strategies and its link with the capability development is mostly missing from their discussions.

2.1.3.1 Thailand Empirical Studies

Bell et al. (1982) conducted one of the early empirical studies on technology development and policy issues in Thailand. They investigated the non-successful upgrading at a Thai galvanized steel plant. The study found that the plant did not sufficiently invest in the explicit in-house efforts to improve the process and equipment, despite the introduction of the new capital equipment. They concluded that the Thai policymakers had to question the effectiveness of the protectionist policy.

Another early large-scale study[24] was conducted in three sectors: biotechnology, material technology, and electronics technology (including information technology) (TDRI, 1989; Vongpanitlerd, 1992). This study categorized the technological capabilities into four levels[25]: 1) acquisitive capability, i.e. the ability to search, assess, negotiate and procure technologies, set it up and commence production; 2) operative capability, i.e. the operation, control and maintenance of production facilities, skill development, production planning and quality control; 3) adaptive capabilities, i.e. technology digestion, minor product and process modifications; and finally 4) innovative capability, i.e. the ability to create major changes in existing products and processes or the invention of new ones through in-house R&D and design engineering. The findings revealed that most Thai firms successfully acquired the operative capability, followed by acquisitive and adaptive capabilities. As for the innovative capability, very few Thai firms had achieved this. The findings also revealed the following problems:

- Science and technology manpower shortage and inadequate firm-level human resources development
- Policy failed to create the "right amount" of competitive pressure, forcing firms to learn and build technological capabilities.
- Foreign direct investment (FDI) does not lead to effective technology (and knowledge) transfer

[24] This study also involved expert such as Larry E. Westphal.
[25] The four-level technological capability definitions employed in this study are both "conceptually illuminating and sufficiently concrete and detailed to serve as a sound basis for an empirical analysis" (Gammeltoft, 2004: 51).

- Lack of long-term entrepreneurial attitudes on technical development and poor firm-level linkage to the science and technology community (i.e. poor firm and public organization linkages)

Despite its significant findings, the TDRI (1989) study remained generalized at the industry-level, and the firm-level process of competitive and learning strategies, learning activities, and capability development (and the linkage among the three concepts) remained largely a "black box"[26]; in particular the issue of inter-firm differences and the evolutionary changes within the firms were not touched upon (since the objective of the study was mainly a cross-sectional survey focusing on the inter-industry comparison).

In the late 1990s, another study (Arnold et al., 2000) sponsored by the World Bank was commenced; its purpose was to analyze the policy framework and institutional structure that support Thailand's technology development. The framework divided the firms into four types: Type 1 (low-capability firms), Type 2, Type 3 and Type 4 (high-capability firms). The category was based upon the firm's varying degrees of the demand, awareness and understanding regarding technical change. The study found that most Thai firms belong to Type 1 and 2, while only a few firms had reach Type 3 (Arnold et al., 2000: 57). Overall the authors also concluded that most Thai firms have rather weak technological capabilities; this finding was corroborated by a subsequent study (World Bank, 2002) which concluded that technology and innovative capabilities of Thai firms lag behind others in comparable Asian countries. Both the World Bank (2002) and Arnold et al. (2000) findings agreed with the previous study, conducted by TDRI a decade earlier, which reported that almost no firms reached the level of "innovative capability".

Contrary to the above findings, two recent large-scale Thailand Innovation Surveys[27] (conducted in 2000 and 2002) found that since the 1997 financial crisis, the private firms are in a transition:

> "Past studies suggest that passive and slow learning of firms. Now [there are] some changes: several large conglomerates invest more in R&D; a number of smaller firms collaborate more with universities; several Thai subcontractors were forced to carry out product design and improve efficiency; and emergence of small number of own design/own R&D start-up firms" (Intarakumnerd, 2003: 33).

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[26] These words are borrowed from Rosenberg (1982).

[27] The large-scale survey conducted in 2000 involved a response of more than 1,000 firms, and similarly the one in 2002 received a response of more than 2,000 firms (Intarakumnerd, 2003: 5).

Though these large-scale surveys provided rich insights into the policy formulation and measures for institutional support at a macro-level, their analyses on the micro firm-level heterogeneity in terms of the learning and competitive strategy and their impact on firm-level capability development are still limited. In particular, the explanation of factors relating to Thai firms' transition to invest more in R&D, increased collaboration with non-firm organizations and the shift towards more product design activities were not explored in great depth and is still lacking; this research will attempt to redress this knowledge gap.

Within the Thai automotive industry, Nawadhinsukh (1983) studied the ancillary firms technological development through the historical analysis of:

- the development of foreign and domestic vehicle assemblers and auto-part suppliers
- firm-level response to the early government industrial development policies

The in-depth analysis described the impact of the local content program and concluded that the technical progress was minimal with: poor technology transfer, lack of skills and low job creation. In addition, it was also concluded that subcontracting has failed to play a major role in technical development of the ancillary firms (Ibid.: 222-226). Focusing on the similar issues, Kaosa-ard (1993) examined the role of transnational corporations on the development of Thai automotive industry. The purpose was to evaluate the benefits from technology transfer. Similar to the earlier studies by Nawadhinsukh (1983) and TDRI (1989), Kaosa-ard found that there was underdevelopment in the local firms' technological capability and learning:

> "... while the *quantitative* aspect of development, measured by the number of local [auto-part] firms, has been respectable, *qualitative* growth is much less impressive" [italics added] (Kaosa-ard, 1993: 11).

Recently research on the Thai automotive industry development received renewed interest: 1) Abdulsomad (2003) historically analyzed the differing automotive industrial policies between Thailand and Malaysia and their differing impacts on firms' technological capability development and 2) Techakanont (2002) investigated the actual practice of technology transfer in an automobile assembly project and later looked at how three local supplier firms develop the technological capabilities (Techakanont and Terdudomtham, 2004).

Using the technological capability framework provided by Ernst et al. (1998b), Abdulsomad concluded that different industrial policies have mattered in the building of technological capabilities and that in both countries "the long period of protectionism ...

has made many local [auto-part] firms internationally less competitive" (Abdulsomad, 2003: 267). Despite such findings, the study also pointed toward the positive influence of joint venture,

> "... joint venture arrangements are another feasible method for local auto parts manufacturers in both countries [i.e. Malaysia and Thailand] to accumulate technological capabilities" (Ibid.: 268).

In other words, the local auto-part firms with higher-level capability were those that involved in foreign joint ventures.

Located at a much more micro-level than Abdulsomad (2003), Techakanont (2002) focused on the characteristics of technology transfer process (both inter-firm and intra-firm) and reported on the critical success factors. He concluded that strengthening of the linkages between local (Thai) suppliers and foreign final product producers (i.e. carmakers) should be one of the government's policy priorities. This conclusion agreed with that of Abdulsomad (2003), stating that foreign joint venture arrangements are important to the local firms' capability development.

Though these empirical studies provided critical insights into the comparative policy analysis between Thailand and Malaysia (Abdulsomad, 2003) and in-depth investigation of the technology transfer process (Techakanont, 2002), they did very little the analysis of the differences at the inter-firm level, regarding firms' learning strategy, their learning activities, and the mutual dynamics that impact the firms' capability development.

In sum, the stylized facts derived from the many learning-related empirical studies are:

- Learning is costly (and *not* automatic), context-specific, and requires intensive management effort. For instance, "... learning is not automatic – there must be motivation to enter the [learning] cycle" (Bessant and Francis, 1999: 375). "It is often idiosyncratic, cumulative, dynamic and uncertain in outcome, involving both knowledge and experience. Learning is usually costly and often difficult to undertake" (Hobday, 1995b: 1190) and often times involves the process of trial and error (Govindarajan and Trimble, 2004: 69). Similarly, "... learning takes time, and the process of learning is specific to each industry and activity (i.e. context-dependent)" (Lauridsen, 2002: 160).

- In the developing country context (where capital goods sector and formal research and development are weak) learning occurs most often via informal activities such as continuous improvement in processes (i.e. modification of capital goods within the capital goods using sectors) and product improvements (Gammeltoft, 2004: 51).
- There are many mechanisms through which learning occurs[28]: learning by "active" doing[29], learning by prior knowledge accumulation (for e.g. the hiring of capable workers to increase the capability to learn prior to engagement in the learning activities[30]), learning by local training (on-the-job and off-the-job), learning by searching (Bell, 1984) and collecting information and learning by foreign connections[31] (Tran, 1999: 20-21) and by forming foreign joint venture(s) (Abdulsomad, 2003). Others studied the firms' learning mechanisms through technology transfer that include foreign technological assistance (Techakanont, 2001; 2002; Techakanont and Terdudomtham, 2004). Other types of mechanisms include learning by user-producer interaction[32] (Lundvall, 1992) and learning by visiting (Caplan, 2005).
- Based on the empirical work of Figueiredo (2001; 2002a) and Dutrenit (2000), firm's learning and competitive strategies can play an important role in directing the firm's learning activities in order to achieve a fast, systematic rate of capability accumulation.
- Within the context of Thailand, there is a shift. On the one hand, some studies (Ghani et al., 2002; Kaosa-ard, 1993; TDRI, 1989) reported on the negative findings regarding the country's technological development. On the other hand, large-scale surveys indicated otherwise, that this view is changing towards a more positive one (Intarakumnerd, 2003; 2004). However, both views still achieve very little to

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[28] Over the recent years, the number of "learning by ..." mechanisms has multiplied greatly (Berger, 2005: 15).
[29] Tran (1999) included the word "active" to distinguish this mechanism from the mainstream economist's "classical" view of automatic "learning-by-doing" (Arrow, 1962).
[30] Some scholars might prefer to call this "learning-before-doing" (Pisano, 1996b).
[31] This learning mechanism implies that there are at least two sources of learning for firms: internal and external. This idea is not new, as Levitt and March (1988: 321, 329) explicated that firms can engage in either "learning from direct experience" or "learning from the experience of others". For latecomer firms, "learning by foreign connection" is considered one mechanism of learning from the external sources. They are many other sources such as firm collaborating with business associations, government (non-firm) organizations, customers, competitors, to name a few.
[32] Johnson (1992) emphasizes the importance of interaction in all types of learning.

attempt to explicitly explain the important role played by firm-level learning and competitive strategies in impacting such shift.

2.1.4 Absorptive Capacity and Latecomer Firm Learning

How external, new knowledge can be internalized into the latecomer firm depends crucially on the "absorptive capacity" [33] (Cohen and Levinthal, 1989: 569), i.e. "the ability of a firm to recognize the value of new, external information and assimilate it to commercial ends" (Cohen and Levinthal, 1990: 128). One way of increasing firms' absorptive capacity is through a deliberate, strategic learning effort (Kim, 1998; 1999). In explicating the learning process at Hyundai Motor, Kim (1998) breaks down the absorptive capacity into two major elements: prior knowledge base and intensity of learning effort (a more important element[34]). Berger (2005: 20) proposes two more elements: organizational factors (organizational structure, internal communication arrangement and managerial human resource management) and human capital (refers to firm's employees and the quality of their education).

In addition, a more fundamental issue not described here is the link between firm learning and competitive strategy and its association with these elements of absorptive capacity. In disaggregating the absorptive capacity concept, Zahra and George (2002) pointed out that there are: "potential absorptive capacity" and "realized absorptive capacity", and the former deals with knowledge acquisition and assimilation capabilities, while the latter deals with transformation and exploitation of knowledge. Furthermore, the potential absorptive capacity is linked with the firm's learning strategy since it provided the firm with the ability to acquire and assimilate new external knowledge, to potentially augment its existing absorptive capacity. Consequently, it is likely that all of the above absorptive capacity elements must be taken into account in a firm's learning and

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[33] Kumar et al. (1999: 86) stated that one of the important elements for building firm technological capability is the "technology absorption capacity" (see Bell (1987)). It discusses the importance of existing level of firm's absorptive capacity in determining the extent to which the firm can participate in the technology transfer process, and also, the type of technology which the firm can efficiently operate and later improve upon.

[34] Kim (1998) added that even if the (latecomer) firm has low prior knowledge base, it could acquire the absorptive capacity it desired by exerting (and continuously maintain) the high level of learning effort. This was certainly the case of Hyundai Motor (Korea) during its early stages of development. Following the same argument, Criscuolo and Narula (2002: 6) stated "Absorptive capacity accumulates *only if* an *effort* [i.e. learning effort] to internalise the external knowledge is exerted and in particular if the prior knowledge has been applied to the solution of problems [italics added]."

competitive strategy contexts; and these elements have particular significance for the sequencing of firm learning activities, learning mechanisms and stages in capability development.

2.1.5 Summary of LFL

The latecomer firm literature provides several very useful contributions toward the framework for a firm learning strategy, but it also has limitations. First are the contributions:

1. The literature discussed in detail the essential characteristics (e.g. various learning mechanisms, improvements in production activities, product modification, etc.) of the learning activities at the firm level and implications for the design of industrial development policy. These studies commonly pointed towards the significant role of conscious investment in indigenous technological learning effort, which can mediate the rate of accumulation of technological capabilities.
2. The stylized facts that (technological) learning process is not automatic, and can be costly and requires deliberate investments in time, financial resources, human and other resources that contribute to the build up of the elements of firm absorptive capacity.
3. The crucial role played by investment in learning effort and other resources implies that proper management of the learning process is required; this is a potential area where firm learning and competitive strategies could have a significant role in directing such activity.

Secondly, the review of LFL also suggests the following key limitations:

1. Though implied as important in each of the conceptual areas above, the literature pays little attention on the important role played by firm learning and competitive strategies in directing firm learning activities and mechanisms. Little discussion was made relating to the (deliberate) investment in formulation of such learning strategy that is part of the investment in learning effort. In addition the literature does not offer to explicitly explain the detailed elements involved in process of managing firm learning strategy; in particular it lacked the description with regards to learning goals, (awareness of) capability gap(s), and the acquisition of knowledge in response to such goals.

2. The LFL tends to assume the prior existence of the simple routine production capabilities (either as simple assembly or production via OEM sub-contract). It considers this capability as the minimum level, whose accumulation seems to be automatic; consequently it ignores the crucial played by firm learning strategy in directing the learning activities to accumulate even the simple routine production capability. In particular, issues such as firms that were mere traders or distributors (i.e. replacement equipment manufacture, REM), then leveraging off their intangible assets and entering for the *first* time into the OEM production sub-contract and building the simple, basic routine production capabilities were not addressed.
3. Similar to above, the transitions from simple to intermediate and finally to innovative capabilities were assumed to occur automatically, without the active involvement of firm-level learning and competitive strategies and their interplay with firm learning activities and mechanisms. In particular, the role played by firm competitive and learning goals and the awareness of its capability gap and gap-closing strategy in managing the transitions were not explicitly discussed.

2.2 The Strategic Management and Resource-based Literature (SRBL)

This section reviews the literature that addresses strategic management issues from a resource-based perspective. The final section summarizes with a discussion on the strengths and limitations of the SRBL as a framework for this study.

2.2.1 Origin of Concepts: Resource, Capabilities and Core Competencies

Credited by many as one of the forerunners of the resource-based concept, Penrose (1959) makes a crucial distinction between resources and the services of resources (i.e. capabilities):

> "… resources consist of a bundle of potential services and can, for the most part, be defined independently of their use, while services cannot be so defined, the very word 'service' implying a function, an activity" (Penrose, 1959: 25).

Furthermore resources are further classified into either physical resources or intangible resources. Physical resources include tangibles such as production plant, equipment, land, raw materials, work-in-process goods and other natural resources and human (and intangible) resources comprise unskilled and skilled labor, clerical, managerial and administrative staff. Penrose (1959) was amongst the first to suggest that it is not these resources that deliver value, but the services (i.e. the capabilities) that these resources render.

Following Penrose, Richardson (1972: 888) defined capabilities broadly as "appropriate knowledge, experience and skills" while Nelson and Winter (1982) dedicated an entire chapter[35] of their book discussing the theoretical basis of organizational capabilities based on the concept of individual routines and skills. Later Prahalad and Hamel (1990) extended the capabilities concept further and developed the influential "core competence" concept. Consequently, it could be said that historically within the resource-based perspective, the terms resources and capabilities/competencies are more than just the neoclassical concepts of "land, labor and capital" and that between the tangible and intangible resources, the resource-based concept paid more attention to the latter which included among others, the intangibles human resources, knowledge and intellectual capital.

2.2.1.1 Conceptual Implications

Resources tend to be more fungible and more likely to be sourced via market exchange, whereas the services or capabilities (i.e. managerial skills or organizational capabilities) are more firm-specific, non-tradable, involve partly-tacit knowledge (Nelson and Winter, 1982; Polanyi, 1966) and usually must be built from within (Chandler, 1992; Teece and Pisano, 1994; Teece et al., 1997). This implies that efforts must be expended by a management team to oversee the development of capabilities through deliberate investment in learning processes. Penrose argued that the limits to a firm's growth rate were the result of managerial constraint (i.e. limits of managerial ability) and the managers' behavioral elements (Kor and Mahoney, 2000: 116). Consequently it could be said that firm learning is one of the key strategic factors that, if managed properly, will lead to reducing limits to a firm's growth rate since according to Penrose's ideas, learning will enable the firm to utilize it resources better and more efficiently, leaving more idle resources to be put to more productive use to fuel firm's growth.

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[35] Chapter 5: Organization Capabilities. Later both Nelson and Winter co-edited a book with Giovanni Dosi on the nature and dynamics of organizational capabilities (Dosi et al., 2000).

In addition, it could be argued that it is highly likely that if firm learning and competitive strategies are brought into strong focus by including them as part of managers' routines in firm capability development, then the firm will attain the "capacity to learn and adapt"[36] (Beer et al., 2005) and endure (more or less) perpetual growth, despite the turbulent, evolutionary and ever-changing external environment. Moreover, the development of a "capacity to learn" becomes even more important when the external environment is turbulent and firm must develop new capabilities.

2.2.2 The 'outside-in' of Firm Strategies

Viewing the firm as the main unit of analysis, Penrose and other scholars acknowledged that the external environment (for example competitors, suppliers and customers) has a significant effect on managerial capabilities and the growth of the firms, but she did not explicitly "spell out" the crucial drivers in the environment[37]. This was conducted by Porter (1980) who divided the environment into the operating and the general environment. Porter developed the "Five Forces model" suggesting that the competitive dynamics in an industry are shaped by

- Threat of new entrants
- Threat of substitute products or services
- Bargaining power of suppliers
- Bargaining power of buyers
- Extent of industry rivalry

Later in the early 1990s, Porter proposed a dynamic theory of strategy but still largely based the core idea of firm success on two variables (both at the industry-level): the attractiveness of industry and the firm's competitive position within the industry (Porter, 1990; 1991). He also described how activities within the firms contribute to building firm's competitive position. Porter's ideas provide significant insights into competitive strategy with the (attractive) industry as the unit of analysis, but they address very little the significant role played by firm's learning in choosing a competitive strategy. The framework places very little emphasis on firm heterogeneity.

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[36] In their original paper, the authors named this capability as organizational "fitness" – i.e. the firm's capacity to continuously learn, adapt quickly and in advance of a crisis (Beer et al., 2005: 463).
[37] This issue was noted by Chandler (1992: 86) who stated "... the concept of the firm's activities and growth developed by Alfred Marshall, Joseph Schumpeter and Edith Penrose, was first spelled out by Richard Nelson and Sidney Winter in *An Evolutionary Theory of Economic Change* (1982)."

Because this "outside-in"[38] approach does not address the firm heterogeneous aspects of firm capabilities (Rumelt, 1991; Stalk, 1992), it has little to offer on an analysis of different learning strategies and learning activities and their roles in underpinning firms' competitive advantage. The approach also neglects the role played by technological change within the ever-changing external environment that significantly affects the competitive position of the firm, and how in that context, firm learning and capabilities accumulation, when applied in a timely manner, are able to improve the competitive position (Tidd et al., 2001: 78-79).

In sum, the "outside-in" approach lacks an adequate perspective on heterogeneous firm resources and capabilities and the role of firm learning strategy and different processes of capability development. Hence, this approach provides only "an incomplete portion of the whole picture".

2.2.3 The 'inside-out'[39] of Firm Strategies

Many researchers have drawn attention to the limitation of the "outside-in" approach. For instance, drawing on "strategic factor market" (Barney, 1986), Barney (1991: 112) pointed out the crucial link between firm resources and the sustainability of competitive advantage and developed the well-known framework incorporating four indicators to assist in identifying firm's strategic resources: valuable, rare, inimitable, and non-substitutable (VRIN). Similarly, Peteraf (1993) concurred with Barney and developed an explicit "Resource-Based Model"[40] explaining firm's sustained competitive advantage. Both scholars acknowledged the insufficient "outside-in" approach to strategy and the need to look more inside the firms for sources of competitive advantage. This was due to the increase in the degree of turbulence within the external environment; in particular, Barney (1995: 49) has stated

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[38] The words "outside in" was borrowed from Javidan (1998: 60) and Drejer (2004: 514); these strategic management scholars referred to the traditional strategic planning process where the planner starts with external analysis and then follows by the internal analysis. In addition, Drejer argued that "this is a reactive approach to strategic management since it involves adapting the resources or competencies of the firm to the market conditions and competitive posture" (Ibid.).

[39] The words "inside out" was borrowed from Javidan (1998: 60); they are used to refer to the strategic planning process where the planner starts with the internal analysis and then follows by the external analysis.

[40] In this model, there are four "cornerstones" of competitive advantage: 1) heterogeneity, 2) ex post limits to competition, 3) imperfect mobility and 4) ex ante limits to competition. These "four conditions must be met for a firm to enjoy sustained above-normal returns" (Peteraf, 1993: 185-186). In an extensive review of resource-based view literature, Prior (2003: 18) acknowledged that Peteraf model is probably the "most comprehensive theory of competitive advantage based on the RBV [resource-based view]..."

"... [the] environmental analysis ... is only *half* the story and that the ... development of tools for analyzing [external] environmental ... has proceeded much more rapidly than the development of tools for analyzing firm's *internal* strengths and weaknesses" [italics added].

Coining the term "resource-based view", Wernerfelt (1984: 176) examined how firm competitive advantage resulted mainly from resource-product portfolio (called "resource-product matrix"[41] and not merely from isolated analysis of product-market positions). Similarly in the same year, Rumelt (1984) introduced the concept of "uncertain imitability"[42] to reflect the heterogeneity among firms; firms are different because of their unique products, which comes from each firm's unique set of resources and capabilities. Rumelt argues that the shift in the conceptual view of the firm, from a product-market to a product-resource competitive position view, has strong managerial implications:

"In essence, the concept is that a firm's competitive position is defined by a bundle of unique resources and relationships that the task of general management is to adjust and renew these resources and relationships as time, competition, and change erode their value" (Rumelt, 1984: 557-558).

Responding to the static resource-based view concept, Dierickx and Cool (1989) further developed the resource-based view, based on the concepts of "stocks" (i.e. resource stocks) and "flows" (i.e. learning and resource/capability building). They argued, through the use of a bathtub metaphor[43], that both "stocks" and "flows" are necessary for firm development.

"... at any moment in time, the *stock* of water is indicated by the level of water in the tub; it is the cumulative result of *flows* of water into the tub (through the tap) and out of it (through a leak). ... the amount of water in the tub represents the stock of know-how at a particular moment in time, whereas current R&D spending [or spending on learning process] is represented by the water flowing into the tap; the fact that know-how depreciates over time is represented by the flow of water leaking through the hole in the tub [italics added]" (Dierickx and Cool, 1989: 1506).

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[41] In his original paper, Wernerfelt utilize the resource-product matrix as a preliminary analysis tool for assisting firm in managing its changing resource position (as opposed to Porter's product-market position) over time.

[42] See also Lippman and Rumelt (1982) for more discussion of the concept.

[43] Jantunen (2002) pointed out that this early attempt made by Dierickx and Cool (1989) was to develop the "dynamic" version of the then "static" resource-based view. Later, similar attempts to extend the "static" resource-based view were made by Teece and Pisano (1994), Teece et al. (1997) and Helfat and Peteraf (2003).

They added, "… *while flows can be adjusted instantaneously, stocks cannot* [original italics]" (Ibid.). Here the implication to the idea of resources and capability is that it takes time and much learning effort to build the "stock" of resources and capabilities (Miyazaki, 1994; Stalk, 1992); this implies that the firm's competitive and learning strategies are most likely necessary to plan the investment in such learning effort and to attempt to augment the "stock" of capabilities.

Despite different emphases, many scholars support the resource-based view on firm learning strategy that the firms generally consist of a portfolio of resource-market positions which it must learn to manage if it wants to achieve competitive advantage. Similar to Porter's over-emphasis on the external (industrial) competitive forces, this "early" resource-based view can be too introspective a focus on static resources and with insufficient attention on the external environment such as the industrial dynamics, market factor uncertainty, industrial technological change and the institutional factors (Jantunen, 2002; Porter, 1991). In addition, the resource-based view focuses on internal firm resources in isolation from other firms and non-firm organizations, paying little attention to the dynamic system effects and resource interconnectedness (Foss and Robertson, 2000: 2). Moreover, the issue of how these resource characteristics impact the development of firm-level learning processes and competitive strategies and capability development, leading to firm competitive advantage is also lacking (Bromiley and Fleming, 2002; Priem and Butler, 2001).

Later in the 1990s, the core competence approach was developed by Prahalad and Hamel[44] and other scholars (Hamel and Heene, 1994; Hamel and Prahalad, 1994; Heene and Sanchez, 1996; Javidan, 1998; and Lei et al., 1996); in the same period, Leonard-Barton introduced the concept of core (technological) capabilities (Leonard-Barton, 1992; 1995). This was the first time that strategy (and management) researchers have seriously examined the central role of technological competencies (Tidd et al., 2001: 132). Instead of planning strategy based on neutralizing threats and strengthening product-market competitive position, Prahalad and Hamel viewed strategic thinking in terms of "core competence". Prahalad and Hamel (1990: 81) defined core competence as "the *collective learning* in organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies" [italics added].

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[44] Wernerfelt (1995) believes that Prahalad and Hamel were responsible for (rapid) diffusion of the resource-based view into practice.

Similar to Prahalad and Hamel but with more focus on the "organic" perspective of learning, Leonard-Barton (1995: 27) defined core technological capability as distinct from other lower-order capabilities and argued that it has four key components: 1) people's *skills* (i.e. employee knowledge and skills), 2) the embedded knowledge within the *physical systems* (e.g. equipment, software), 3) the *managerial systems* that facilitate the knowledge-building activities (e.g. systems of education, rewards and incentives) and 4) *values* and norms that serves as mediators to select the types of knowledge to be developed [original italics]. On the whole, the core competence/capability scholars believed that a firm's successful competitive strategy must be built on a firm's internal core competencies (Javidan, 1998) and these must be managed as an inter-dependent, well-functioning knowledge system (Leonard-Barton, 1992; 1995).

Having its roots in the "economic" resource-based view[45], the core competence idea can be too introspective and lacks the "outside-in" view of competitive position and industry analysis (Porter, 1991). The concept of core competence, if overemphasized by the exploiting firms, will cause the firms to fail to renew the existing competencies and possibly lead to "core rigidities" (Leonard-Barton, 1995: 33) or "competence trap"[46] (O'Driscoll et al., 2001: 76). Moreover, the core competence perspective is always described as a historical account of successful global firms which usually remained at an abstract level and rather static[47].

These limitations prompted scholars to develop an approach that simultaneously incorporates both the "inside-out" and "outside-in" perspectives as well as incorporating more dynamic elements such as organizational learning (Dunphy et al., 1997) and meta-learning (Lei et al., 1996), learning organization (Garvin, 1994; Senge, 1990), knowledge, organizational behavior and continuous innovation in a competence-based strategic management framework[48].

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[45] The "core competence" concept is essentially a management version of the "economic" resource-based view thinking (Barney, 1991; 1995; Wernerfelt, 1995).

[46] Here the competence trap is defined as "the failure to reconcile the competence leveraging with competence building can lead to competence trap." Early development of the concept of "competency traps" was made by Levitt and March (1988), and later, Levinthal and March (1993).

[47] Drejer criticized that the core competence concept implicitly stated that core competencies do not need to be developed over time (Drejer, 2002: 102).

[48] See for example: the concept "combinative capabilities" (Kogut and Zander, 1992); likewise, the concept of "integration capability" (Iansiti and Clark, 1994); Collis and Montgomery (1995) on improving the "static" resource-based view to include the changes within the external environment and recently integrating the resource-based view with organizational economics into a dynamic framework explicating corporate strategy; Sanchez and Heene (2004) on competence-based strategic management model; Sanchez et al. (1996) on the

2.2.4 The Dynamic Resource/Competency-based Theory

To resolve issues of either too outward or too inward a focus and the tendency to a static view on competence-based strategic management, the idea of integrative, dynamic competency-based theory has emerged. However, this idea is not new. Commenting on the legacy of Penrose, Rugman and Verbeke (2002: 771) state:

> "Her insights on the [firm] growth process, especially the enactment of the [external] environment *and* the discovery of productive opportunities [i.e. the internal capabilities to render productive services] through a dynamic *learning process* but guided by path dependencies[49], remain as relevant today as 40 years ago" [italics added].

The early resource-based view neglected the complex relationship between the resources, capabilities and learning strategy that partially derived from anticipation of changes in the *external* environment and firm's strategic plan to seize future business opportunities. The emphasis of the integrated view is on *both* the external environment and the firms' realization of opportunities, as Collis and Montgomery (1995: 119) rightfully stated:

> "The [emerging modern] *resource-based view of the firm* ... combines the *internal* analysis of phenomena within companies ... with the *external* analysis of the industry and the competitive environment ... Thus the [modern] resource-based view builds on, but does not replace, the two previous broad approaches to strategy by *combining* internal and external perspectives" [original italics].

Other scholars also attempted to integrate both the external environment and firm resources in their framework[50]. In addition to the integration of the external and internal views, the perspective on dynamism (i.e. changes through time) of firm strategy and learning activities also matters, as Penrose stated:

> "... 'history matters'; [firm] growth is essentially an evolutionary process and based on cumulative growth of collective knowledge [and capabilities] in the context of a purposive firm" (Penrose, 1995: xiii).

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dynamics of competence-based competition; Amit and Schoemaker (1993) on integrating the resource-based view with external industry analysis; and Drejer (2002; 2003) on linking competence development to innovation and organizational learning.

[49] The concept of "path dependencies" here is taken to mean "a firm's [current learning processes and] capabilities are defined very much by where it has been in the past and what it has done" (Augier and Teece, 2006: 404) and that "history matters" (Teece, 2000: 113, see also Nelson and Winter (1982)).

[50] For instance, Amit and Schoemaker (1993) attempted to explicitly link the resource-based view, an industry analysis framework, and the behavioral decision theory to better explain the concepts of "strategic assets" and their impact on organizational rent.

This reinforces the modern resource-based thinking with regards to firm heterogeneity that firms differ in their historical knowledge base, in the learning and competitive strategies used to acquire external resources, and in their internal development of capabilities. These factors underpin the emergence of the development on a modern resource-based concept.

2.2.4.1 The Modern Resource-based Concept

Scholars in the field of both economics and business policy had extended this "early" resource-based view to incorporate other aspects relating to firm resources (both internal and external) and firm competitive advantage. There were two main development directions of the "modern" resource-based concept. The first was based on the criticism that the original resource-based concept is rather static and did not incorporate change; this was provided by the proponents of the dynamic capabilities view[51] (Teece et al. (1990), Dosi and Teece (1994), Teece and Pisano (1994), Teece et al. (1997))[52].

The second development emphasized the integration of other concepts into the resource-based thinking framework, including: organizational learning (Bierly and Hamalainen, 1995; Drejer, 2000; Wang and Ahmed, 2003; West and Burnes, 2000), knowledge creation (Nonaka, 1994; Nonaka and Takeuchi, 1995; Nonaka et al., 2000), knowledge-based organizational capability (Grant, 1996; Metcalfe and James, 2000; Spender, 1996), knowledge strategy (Zack, 1999; 2002) and learning and innovation (Drejer, 2003; Lam, 1998).

Historically, Teece's dynamic capabilities framework originated at about the same time as the idea of Prahalad and Hamel's core competence (Teece et al., 1990; 1992) and that the framework "has been presented as an alternative to Porter's (1980) 'outside-in' competitive forces model as well as the inside-out resourced based" (Antonacopoulou et al., 2005: 24). The dynamic capabilities approach emphasizes learning and focuses on three key elements that directly affect the firm learning and competitive strategies: path, position and processes (Teece and Pisano, 1994; Teece et al., 1997). Teece's idea is by far the most useful framework for analyzing firm learning and innovation strategy (Tidd et al., 2001: 69)

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[51] For more articles related to dynamic capabilities concept, please refer to the special issue of *Industrial and Corporate Change* (1994) on this subject.

[52] See also Augier and Teece (2006), Eisenhardt and Martin (2000), Hilliard (2004), Buenstorf and Murmann (2005), Zollo and Winter (2002) on learning mechanisms and dynamic capabilities, Winter (2003) on explicating the concept of dynamic capabilities, Fujimoto and Orihashi (2004) on the case studies of Toyota and Mitsubishi carmakers, Lei et al. (1996), Adner and Helfat (2003), Madsen and McKelvey (2005), and Ferdinand et al. (2005)).

since it integrates the former resource-based thinking with the Schumpeterian view of competition (Amit and Schoemaker, 1993; Mahoney, 1995; Nelson, 1991; Wernerfelt, 1995). Nelson (1991) and other evolutionary economics scholars (Dosi et al., 2000) had earlier argued that a central issue for strategic management should be the firm-specific dynamic capabilities in a Schumpeterian and evolutionary context; firms must be understood in terms of their diversity in strategy, structure and core competences (Dosi et al., 2000; McKelvey, 1998) and problem-solving routines (Dosi and Marengo, 1993) and how these elements change through time.

In this view, firm-specific dynamic capabilities are the source of sustainable competitive advantage. Teece (1994: 538) pointed out two key definitions: "dynamic" means

> "the *shifting* of character of the environment; certain strategic responses are required when time-to-market and timing is critical, the pace of innovation is accelerating, and the nature of future competition and markets is difficult to determine" [italics added]

and "capabilities" means

> "the key role of strategic management [and managers] in appropriately adapting, integrating, and re-configuring *internal* and *external* organizational skills, resources, and functional competences [and capabilities] toward changing environment" [italics added] (Ibid.).

From these two definitions, it is easy to see that the powerful insight within the dynamic capabilities view incorporates: 1) both the external and internal changes to the firm's skills, knowledge and resources and 2) these firm-level changes must be in constant interaction with the ever-changing, turbulent environment. In addition, within the dynamic capabilities framework, firm's competence and capabilities rest fundamentally on three key themes: paths, positions and (organizational) processes (see also Kim and Nelson (2000b: 6)). Teece (1994: 541) defined these as:

- Paths refer to "the strategic alternatives available to firm, and the attractiveness of the [business] opportunities which lie ahead."
- Positions refer to "[firm's] current endowment of technology and intellectual property, as well as its customer base and upstream relations with suppliers.

- Processes refer to "the way things are done in the firm, or what might be referred to as its 'routines' [i.e. the firm's managerial, organizational and learning processes]"

Having defined these three constructs, he later stated: at any point in time the firm's capability is collectively encompassed by its "processes" and "positions". Similarly, at any point in time, the firm must choose its future development "paths", and that firm's competitive advantage and strategic capability hinge on "what a firm can do and where it can go [as a result of] the topography (i.e. historical accumulation and choice of) of its processes, positions and paths" (Teece, 2000: 116).

Though powerful in its key conceptual constructs, the dynamic capabilities view is in its preliminary development phase and lacks sufficient empirical evidence (Jantunen, 2002; Williamson, 1999), and this makes it difficult to identify firms that possess dynamic capabilities (Blyler and Coff, 2003). Arguing that firm-specific competencies is the underlying factor influencing differences among firm dynamics and the degree of sustainability of firm competitive advantage, Pavitt commented:

> "The identification of dynamic competencies is inevitably itself part of a learning process, and is [currently] *neither* an elegant theory enabling scholars to predict outcomes, *nor* a simple recipe enabling managers to achieve corporate success" [italics added] (Pavitt, 2002: 10).

Consequently, what is needed in this area is more empirical studies (Pavlou and El Sawy, 2005), both at the industry-level and firm-level, to establish the "microfoundations of dynamic capabilities" (Jantunen, 2002: 53).

A number of researchers in Europe, including Anders Drejer, Ron Sanchez, Aime Heene and Howard Thomas, have worked on problems related to competence-based strategic management and competition (Heene and Sanchez, 1996; Sanchez, 1993; Sanchez et al., 1996), organizational learning and innovation management (Drejer, 2000; 2003; McKee, 1992; Stata, 1989), learning and knowledge assets (Sanchez and Heene, 2005). Other scholars worked on combining industrial organization, spatial competition, strategic groups and cognitive communities into a theory of resource-based view and competence-based competition (Thomas and Pollock, 1999). In a series of articles and books, Drejer explored the linkage among organizational learning and the different elements of competence development (Drejer, 2000; 2001a; 2001b) and later attempting to link the concept of core competence to strategic management and establish the notion of "competence-based strategy" (Drejer, 2002).

Sanchez and Heene (2004: 5) discuss the competence-based view of the firm, in which they view firm as an open system composed of six main "*system elements*" [original italics]:

- Strategic logic – refers to the operative rationale for achieving organizational goals through the coordinated resource deployments
- Management processes – refers to the coordination mechanisms for acquiring, leveraging and deploying resources
- Intangible assets – refers to the knowledge, intellectual property, reputation and relationships
- Tangible assets – refers to the physical assets such as plant, equipment and so on.
- Operations – refers to firm's operational activities
- Product offers – refers to the entire package of benefits and costs a customer imagines when thinking about purchasing the product

It could be argued that both the "strategic logic" and "management processes" are the most relevant elements to firm's learning strategy and that the ability to effectively direct firm's learning activities must be based upon at least two key elements: data[53] from firm's existing assets (intangible and tangible), operations and product offerings and external data on resources that are available to firms, the "firm's addressable resources"[54] (Ibid.: 82).

Some scholars in the resource-based field have argued that among all the firm resources, knowledge is the most important one (Grant, 1996; Kogut and Zander, 1992; Liebeskind, 1996; Nonaka, 1994; Spender, 1996). The implication is that to maintain firm competitive advantage, firm knowledge must be strategically managed. This implies that firm must link the business development strategy (i.e. competitive strategy) with the learning (or knowledge development) strategy (Zack, 1999; 2002). Other scholars also extended the resource-based view beyond a single firm's boundary to include the

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[53] Basing the concept on the systems theoretic framework, "data" refers to the feedback comprising information and knowledge that the strategic managers received from managing the various functional resources of the firm. The data will enable the managers to make appropriate adjustments to decisions, policies, procedures and budgets (Ibid.: 5).

[54] Sanchez and Heene define firm-addressable resources as the resources that an organization does not own, but can be access through market transactions (what economist called factor markets). Another type of resource described by these authors is firm-specific resources and these are internal resources of a firm such as permanent employees, machines and other physical assets.

"relational aspect", i.e. the inter-organizational relations (Acedo et al., 2006; Dyer and Nobeoka, 2000; Dyer and Singh, 1998; Nobeoka and Dyer, 1998) and firm capability development within the learning networks (Bessant and Francis, 1999; Bessant et al., 2003; Hakansson et al., 1999). The main focus of these recent studies is on the concept of management of firm knowledge sharing (and shared learning) and the effectiveness of the inter-firm learning processes in building firm capabilities (Bangens, 1998; Lane and Lubatkin, 1998; Mikkola, 2000); these scholars argue that much of the "early" resource-based view literature addresses very little of such issues, hence an extension to inter-firm relations is justified.

2.2.5 Strategy as Learning and Knowledge Strategy

The strategic management literature is essentially divided into two streams: the content and the process. Most of the above discussion of SRBL (with the exception of dynamic capabilities[55]) had reviewed only the content perspective: what you need to *have* to sustain competitive advantage, not on what you need to *do*. The core issue of identifying the strategic learning process that firms must engage in order to create competitive advantage is mostly lacking in all the strategic management theory:

> "While there has been considerable progress in developing frameworks that explain differing competitive success at any given point in time, our understanding of the dynamic processes [i.e. learning processes] by which firms perceived and ultimately attain superior market positions is far less developed" (Porter, 1991: 95).
>
> "... it is disturbing to note that the theory on strategic management, over the past decade, has failed to provide [prescriptive] models and framework for [strategic managers] ... it seems as if scholars within the area has been engulfed in a fruitless war over *who* and *what* [i.e. the content] defines competitive advantage, rather than on *how* [i.e. the learning process] to create advantage" [italics added] (Drejer, 2004: 517).

Similarly, McGrath et al. also stated their view on strategy research:

> "... the [learning] *processes* used to develop new sources of advantage are as important to the long-run competitive vitality of a firm as the *content* of any given advantage" [italics added] (McGrath et al., 1995: 252).

Consequently it is worthwhile for scholars to pay more attention to the (learning) process-side of strategic management models or frameworks and in particular to how learning

[55] Lewis (1995: 38) stated that the dynamic capabilities approach's "emphasis on learning and the constraints on learning reflects the key issues in the process-based [rather than content-based] strategy perspective."

strategies form in firms (Mintzberg, 1993; 1994). Mintzberg proposed that formal strategic planning per se is doomed to fail and that learning is inherent in the process of forming strategy[56] (Mintzberg and Waters, 1985). There will always be continuous adjustment along the way to achieve a dynamic fit (alignment) between what is realized from strategy and its intended, original plan[57]. The implication of Mintzberg's emergent strategy approach is that within an ever-changing industrial environment, it is highly likely that firm's learning strategy is an emergent, rather than a rationally planned one, making the formulation of firm-level learning strategy itself a learning process (Tidd et al., 2001: 69-73; 2005: 401-402). In short, firms must engage in a process of "learning to learn" strategically (Bessant and Buckingham, 1993: 223).

Consequently, firm managers should attempt to distinguish among the different levels of (technological) firm learning: operational, tactical and strategic and at the strategic level, managers should develop the firm strategic ability to "learning to learn-how-to-learn and unlearn from experience" (Carayannis and Alexander, 2002: 629) or adopt a "learning approach to strategy" (Mumford, 2000). Others similarly described two or more different levels of learning: "adaptive learning" (i.e. learning associated with simple first-order change) versus "generative learning" (i.e. learning that can enhance organization's creative capacity through second-order change) (Senge, 1990: 14) and from "single-loop" (i.e. the detection and correction or organization errors to allow firm to pursue its existing objectives) to "double-loop" (i.e. the understanding of ways that organizational errors were detected and corrected) and finally to "deutero learning"[58] (i.e. the fundamental inquiry into the firm's learning system and how well it functions) (Argyris, 1977; Argyris and Schon, 1978).

Despite the difference in the detailed definitions, these scholars agreed that "higher-level learning" (Fiol and Lyles, 1985: 810) exists and that such higher-level "strategic

[56] In addition, Mintzberg (1990) categorized ten distinct "schools" within strategy research, one of which is the "learning schools", which describes the process of strategy making as an emergent process.
[57] Mintzberg (1978) and Mintzberg and Waters (1985) dubbed this concept "realised", "intended" and "emergent" strategies (Ibid.).
[58] This type of learning is sometimes called "meta-level learning" (Lei et al., 1996) or "triple-loop learning" (Easterby-Smith, 1997: 1106), and it is usually associated with an understanding on how to identify which kind of learning activity and mechanisms are required for a particular situation/task and how to manage such selections (Bessant and Buckingham, 1993: 223). Some scholars remarked that deutero learning is essentially a sub-category of double-loop learning and it is highly similar to the concept of firm dynamic capabilities (Weinstein and Azoulay, 1999: 42). Likewise, other scholars also remarked that double-loop learning is similar to that of dynamic capabilities because "it implies a learning process which changes the values and operating assumptions of the organisation ..." (Easterby-Smith et al., 2006: 7).

learning" (Dodgson, 1993; Thomas et al., 2001) is necessary if firms wanted to renew itself into new competitive realms (Lei et al., 1996) and to increase the rate of capability accumulation by means of enhanced, innovative organizational routines (Nelson and Winter, 1982) or organizational capability (Winter, 2000). They further agreed that most firms that are unable to engage in the higher-level learning process will be unable to compete in the long term (Beckett, 2001) and that these firms cannot maintain an effective control of the various "operational" and "tactical" learning processes (Carayannis and Alexander, 2002). This argument could be extended further to postulate that firms without the deliberate strategy to engage in higher-level learning are unable to regulate the lower-level learning processes, and this would lead to the slowing down of the accumulation of firm capabilities. This thesis will attempt to further explore the validity of such an argument.

Recognizing that in developing a knowledge strategy one must consider two dimensions of knowledge and learning strategy (Zack, 1999): first is the exploration versus the exploitation (March, 1991) and second is the internal versus external learning dimensions, and the combination of these two sources to maintain synergy and build firm knowledge (Kogut and Zander, 1992). Based on these dimensions, Zack (1999: 126) has made two assertions: 1) the link between knowledge management and business strategy, which is currently lacking, must be put more into practice and 2) business managers are in need of a framework to assist them to understand the knowledge-strategy and learning-strategy links. Here it is argued that not only do these knowledge strategy, learning strategy, and business (competitive) strategy simply link to each other, but they also must link in a systemic way to enable a firm to achieve higher rate of capability accumulation.

2.2.6 Summary of SRBL

The review of the above concepts from the strategic resource-based literature revealed the following strengths and limitations. First are the strengths:

1. It offers great insights into learning strategy formulation, how the tensions between the internal organization (i.e. management of resources and capabilities) and the dynamics of the external environment (customers, competitors and suppliers) contributed to shaping firm's competitive and learning strategies. In addition the underlying premise of this literature is persistent firm heterogeneity with respect to

their resources and capabilities and thus possibly persistent differences in the firm learning and competitive strategies.

2. The "modern" resource-based concepts also incorporate much dynamic elements related to the process of learning and capability building, such as organizational learning, knowledge and innovation, and the view that a firm's learning and competitive strategies are also important parts of its learning process, and they must be properly managed and aligned with the learning activities and mechanisms.

Secondly, the review of the SRBL also suggests the following limitations:

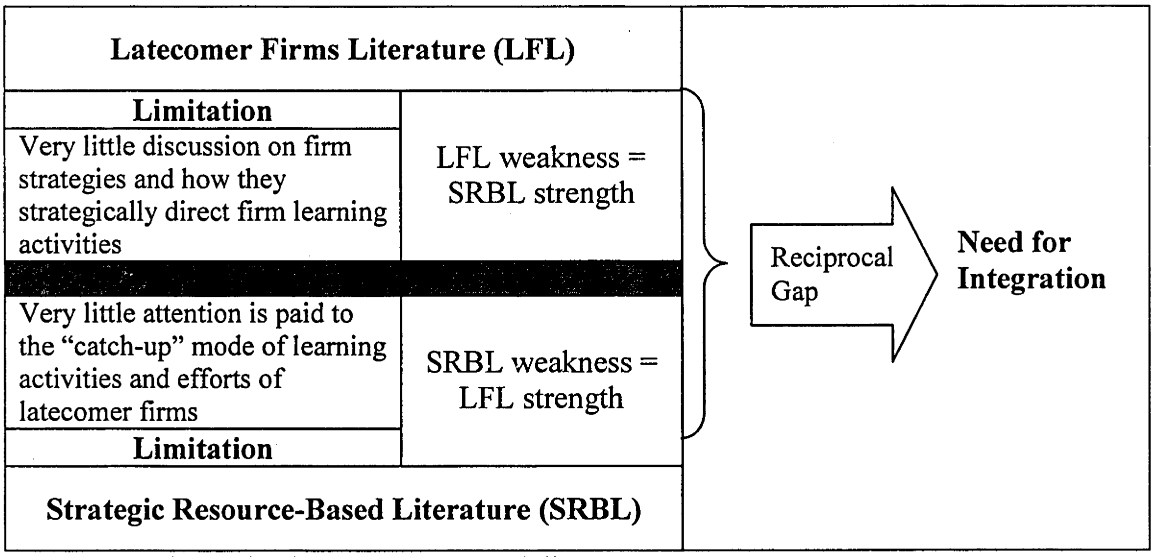
1. The literature (in particular, the "original" resource-based view) offers very little discussion regarding the significant role played by the deliberate investment in learning effort and learning activities, especially in the context of a latecomer firm[59].
2. The operationalization of the key constructs within the "modern" resource-based concept is mostly lacking. This has implication for developing country context; without such operationalization, the latecomer firms' managers (and policymakers) could not clearly see the linkage among the competitive and learning strategies, the learning activities, and firm resources and capabilities, and how these elements interdependently link into the concept of latecomer firm's sustainable competitive advantage. Consequently, more empirical studies that focus on such operationalization are needed.

2.3 Summary and the Literature Reciprocal Gaps

From the review of both LFL and SRBL above, it is argued that there exist mutual gaps between both bodies of literature. The characteristics of such gaps are that the strength (or weakness) of LFL becomes the weakness (or strength) of SRBL (see Figure 2.1).

[59] For example, the studies conducted by Mathews (1998; 2002) stated that the "original" resource-based view was inapplicable and inappropriate to context of a developing country firm. Instead of targeting resources/assets which are inimitable, non-substitutable, and difficult to transfer (Barney, 1991; Peteraf, 1993), latecomer firms should acquire the initial competitive advantage by acquiring assets that are more imitable, substitutable, and easier to transfer (i.e. the "inverse" of the former criteria).

Figure 2.1 The Literature Reciprocal Gap

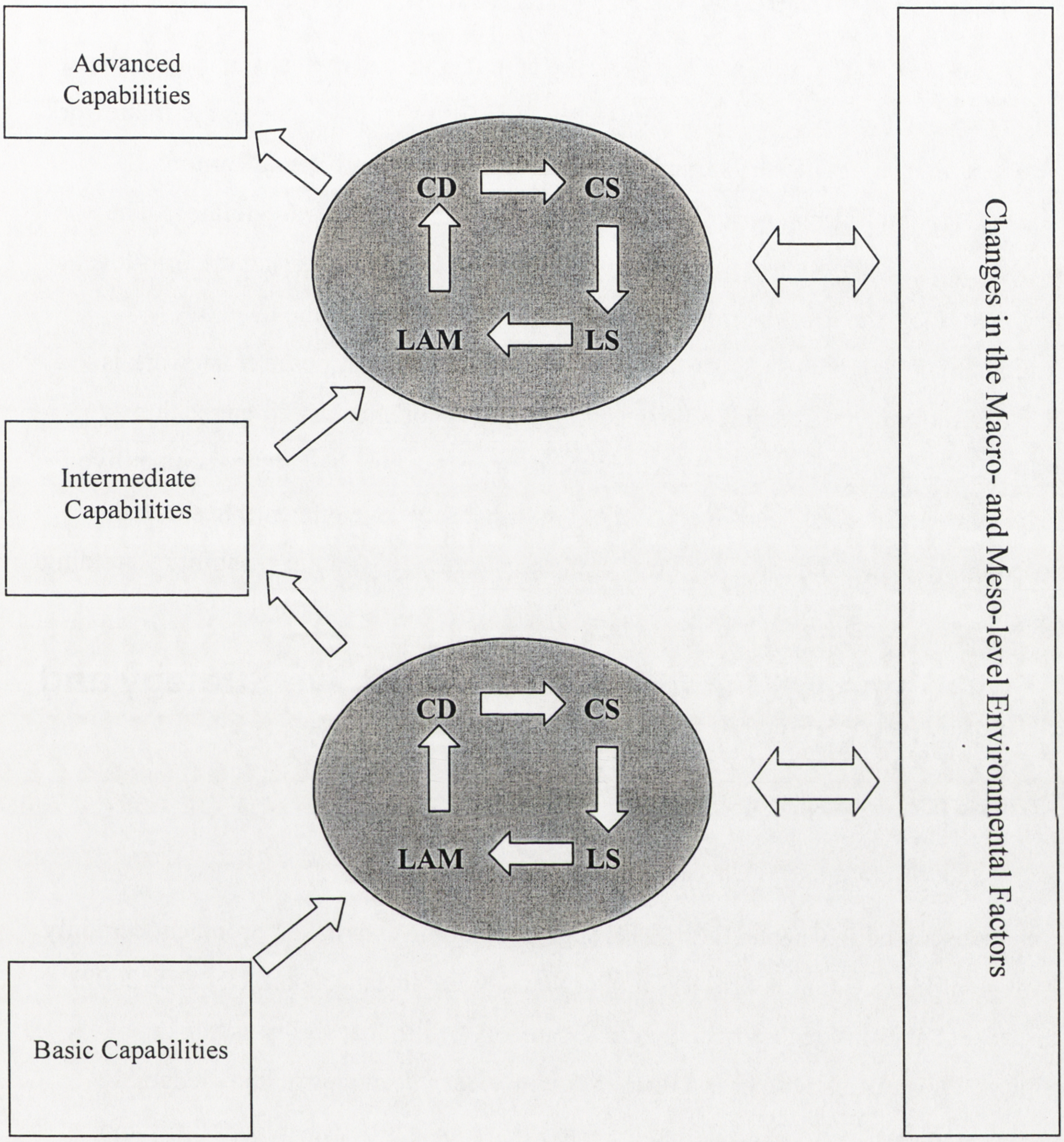


Source: own elaboration based on the research literature

In other words, it is easy to see that the gap in LFL is the strength of SRBL and the same is true vice versa. For instance, the LFL mentions much about how latecomer firms must initially engage in effort-intensive learning activities in order to build the basic technological and organizational capabilities, whereas the SRBL focuses more on the ability to sustain the pre-existing firm competitive advantage and does not discuss much about the latecomer firms' learning processes. In reality, however some successful latecomer firms also possess the "strategic learning" capability (in the SRBL sense) and this assists the firms in moving up the capability ladder. This issue was not sufficiently mentioned in the LFL.

Consequently, the integration of the two bodies of literature involves combining the reciprocal strength from each literature (i.e. at the same time, neutralizing the weakness of each literature). Conceptually the integration would yield a more enhanced, holistic conceptual framework with an improved ability to effectively capture the dynamics of latecomer firms' competitive and learning strategies, learning activities (and mechanisms) and the rate and types of capability accumulation. As a result, this study seeks to locate at the integration of the two bodies of literature to address the interdependent and complex relationship among the **three** key conceptual issues (i.e. strategies, learning process, and firm capability development) in the latecomer firm context (see Figure 2.2).

Figure 2.2 Conceptual Model of Latecomer Firm Capability Development



Source: own elaboration based on the research literature

Notes: 1) CS = Competitive Strategy
LS = Learning Strategy
LAM = Learning Activities and Mechanisms
CD = Capability Development

2) The study focuses on the shaded circle areas, where both the LFL and SRBL paid little attention and largely failed to sufficiently explain the dynamics

Chapter 3 – Conceptual and Analytical Frameworks

The purpose of this chapter is to develop an integrated analytical framework based on two levels, the meso-level and the firm-level. The **first** section discusses the framework for assessing the impact of the external factors on firm's competitive and learning strategies. Here both firm competitive strategy and learning strategy are defined. The **second** section explicates the definitions and the frameworks for assessing the firm-level learning activities, the learning mechanisms and the type as well as the level of accumulation of capabilities. The **final** section argues that this proposed framework is capable of capturing the dynamics of latecomer firm technological and organization capability development, taking into account the dynamics occurring among: competitive strategy, learning strategy, learning activities and capability development. In short, the proposed framework attempts to capture the latecomer firms' dynamic capabilities building process.

3.1 Environmental Factors, Firm Competitive Strategy and Learning Strategy

3.1.1 Macro- and Meso-Level Factors

3.1.1.1 Contributions from LFL and SRBL and Limitations

As discussed in Chapter 2, the LFL suggests that the external environment certainly has a range of impacts on the firm learning processes. For instance, both UNIDO (2002) and Ernst et al (1998a) explicitly defined one category of firm capability as "linkage capability", which deals with how a firm links with *external* sources of knowledge. Likewise, Tran (1999; 2002) described the important linkages between local firms and *external* foreign connections in capability development. Similarly, Virasa (2005: 99-101) acknowledged the importance of firm "external linkage capability", but did not explicitly delineate this concept with firm-level learning strategies[60]. However, these studies neither systematically identify the types of external meso-level factors nor how the sequence of changes in these factors affects firm-level competitive and learning strategies.

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[60] However, in terms of firm competitive strategies, Virasa (2005: 98) described the linkage between firm linkage capabilities and their "business model", grouped into three types: locally-owned brand manufacture (OBM); locally-owned original equipment manufacture (OEM); and locally own niche-focused venture.

The strategic management clearly acknowledges the importance of the external environment, starting with Porter's industrial five forces framework (Porter, 1980). Then in the early 1990s when the resource-based view became dominant, the firm internal resources (and capabilities) were the central focus and the external environment took a subsidiary role. The external environment became important again under the recent dynamic capabilities framework (Teece and Pisano, 1994; Teece et al., 1997). In this framework, one of the main emphases is on the rapidly "shifting character of the environment" (Teece and Pisano, 1994: 537); and its implications on the need for firms to timely adapt, integrate and reconfigure internal and external skills, resources and knowledge. But the framework did not explicitly spell out the factors or actors (i.e. customers, suppliers, public organizations, business associations, etc.) within the external environment that may affect the firm-level competitive and learning strategies.

Even though both LFL and SRBL suggest that the researcher cannot deny that each firm is embedded within an industry (or industries) and that the industry normally comprises a group of firms offering similar products or services, as well as supporting organizations and institutions, neither body of literature on its own is capable of specifying the types of actor within the external environment that may shape firm-level competitive and learning strategies. For instance, the LFL acknowledged the importance of a firm's external linkages and their impact on firm capability development (Ernst et al., 1998b; Poapongsakorn and Tonguthai, 1998; Tran, 1999; Virasa, 2005), but declined to state the specific factors (for e.g. government policies, industrial regulations, rival firms' upgrading activities, establishment of supporting organizations, etc.) within the external environment that were affecting firm learning and capability development. Similarly, the SRBL (Teece and Pisano, 1994; Teece et al., 1997) also acknowledged the industry competitive dynamics, linkages with other firms and organizations, but did not systematically list such external factors. Consequently, to address such issue we shall turn to a discussion of the innovation systems literature, which does address this issue, particularly focusing on the developing country perspective.

3.1.1.2 Innovation Systems Literature[61]

Since the 1980s, the concept of innovation systems has been developed in order to more adequately explain technological change, and its role in the long-term economic development of a nation. Innovation systems operate at many hierarchical levels and boundaries: national innovation systems (Dosi et al., 1988; Freeman, 1982; Lundvall, 1992; 2003; Nelson, 1993); regional (geographical) innovation systems (Braczyk et al., 1998; Ohmae, 1993); and sectoral innovation systems (Breschi and Malerba, 1995; Malerba, 2002; Scott-Kemmis et al., 2005). These various studies have pointed toward the two key features of any innovation systems: the main actors (i.e. the different organizations and firms) and the linkages among these actors that enable them to function together as a learning system. These innovation system concepts were developed in a developed country context, and some scholars have proposed that the application of such concept to a developing country context is still lacking (Alcorta, 2005; Intarakumnerd et al., 2002).

In contrast to Intarakumnerd et al (2002), this study has taken a narrower focus at a single sector (i.e. the automotive industry) and defined the actors within the sectoral innovation system (Malerba, 2002; Scott-Kemmis et al., 2005) to comprise mainly three distinct types: 1) the institutions (inclusive of industry incentives, regulations and development policies), 2) the private business firms (i.e. the carmakers and the auto-parts firms) and 3) the non-firm organizations (see Chapter 5 for details). Together these three actors and their interactions[62] shaped the firm-level competitive as well as learning strategies. Furthermore, some larger Thai auto-part firms (i.e. the conglomerates) also attempt to shape the evolution path of the industrial environment through affecting the public policy decisions by the state and its agents.

3.1.2 Firm's Competitive Strategy: Paths and Positions

Having a foundation on industrial organization economics, Porter (1980) identified three generic types of firm competitive strategy: cost leadership, differentiation, and focus,

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[61] This section highlights the role of industry-level dynamics and meso-level change in generating challenges and business opportunities. It is intended to clarify which factors, actors and important linkages within the industry environment could affect firm-level competitive strategy, learning strategy, learning mechanisms and the process of firm capability development. This section is by no means an exhaustive review of the innovation systems literature; as this is outside the scope of this thesis.

[62] The interactions represent market as well as the non-market ones. Further the interactions are also shaped by the process of communication, exchange, co-operation and competition; all shape by the institutional environment (Malerba, 2002).

and proposed that firm competitive success depends upon choosing only one of the three strategies (Porter, 1985: 36-38). He also cautioned firms not to be "stuck in the middle" (i.e. especially not to mix cost leadership with differentiation strategy). However, this prescription has proven to be rather inaccurate or inadequate in some competitive situations (see for example, Prahalad and Hamel (1990), Sanchez and Heene (2004: 30-31), Alkhafaji (2003: 132-133) and Grant (2002: 89-91)). In addition, Porterian industrial organization economics did not place great emphasis on: the role of firm strategic learning, the importance of firm capability acquisition and development, and finally, the issue of uncertainty and path dependency in firm learning and capability development.

Rather than focus on seeking attractive positioning within the industry, Sanchez and Heene (2004: 136-139) have proposed a new view of firm's competence-based competitive strategy based on various sources of cooperative gain. For instance, a firm could gain more by cooperation with the suppliers to develop better inputs and improve the supply chain coordination (Bessant, 2003; Bessant et al., 1999; Nobeoka et al., 2002). Likewise, the firm could cooperate actively with the buyers to define better products and provide better services (Von Hippel, 1988). The view also acknowledged that cooperation with other actors in the external environment is important, and implicit in these collaborations is the crucial issue of firm learning. What was uncovered from these studies is the key finding that firm's competitive strategy is not only restricted to firm positioning within an attractive industry per se, but also include active strategizing about searching for synergistic cooperation to augment firm's learning opportunities and its absorptive capacity (Cohen and Levinthal, 1990).

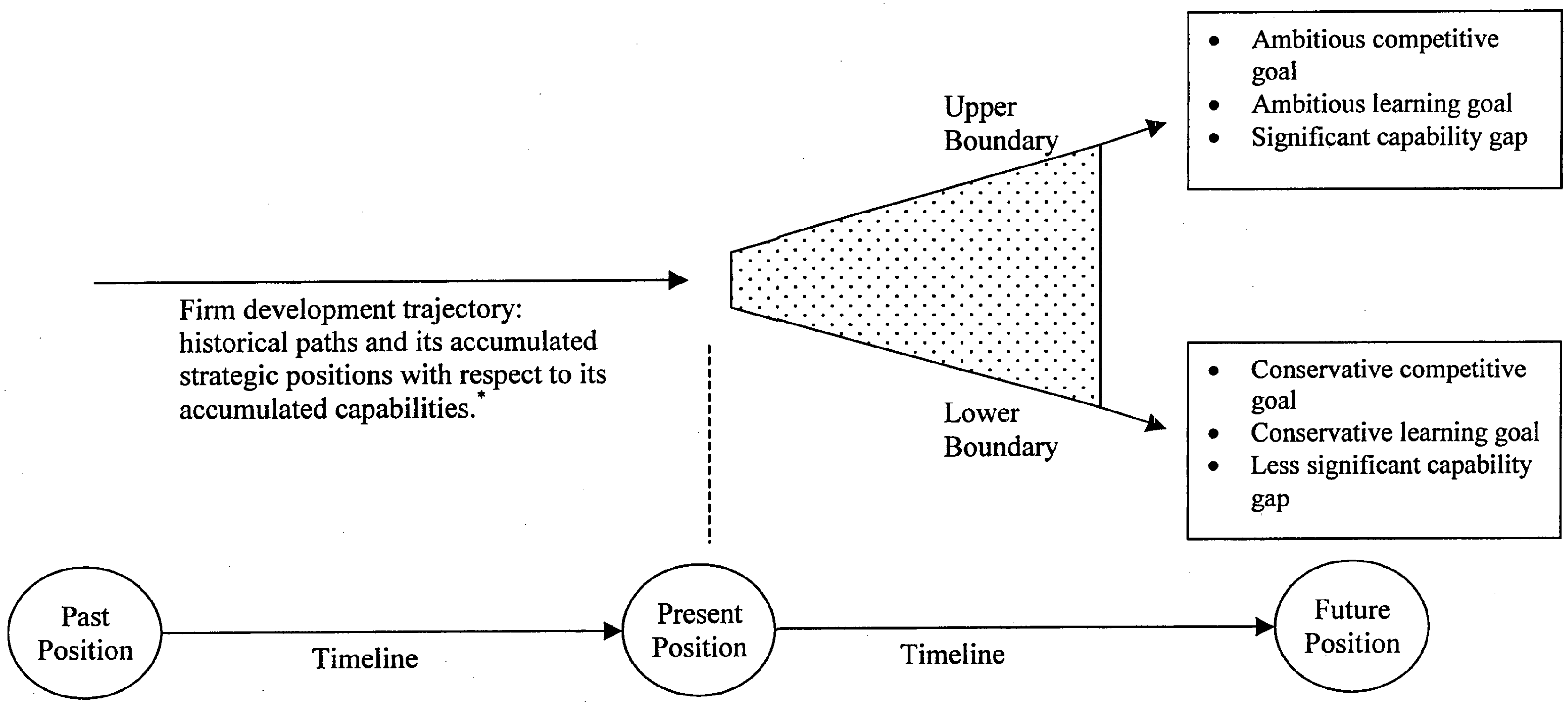
Though enlightening in their explication of the key concepts related to firm's competitive strategy, these frameworks did not highlight the need to conceptually link firm's competitive strategy with its learning strategy. In particular, the frameworks did not explicitly state how the firm's competitive goal relates with its learning goal; the issue of dynamic alignment between the two and how this would impact the rate of learning and overall firm capability development. Moreover, the frameworks above were based upon the empirical case study of large corporations located within the First World context; hence little attention was paid to the context of latecomer firms located within a developing country.

In this research, the firm competitive strategy refers broadly to a firm's perception of opportunities and threats and its corresponding decision of where it wants to locate within the existing value chain and product-market position (Porter, 1998) (i.e. to be first-tier auto-part OEM supplier, second-tier auto-part supplier or replacement equipment producer, etc.). In other words, given a firm accumulated capabilities, the competitive strategy refers to: a firm's sense on the existing as well the emerging business opportunities and threats and the decision on what to produce; the business and market(s) it wants to be in; and its formulation of corporate long-term goals and short-term objectives. The firm chooses the competitive "path" it wishes to pursue in the future. Such decisions are often constrained by where the firm has been and where it is at currently (i.e. they are path dependent (Dosi et al., 1988; Teece and Pisano, 1994)). The dynamism of firm's competitive strategy is included in this definition, since over time firm's decision plan may change as a result of turbulence within the industrial environment.

The gap, or the misfit, between a firm's goals and its existing position is highlighted; if the gap is large, then it is usually the result of a firm quite ambitious competitive goal and its chosen competitive "path" that lies close to or at the "upper boundary" of the feasible development path (see Figure 3.1). However, a large gap or stretch competitive goal does not automatically imply that the firm is highly competitive relative to its competitors; it must be able to realize its ambitious goal through successful management and implementation of learning activities and capability development.

This is very much a function of the firm's top-level managers (or entrepreneurs), who must have the capacity to sense the sequence of changes within the meso-environment and the search for business opportunities. These managers must also have the ability to seize the available opportunities and overcome any problems that may occur. Normally such situations force managers to set high, stretch learning goals and to assess the degree of realization of firm's competitive strategy when it is implemented. The competitive strategy envisaged here also includes the related plans for supporting activities and capabilities that the firm will need to successfully execute its competitive strategy. This then serves as a platform for firm to set up its learning strategy.

Figure 3.1 Visualizing Single Firm Strategy: Competitive and Learning Paths



Source: own adaptation based on the dynamic capabilities framework (Teece and Pisano, 1994; Teece et al., 1997)
Notes: * Here portrays as a straight line for simplified illustration. In reality, the process of accumulation of capabilities is neither automatic nor costless and is highly unlikely to follow a linear path.

 = Space comprising a set of feasible "paths" available to the firm at the present time. Due to the assumption of path dependency and localized learning, it is extremely challenging (or impossible) for firms to choose the "paths" located higher than the Upper Boundary. Likewise, it is neither logical nor economical to choose the "paths" below the Lower Boundary, which are taken here to mean the minimum level of capabilities for firms to run a viable business.

3.1.3 Firm's Learning Strategy: Paths and Positions

When a firm has high stretch competitive goal, it often must also have an ambitious learning goal. For instance, if the firm competitive strategy states that it wants to become a first-tier auto-part supplier (the competitive goal), it is required to learn efficient supply chain management (the overall learning goal). In other words, along with these stretch competitive and learning goals the knowledge or capability gap between firm's existing capabilities and its targeted capabilities may be rather wide. Hence if the firm wishes to compete successfully, there is a need to timely close this capability gap through the acquisition of the requisite capabilities.

Through the formulation of an appropriate learning strategy (i.e. setting the learning goal with a conscious awareness of the knowledge gap) a firm can increase its chance of successfully directing the learning activities to build the firm capabilities. Consequently in this study the firm's learning strategy is defined as the emergent plan formulated and executed by the firm management in acquiring the requisite skills, knowledge and capabilities in order to enhance the likelihood to compete successfully in the future. Firm learning strategy also assists in giving firm learning activities a sense of direction and cohesiveness in aiming at building firm capabilities.

Firm learning strategy is emergent since a complete understanding of complex interactions between changes in the external environment, firm strategies, and firm capability development process is virtually impossible (Tidd et al., 2005). At best, a firm could partly comprehend the strengths and weaknesses of its existing capabilities and how this interacts with its ability to seize future business opportunities and neutralize threats. However, this does not imply that all firms have the same degree of emergence in their competitive and learning strategies. It only implies that the emergent learning and competitive strategy characteristics are important and must be taken into account when describing a firm model of capability development process.

Keeping in mind the emergent characteristics, it could be said that the formulation of firm's learning strategy is *not* automatic. It is a complex process involving several factors: the changing external environment; firm's competitive strategy; learning opportunities, existing firm capabilities; and the possible executable learning activities (i.e. knowledge acquisition activities). Additionally, the firm must know what it must know about these factors in order to appropriately define a learning goal. This is also complex since the firm will face the "learning paradox, [which means] until you have learnt something you cannot properly specify what you need to learn" (Arnold and Thuriaux, 1997: 39) and likewise,

> "... there are no simple answers regarding what a firm must know to be competitive – if there were, then there would be no sustainable advantage" (Zack, 1999: 133).

Similarly, there is neither a single right way nor a clear roadmap on how to quickly become a successful learning organization (Appelbaum and Gallagher, 2000). Consequently, it could be said that, like competitive strategy, the process of formulating the firm learning strategy is an emergent one (Mintzberg and Waters, 1985) and at best conjectural, albeit it is an important component within the overall firm capability development.

From the SRBL, a suggestion to resolve such learning paradox is to develop firm core competencies based upon specifying "strategic architecture" (i.e. organizational roadmap that identifies which core competencies to build) (Hamel and Prahalad, 1994: 117-118) and "strategic intent" (Ibid.: 141), which refers to the ambitious strategic goal for firm's future development of these core competencies. Such suggestion has elegance in its descriptive presentation; however, it lacks the operative and prescriptive rationale on how the firm managers *gradually* identify the firm's strategic architecture as well as the strategic intent through a series of long trial and error learning processes (Tidd et al., 2005: 193). In other words, the core competence perspective is an abstract, descriptive historical account of successful global firms and implicitly state that core competencies do not need to be developed over time through organizational learning processes (Drejer, 2002: 102). In addition, since the firm's future capability needs cannot be known with certainty, part of the learning strategy (for e.g. future learning goals and attempt to fill the capability gap) must be imagined with some degree of disciplined creativity, i.e. in correlation with the firm's aforementioned competitive strategy and the opportunities and challenges available within the meso/industrial environment.

In addition, there are at least **two** important tensions in the formulation of firm learning strategy. **First**, the firm learning strategy must strike the right balance between exploitation and exploration (Levinthal and March, 1993; March, 1991); in other words, a too conservative learning strategy will overemphasize on the exploitation of today's capabilities and focus mainly on firm survival and most likely fail to sufficiently experiment and build the necessary capabilities for supporting firm's future growth. Firm learning strategy that overly emphasizes exploitation will drive out the exploration aspect. It is important to note that successful learning organization must maintain a proper balance between the two in order to balance capability development for both current survival and future growth (Beckett, 2001: 6).

Likewise, Winter (2000: 987) stated that if one allows the exploitative learning to dominate, then the firm's learning process would tend to end too soon and has a relatively inferior achievement in capability development outcome. Sanchez and Heene (2004: 9) described this issue as the choice between "competence building" and "competence leveraging". Here "competence building" implies that the firm *qualitatively* adapts and improves on new kinds of resources or capabilities coordination to assist the firm to achieve its future competitive goals (i.e. exploring with future competence); where as "competence leveraging" refers to the way firm seeks to achieve its competitive goals by using similar type of capabilities that it already possesses, and there is *no* qualitative change in the capabilities (i.e. exploiting today's competence).

Another tension in the firm learning strategy is achieving the right balance between the acquisition of internal and external capabilities and attempting to integrate the two to achieve synergy as well as balance[63]. In short, firm learning strategy must simultaneously maintain external as well as internal consistency (Lei et al., 1996: 562). This was similarly described in the literature as the firm "combinative capabilities" (Kogut and Zander, 1992) and "integration capabilities" (Iansiti and Clark, 1994), i.e. the ability to integrate the prior knowledge base of the firm with the *internal* learning as well as the *external* learning activities. In this research, the tension between internal and external learning is highlighted since most firms today are not able to perform all the activities in-house (Hamel, 1991; Heller and Orihashi, 2003); "... very few firms can successfully 'go it alone' anymore" (Teece, 1992: 3), and inter-firm collaboration (Chen and Qu, 2003) and "learning from others" (Garvin, 1994: 24) are almost a necessity.

Other scholars also emphasize different ways firm learn to tap into the sources of external capabilities and learning. There are many advantages for latecomer firms in leveraging external or shared learning within a group of firms within a supply chain

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[63] If the firm learning strategy focuses too much on the internal side; it would most likely suffer a "learning myopia" condition (Levinthal and March, 1993), which describes the situation where firms are locked into their short-run success formulas and neglected the perception of external stimuli for change and avoid the exploration of long-term, future learning and capability development.

(Bessant et al., 1999) or firms within a learning network (Bessant and Francis, 1999; Bessant et al., 2003; Deyo and Doner, 2000; Hakansson et al., 1999; and Styhre et al., 2004) and/or learning by visiting other firms and organizations (Barnes et al., 2001; Caplan, 2005). For instance, today first-tier auto-part suppliers frequently have to send their "guest engineers" to visit the multinational carmakers to collaborate on new product design activities; these auto-part firms are "learning by visiting" and collaborating with other firms (Caplan, 2005).

Most often the latecomer firms, who are mostly deficient in their existing capabilities, have to search for successful access to the external sources of capabilities (i.e. linkage for learning), and for other advanced firms and organizations to assist them with their internal development of capabilities. For instance, within the automotive industry, most of the first-tier auto-part suppliers develop extensive linkages with the multinational carmakers which often involve expert technical assistance and sometimes formal joint venture agreements. But the strategic question of how much should be built in-house versus how much to source externally is also part of the focus of this tension on the firm learning strategy. It is widely acknowledged in the LFL that the latecomer firms will most likely have to acquire capabilities through external linkages (usually through foreign firms), and due to the partially tacit knowledge involved with such capabilities, some capabilities cannot be easily transferred. Therefore, these capabilities must still be built in-house.

3.1.4 Summary on Environmental Factors and Firm Strategies

This above sections has reviewed the literature related to both competitive as well as learning strategy. It is now propose that a framework and definitions for firm competitive strategy and learning strategy below serve as useful tools for later analysis on firm strategic learning process.

3.1.4.1 Defining the Key Characteristics of Firm Competitive Strategy

There are **three** key characteristics of firm competitive strategy, and all are related in ways that firm competes against its rivals to attempt to achieve competitive advantage. The first two characteristics relate to the issue of competitive positions and the latter is focused on the firm unique competitive goal (see Table 3.1).

Table 3.1 Key Defining Characteristics of Firm Competitive Strategy

Dimensions of Competitive Strategy	Defining Characteristics
Product-market Position	What products to produce and for which market segments Who are the customers and their locations This also includes an establishment of new line(s) of business through corporate and/or business diversification
Resource/capability-market Position	What existing capabilities are needed to "stay in the game" What new capabilities are needed to "stay ahead of competitors" What capabilities are needed to collaborate with others (i.e. suppliers, customers, and non-firm organizations)
Competitive Goal	Which competitive "path" or "paths" to take in the future with respect to the firm's existing "position" comprising existing capabilities and assets (inclusive of firm learning capability); products, competitors, customers and suppliers

Source: own elaboration based upon the research

- **Product-market position** – For product-market position, firm competitive strategy refers to the managerial decision on: products to produce; for whom (i.e. customers); for which market segments the products are intended (i.e. inclusive of market location: domestic or overseas); and the competitive advantage of these products compared with similar other offerings in the market (Porter, 1980; 1985). Furthermore, it also includes who are the customers and what are their demands and how the firm attempt to fulfil such demands (Drejer, 2002). This broad definition would serve the purpose of linking firm decision on what capabilities to develop to either maintain a particular product-market position or move into a new product-market position. Consequently, this view on product-market position is not static (as in a Porterian sense); the firm is capable to both influence and be influenced by the product-market position. Moreover, this position will shift according to the meso-level changes and evolution.
- **Resource/capability-market position** – For resource-market position, the firm competitive strategy refers to two things: which capabilities are needed to sustain the existing product-market position (i.e. the necessary capabilities to maintain a viable business) or which capabilities are required to move into a new product-market position (or positions) (i.e. the new capabilities necessary for future growth or business/corporate expansion). It is important to note that the choice between the two is intimately linked with the firm learning strategy. Since to be able to achieve

the aspired resource-market position, firms usually have to either acquire new capabilities or improve on existing capabilities. Thus firms need to formulate the learning strategy to develop capabilities and to utilize these capabilities to manufacture the targeted product as demanded by customers who are located within a particular market segment. However, this definition is not to be misconstrued that firms are passive actors waiting to adjust their capabilities according to given changes in the external environment. In some successful cases, firms could anticipate the emerging customer needs and engineer their own product-market as well as resource/capability-market positions.

- **Competitive goal** – this refers to chosen competitive "path" or "paths" of the firm. In other words, where the firm wants to be in the future with respect to its current "position". Firm competitive goal reflects where its future and existing products will be located within the existing product-market position as well as the capabilities required to maintain such a position. Firm competitive goal also implies how the firm engages in setting ambitious target of building new capabilities to move into new product-market and/or resource/capability-market positions.

3.1.4.2 Defining the Key Characteristics of Firm Learning Strategy

There are four key characteristics of firm learning strategy, and these are closely related to the three characteristics firm competitive strategy (as defined above) (see Table 3.2):

- **Learning goal** – In this research, the learning goal is defined as the firm's emergent target to acquire a specified level of knowledge, skills and experience as well as requisite resources to build the firm capabilities. In practice, a firm could define any targeted knowledge it wishes to acquire; however, when the learning strategy is implemented there could be some obstacles preventing firms from achieving its target. Hence, firms often need to make continuous adjustment along the way to arrive at an emergent fulfilment of its learning goal. In addition, for any well-functioning learning strategies, the learning goal has to be specified in such a way that there is an appropriate dynamic alignment (i.e. fit) with both the competitive goal and the firm's learning activities and mechanisms.

Table 3.2 Key Defining Characteristics of Firm Learning Strategy

Dimensions of Learning Strategy	Defining Characteristics
Learning Goal	Firm's target to acquire a specified level of knowledge, skills and experience as well as the requisite resources/assets to build the firm capabilities.
Capability Gap	The discrepancy between the firm's existing level of capabilities (i.e. what the firm current possesses) and the requisite capabilities that must be acquired (i.e. what the firm must possess to compete)
Exploiting and/or Exploring	The trade-off between learning to leverage today's capabilities (i.e. exploitation and survival per se) versus learning to build capabilities for future competition (i.e. exploration, both survival and future growth).
Internal and/or External	The trade-off or the complementarities between learning internal and learning external sources of knowledge for capability acquisition. Achieving synergy and integration between the two is the key.

Source: own elaboration based on the research

- **Capability gap** – this is defined as the misfit or the discrepancy between the firm's existing level of capabilities and the requisite capabilities that must be acquired for firm to accomplish both the learning goal and competitive goal.
- **Exploring versus exploiting** – this refers to the managerial decision that focuses on the trade-off between learning to leverage today's capabilities (i.e. exploitation) versus learning to build capabilities for future competition (i.e. exploration). If the firm management chose to lean towards the exploration side, then it might choose to set highly ambitious goals relative to the firm existing capabilities and thus create an "intentional" capability gap[64].
- **Internal versus external tension** – this refers to the ability of the firm to balance the two main sources of knowledge for capability acquisition and to achieve the synergy as well as integration among the two for efficient learning.

It is important to note that embedded within all the above characteristics is the issue of emergence. The process of change is too complex for any firm to understand the whole process completely (Tidd et al., 2005), thus it is highly likely that these learning strategy characteristics will emerge through time as firms adapt themselves to the changing internal and external conditions.

[64] The LFL literature discussed this concept in terms of "crisis construction" (i.e. an internally-constructed crisis proactively set up by the top managers to intensify the employees' learning effort to expedite learning activities, augment firm absorptive capacity and achieve a faster rate of firm capability development) (Kim, 1998).

3.1.4.3 Defining the Framework for Firm Strategies

The above discusses two types of firm strategies: competitive and learning. Below is the discussion that concerns the two different levels within each type of firm strategies, see Figure 3.2.

Figure 3.2 Firm Strategies Matrix

COMPETITIVE STRATEGY (sensing)	LEARNING STRATEGY (seizing)	
	Level 1 (Ill-functioning)	**Level 2 (Well-functioning)**
Level 1 (Ill-functioning)	Unsustainable business operations: unable to capture the business opportunities, lacking both the *sensing* and *seizing* abilities (possible disaster)	Poor or intermittent *sensing* of emerging business opportunities, yet possess the learning ability to *seize* the existing opportunities
Level 2 (Well-functioning)	Capable to continuously *sense* the emerging business opportunities, but unable to *seize* it, either due to poor learning capability or unwillingness to invest in sufficient acquisition of the requisite capabilities	**"Strategic Learning Capacity"** defined as the ability to timely *sense* the emerging business opportunities and seriously commit to timely and sufficiently invest in the acquisition of requisite capabilities in order to successfully *seize* the business opportunities

Source: own elaboration based on the research, inspired by Augier and Teece (2006: 408)

For firm competitive strategies, there are two levels: Level 1 (ill-functioning) and Level 2 (well-functioning). At Level 1, firm competitive strategy comprises a poor understanding of its product-market positioning and the inability to prepare firm capabilities for appropriate position of resource-market positioning. Also notable at this level is the firm poor ability to set its competitive goal, or if it does the competitive goal is defined in such a way as to sustain the existing business operations without much focus on sensing future business opportunities. The choice of competitive path at Level 1 is closer towards the Lower Boundary of the feasible paths (see Figure 3.1). On the contrary, firm competitive strategy at Level 2 comprises a good ability to sense the emerging as well as existing business opportunities within the meso/industrial environment. These firms have the ability to set a more ambitious goal, i.e. strategic intent (Hamel and Prahalad, 1989), relative to its future product-market as well as resource/capability-market positions. The choice of competitive path at Level 2 is located closer to the Upper Boundary as defined in Figure 3.1.

For firm learning strategies, there are also two levels: Level 1 (ill-functioning) and Level 2 (well-functioning). The learning strategy at Level 1 occurs when the firm does not have sufficient capability to plan for and coordinate the diverse learning activities. In other words, even though the firm is able to sense the emerging business opportunities, it could not commit itself to invest in sufficient learning activities as well as coordinating the various learning mechanisms to build the requisite capabilities in order to seize such opportunities. Similar to the firm's path on competitive strategy, the choice of learning path at Level 1 is closer towards the Lower Boundary (see Figure 3.1), where the firm lacks the "strategic intent" (i.e. ambitious learning goal and serious commitment to achieve it) (Hamel and Prahalad, 1989).

On the contrary, Level 2 learning strategy describes the firm who has the ability to seize the upcoming business opportunities; the firm has the ability to commit itself to the necessary investment in planning for and coordinating the diverse learning activities as well as the learning mechanisms necessary to build the requisite capabilities. Again this is similar to the firm's competitive strategy path that is closer to the Upper Boundary (see Figure 3.1), where the firm possesses the "strategic intent" and the commitment to utilize its learning strategy as "stretch and leverage" on firm capabilities (Hamel and Prahalad, 1989).

3.2 Firm's Learning Activities, Learning Mechanisms and Capability Development

This section reviews **three** concepts: firm learning activities, learning mechanisms and capability development. The final section highlights a framework integrating the relationships among these three concepts.

3.2.1 Firm's Learning Activities and Learning Mechanisms: Processes

3.2.1.1 Firm Learning Activities

From the LFL, many empirical studies have shown that firm capability building is the outcome of firm-level cumulative and path-dependent learning processes, and that these learning processes are neither automatic nor costless (Ariffin and Figueiredo, 2001;

Dutrenit, 2000; Figueiredo, 2001; Kim, 1998; Miyazaki, 1994). The LFL also elaborates the elements of firm learning processes, with particular attention paid to the factors that have contributed to successful learning (i.e. fast learning rate). The learning activities are also related to different types of learning. For instance, firm-level learning activities are concerned with product design and process engineering improvement, existing product improvement, new product development and linkages to foreign sources of technology (Bell and Pavitt, 1995). No matter how diverse and varied these activities are they seemed to share eight common (learning) activities, as defined in the "extended learning processes" (see Chapter 2 pp. 12-13).

Here it could be argued that implicit in the elements of the "extended learning processes" are the similarity with the aforementioned concept of firm learning and competitive strategies. For instance, firms who are aware and timely search for the trigger for change (i.e. Level 2 learning strategy) will most likely assess their own existing competencies relative to the market needs (i.e. competitive strategy based on the resource/capability-market position). To increase the awareness and search ability, the firm learning activities could involve benchmarking, collaboration in supplier "cooperation for development" club, and collaboration with other public research organizations; these involvements could lead the firm to develop relevant technology strategy based upon its existing competencies. Furthermore the issue of assessment and selection, acquisition, and implementation of technology can be explained via the firm's choice among the available technologies and equipment and the choice of learning mechanisms which after successful implementation would lead to the development of firm's internal capabilities. However, the explicit explanation on the impact of firm's competitive and learning strategies (for e.g. firm goals and the tensions within a firm's learning strategy) in guiding the firm "extended learning process" is still missing.

3.2.1.2 Firm Learning Mechanisms

Many learning mechanisms were identified in both the LFL and SRBL: learning by doing (Arrow, 1962); learning by problem solving and "templating" (Von Hippel and Tyre, 1995); learning before doing[65] (Pisano, 1996a; 1996b); learning by doing and learning by

[65] This is different from the classical "learning by doing" (Arrow, 1962). It is based on the estimates that up to 70 per cent of the product's cost are determined during the design stage; therefore, it would make economic

using (Rosenberg, 1982); learning and innovation (Boerner et al., 2001); and, learning by operating, changing, searching, hiring and training (Bell, 1984; Kim, 1998). Here, the latter three learning mechanisms are considered to be non-doing based and to involve more investment in learning effort. Recently, other scholars advocated the integration of various types of learning mechanisms and formed the concept of: "integrated learning" (Bessant et al., 1996); learning by visiting as a hybrid between learning by doing and learning by searching (Caplan, 2005); and learning by performing strategic experiments (Govindarajan and Trimble, 2004).

From the SRBL, Zollo and Winter (2002) focus on "deliberate" learning mechanisms to build firm dynamic capabilities. In their conceptual framework, these learning mechanisms linked the evolution of firm dynamic capability with the changes in its lower-level operating routines[66] (Nelson and Winter, 1982), and these learning mechanisms were of three types: experience accumulation (semi-automatic, not highly deliberate and requires the least level of investment in learning efforts), knowledge articulation and knowledge codification (more deliberate and requires high-level learning efforts) (Zollo and Winter, 2002: 340). Drawing on the original concept of absorptive capacity (Cohen and Levinthal, 1990), Lane and Lubatkin (1998: 462) have explicated the concept of "relative absorptive capacity" and identified three methods of learning new external knowledge: 1) passive, 2) active and 3) interactive. These could be viewed as firm learning mechanisms since passive learning occurs when the firms simply acquire knowledge through codified journals, seminars and other publications, and active (i.e. semi-automatic) learning occurs when the firm performs more conscious learning activities such as benchmarking and obtaining competitor's intelligence; however, this still occurs at arm's length and lacks any significant interaction during the transfer of the partly tacit technical and organizational knowledge.

Whereas, the more deliberate mechanism involving interactive learning usually requires the learner to access the knowledge sources through a long-term contact and

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sense to learn to solve any the design problems *prior* to the production stage (Tidd et al., 2005: 384). Thus the term "learning before doing" any production activities.

[66] Here the concept of lower-level operating routines is defined as "behavior that is learned, highly patterned, repetitious, or quasi-repetitious, founded in part in tacit knowledge—and the specificity of objectives" (Winter, 2003: 991). This is different from the firm (dynamic) organizational capabilities, which is defined as "a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type" (Ibid.).

communication (for e.g. face-to-face interaction, dialogue, long-term strategic alliances such as joint venture). In this mechanism, the learner firm will be able to understand not only just the observable components of the transferred knowledge (i.e. the codified knowledge), "but also the more tacit components: the 'how and why' knowledge" (Ibid.: 463). Likewise, Styhre et al. (2004: 963) discovered that the interactive learning mechanisms such as face-to-face interaction and continuous dialogue among employees during training are important for development of firm learning capability. In addition, these scholars also advocated that interactive learning mechanism per se would not ensure the full potential of the development of firm learning capabilities, the firm needs to complement it with the passive learning mechanisms as well (Ibid.: 964); note that this is similar to the concept of "integrated learning" (Bessant et al., 1996).

The relevance of different types of learning mechanism, advocated by both LFL and SRBL, depends on: the strategic context of the firm; the type complexity of products and technology; and the knowledge acquisition involved. For instance, in acquiring technical knowledge, learning by doing, by using and by conducting R&D may be appropriate (Chen and Qu, 2003: 863); where as if one wants to acquire managerial knowledge, learning by "benchmarking" or "best practice" may be more appropriate (Ibid.). All of these contextual factors are normally governed by the firm's competitive and learning strategies. A firm with a "well-functioning" learning strategy (i.e. Type 2 learning strategy) will tend to engage in more advanced, complex types of learning activities, which would involve a coordination of a range of learning mechanisms. Such a firm would also stress the more active mechanisms such as learning by searching, hiring, training (i.e. the non-doing based learning) (Bell, 1984) and learning by visiting (Caplan, 2005).

But prior studies on learning mechanisms have not attempted to fully explain the linkage between firms' competitive and learning strategies, and the choice of learning mechanisms. In addition, the role played by firm strategies in directing firm learning activities, and the issue of the dynamic alignment (and re-alignment) among firm strategies, learning mechanisms and learning activities within the context of a changing meso-environment has not been systematically analyzed in these studies.

Henceforth, the role played by the interaction between firm competitive and learning strategies and its effect on firm learning activities and mechanisms should be made explicit. By linking both types of firm's strategy with the learning activity and the choice of learning mechanisms, it is possible to explain how firm strategies assist in providing the diverse set of learning activities with a focus and continuity. Then it would be possible to explain how such deliberate (yet emergent) firm strategies contribute to impacting the rate of firm capability development.

3.2.2 Firm's Capability/Competence Development

The process of capability building discussed in the LFL involves complementarities between technology imports and the development of indigenous capabilities, implying that the latecomer firms must engage in both in building their own capabilities (Bell and Pavitt, 1995); in other words, imported technologies are not substitute for the development of indigenous firm capabilities. Almost all the latecomer firms capability development is initially involved with the catching-up (Gammeltoft, 2004; Hobday, 1995b; Tran, 1999) and not with sustaining a pre-existing competitive advantage (Mathews, 2002). Consequently, the objective of LFL is to explain how firms can successfully catch-up by developing the minimum necessary technological and organizational capability (UNIDO, 2002). However, the interaction between firms' competitive and learning strategies and learning activities in contributing to the rate of capability accumulation in the catching-up process has received little explicit discussion in the LFL.

From the SRBL, the actual process of capability building or competence development receives lesser focus due to much emphasis of the literature on the sustainability and durability of competitive advantage (see for example, Wernerfelt (1984), Barney (1991), and Peteraf (1993)) rather than the process of building the initial or minimum level of capability in the first place. The SRBL assumes that firms already possess the minimum-level of capabilities necessary for sustaining their competitive position, and that these firms are focusing on how to further solidify their competitive sustainability. Moreover due to this emphasis on the sustainability (and equilibrium) perspective, an operational model explaining the initial organizational learning processes (i.e. the disequilibrium process) that the firms had to undergo to achieve the attributes of sustainable competitive advantage is mostly lacking (Drejer, 2002: 104).

Some SRBL scholars attempted to fill this void by proposing the concept of dynamic capabilities (Teece and Pisano, 1994; Teece et al., 1997), but still the empirical extension of the key concepts (i.e. paths, positions, and processes) is lacking (see Section 2.2.4.1). While a few scholars (Jantunen, 2002; Pavlou and El Sawy, 2005) have attempted to operationalize these concepts, these works have concentrated on the industrialized country context, and the application of the dynamic capabilities framework to the developing country context is still mostly lacking[67].

Drawing on the insights provided by both LFL and SRBL, it could be said that the process of capability development is both important and complex. It could involve either building the minimum requisite capabilities for catching-up (i.e. LFL) or sustaining/building the advanced capability to ensure competitive advantage (i.e. SRBL). Capability development surely involves a learning process and an operationalization of key concepts is needed to arrive at a better model, capable of explaining the process of building up latecomer firm dynamic capabilities. In particular, missing from both literatures is the explicit explanation of latecomer firm's strategies to manage the capability transitions (see Figure 2.2).

The latecomer firm's sequential transitions from minimum level of routine capabilities to intermediate-level and then high-level innovative capabilities need to be explained in terms of firm's competitive and learning strategies, taken together as "strategic learning capacity" for successful capability development (see Figure 3.2). Here firms who possess such capacity are able to successfully set both competitive and learning strategies, achieving dynamic alignment. Together these strategies and proper alignment would serve as a focusing device for later implementation on the firm's choice of learning activities and selection of learning mechanisms. Thus these elements (i.e. firm strategies, learning activities, and learning mechanisms) work together as a "learning system" that will enable firms to successfully transition from minimum level of capabilities to intermediate and then innovative capabilities. It is proposed here that firms that possess the "strategic learning capacity" will achieve more effective function of learning activities and learning mechanisms when compared with firms that do not have such capacity.

3.2.3 Summary on Learning Activities, Mechanisms and Capabilities

The above sections have reviewed the literature related to learning activities, learning mechanisms, and capability development. Framework and definitions for these concepts will be developed to serve as a useful tool for later analysis on firm learning activities and the process of capability development.

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[67] Notable exceptions include Kim's (1998) detailed study of learning and capability building at Hyundai Motor, and John Mathews who developed a "modified" resource-based framework suitable describing latecomer firms' learning and creation of dynamic capabilities (Mathews, 1998; 2002).

3.2.3.1 Defining the Framework for Firm Learning Activities

Learning activities are the activities that the latecomer firms carry out to develop technological and organizational capabilities (Hobday, 1995b). Others have defined learning more strategically as the interaction among firm resources, innovative capabilities and competence in a purposive search for competitive advantage (Dodgson and Bessant, 1996). In this study, firm learning activities are taken in a more narrow sense to refer to firm development related to its functional activities, ranging from preparation for investment activities to production process planning and product engineering, and finally linkage and marketing activities. However, having defined learning activities in this way does not preclude the link with the firm strategic elements (i.e. firm competitive and learning strategies). As stated above, the study attempts to explicitly link firm strategies and its learning activities and mechanisms. For instance, firm competitive and learning strategies on meeting higher customer needs and market expectations are certainly impacting the way firm decides to implement learning activities on the new/improved products and production processes.

This concept of firm learning activities is not limited to just technological dimension per se, it also includes other internal organizational activities that lead to the development of firm capabilities (Leonard-Barton, 1988) such as human resource training, quality certification, and other operational problem solving activities (Drejer and Riis, 1999). Due to this varied nature of the learning activities, there needs to be some categories in order to systematically assess the way these learning activities are both simultaneously guided by firm learning strategy and the contributions these activities make to the firm capability development. One way of achieving this is to categorize firm learning activities according to a well-defined structure, stating what the firm learns in terms of its technical and non-technical functions.

In short, firm learning activities comprise two parts: the object of their learning, "what a firm learns" (for e.g. incremental improvement of existing processes/products or development of new process, product, problem-solving technique, investing in new production facility, etc.) and "what a firm does to learn" or "how a firm learns" (i.e. the learning mechanisms such as doing, changing, hiring, searching, visiting, and human resource training). In this regards, Humphrey and Schmitz (2002: 19) provided four forms of learning activities within a developing country context:

- Process Upgrading – refers to the ability to transform inputs into outputs more efficiently. Here the object of learning is "process".
- Product Upgrading – refers to the ability to move into more sophisticate product lines. Here the object of learning is "product".
- Functional Upgrading – refers to ability to acquire new functions (or abandoning/unlearning the existing functions); to increase the skill context of activities. Here the object of learning is firm "functional area".
- Inter-sectoral Upgrading – refers to ability to apply the competence/capability acquired in one sector and use it in another. Here the object of learning is "competence application" to a new functional area or industry.

In each of the above upgrading/learning activities, it is possible that a firm could engage in a number of learning mechanisms. For instance, a firm could upgrade its production process by performing existing routine production activities (i.e. learning by doing), searching for new technological equipment (i.e. learning by searching), and hiring capable engineers and technicians (i.e. learning by hiring).

Another useful source of firm learning categories is the taxonomy of firm functions in the technological capability framework devised by Lall (1987; 1992) and Bell and Pavitt (1995) and technological and organizational capability framework (UNIDO, 2002). Drawing on both the upgrading activities (Humphrey and Schmitz, 2002; Schmitz and Knorringa, 2000) and firm functions classified according to technical and organizational capabilities (Bell and Pavitt, 1995; Lall, 1992; UNIDO, 2002), the following adapted definitions are defined for five different types of learning activities (see Table 3.3):

- **Investment activities** – these learning activities comprise the project preparation, project execution ability, equipment selection and investment in new facility.
- **Production activities** – these learning activities include the process engineering aspect, quality management, routine maintenance, capacity stretch, process modifications, production management techniques (JIT, TQM, etc.) and continuous process improvement (inclusive of quality management systems).
- **Product activities** – these learning activities comprise the basic product design, product quality management, minor/major product adaptations and improvements, and new product innovation and research.

Table 3.3 Framework for Firm Learning Activities

Types of Learning Activities	Defining Characteristics
Investment	Activities related to firm's ability to improve upon the existing or building new production and administrative facilities (inclusive of project management issues)
Production	Activities related to the improvements or installation of new production facility, inclusive of routine production management and equipment maintenance issues
Product	Activities related to adaptation to the existing or building new products, inclusive to product design and engineering activities
Technology Linkage	Activities related to the ability to transfer technology into the firms from external sources, both domestic and international sources, inclusive of the management of the means of transfer (i.e. licensing, joint ventures, etc.)
Marketing	Activities related to obtaining knowledge about the markets (both domestic and overseas) to plan for the firm marketing strategy

Source: own elaboration based on the research

- **Technology linkage activities** – these learning activities include procurement and transfer of technology from sources that are mostly external to the firms (domestically and/or internationally); also included in the networks established with the technology suppliers, customers, and other firms and public organizations[68].
- **Marketing activities** – the learning activities include firm market research and product promotion activities. It could be either for the domestic and/or export markets. At the advanced stage, firm activities will include own design or brand manufacturing (ODM/OBM) with systematic brand management. This also requires firm to carry out advanced brand creation and maintenance.

It is important to reiterate that while the learning activities are defined as "*what* the firms learn"; the learning mechanism is defined as "*how* the firms learn". The two are conceptually intertwined and complements each other, and must be analyzed together.

3.2.3.2 Defining the Framework for Firm Learning Mechanism

The LFL literature comprised many examples illustrating the concept of firm learning mechanism. For instance, Bell (1984) clearly distinguished two main types of learning mechanisms: doing-based (learning by operating and changing) and non-doing

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[68] Networking is included in this learning activity category since "networking increases learning" (Hakansson et al., 1999: 450).

based mechanisms (learning by searching, hiring and training). The former involved semi-automatic efforts expended by the firms, but the latter involve more investment in effort and purposive search which are necessary to acquire capabilities. Similarly, Tran (1999) extended Bell's (1984) framework to include more learning mechanisms such as learning by linking with foreign sources of technology and two types of learning by training: on- and off-the-job. Tran concluded that the use of multiple learning mechanisms will more likely result in successful development of technological capabilities, and that reliance on any single mechanism is less effective for capability accumulation. Likewise, from the SRBL, firm dynamic capabilities are more likely build through the implementation of deliberate learning mechanisms (Zollo and Winter, 2002) and usually involves the interactive forms of learning (Lane and Lubatkin, 1998) or sometimes active learning within a network context (Bessant et al., 1999; Bessant et al., 2003).

Drawing on the insights from both the LFL and SRBL, the following are two learning mechanisms defined in this study:

- **Semi-automatic (passive) learning mechanisms** – these are the mechanisms that firms use to acquire lower-order operational capabilities by merely conducting the normal learning activities such as doing production tasks and producing simple products. This is similar to the "experience accumulation" learning mechanism (Zollo and Winter, 2002), the passive learning methods (Lane and Lubatkin, 1998) and the doing-based learning mechanisms (Bell, 1984; Tran, 1999).
- **Purposive (active) learning mechanisms** – these are the more active (and more conscious) mechanisms that firms used to acquire higher-order change-generating activities (Bell and Pavitt, 1995). It is also similar to the deliberate learning mechanisms involved with the knowledge articulation and codification and higher learning investment (Zollo and Winter, 2002), the interactive learning method (Lane and Lubatkin, 1998), and the purposive non-doing-based learning mechanisms (Bell, 1984).

The implication for distinguishing the two learning mechanisms is it enables the study to link the different types of firm competitive and learning strategies with the different types of learning mechanisms.

This study accepted Kim's (1998; 1999) and Lane and Lubatkin (1998) ideas on absorptive capacity and applying it to the issue of firm conscious choice of learning mechanisms. Often times, the latecomer firms would face the problem of low level of initial absorptive capacity when compared to that of advanced firms. However, if these latecomer firms possess the strong "willingness to learn"[69], which will more likely result in choosing to engage in more "purposive learning mechanisms" rather than the "semi-automatic learning mechanism" per se, and then they could successfully augment their absorptive capacity (Kim, 1998).

Moreover, it is proposed that latecomer firms that have a "strategic learning capacity" (see Figure 3.2) have the "willingness to learn" and will most likely be able to execute a higher proportion of purposive learning mechanisms than firms who possess either the "ill-functioning" competitive strategy or learning strategy. This, however, does not mean that firms can learn without the semi-automatic learning mechanisms. It means that both learning mechanisms should exist in a complementary way; and both should be guided by the firm competitive and learning strategies. The main point here is for firms to achieve synergy and integration among the two types of learning mechanism.

3.2.3.3 Defining the Framework for Firm Capability Development

In this study, the concept of firm capability is adapted from the earlier definitions of "technological capability" (Bell and Pavitt, 1995; Dahlman et al., 1987; Lall, 1987; 1992; Westphal et al., 1985), but with an augmentation to other non-technical aspects such as linkage and marketing capabilities (Ernst et al., 1998a; Tran, 1999). There are **two** reasons to include the non-technical aspects. **First** was due to Schmitz and Knorringa (2000: 195), whose study on local firms' learning found that most multinational buyers assisted in upgrading the local firms' technological capabilities, but not the marketing or other upstream capabilities. This was due to the fear that local firms, once they acquired the branding or marketing capability, are capable to directly competing head-on with multinational firms. **Another** was due to Leonard-Barton (1988; 1995), who explicated the importance of the non-technical capabilities such as organizational capability, managerial and employees skills and firm's values and norms.

[69] On this point, Schmitz and Knorringa (2000: 190-191) have demonstrated that the issue of "willingness to learn from foreigners (i.e. 'global buyers')" is one of the factors that helps explain the difference in the latecomer firms' production capabilities and their differing ability to meet the competitiveness demands of the global buyers. Though initially lacking sufficient capability, latecomer firms who possess the "will to learn" and consciously link up with foreign firms perform better on: product quality; price (cost); punctual delivery; flexibility (i.e. changes in production orders); and design and engineering activities.

As a result, firm capability in this study is defined broadly as the resources needed to generate and manage technological as well as non-technical changes, and include skills, knowledge and experience and organizational management/development ability. This study uses the framework on firm technological and organizational capability development suggested by UNIDO (2002), and based on (Lall, 1992), as it is based on this wider concept of firm capability (see Table 3.4).

The choice of the UNIDO (2002) framework was due to:

- It was based on the frameworks of Bell and Pavitt (1995) and Lall (1992), which have been adapted and used successfully in many empirical studies to categorize the types of capabilities by technical functions as well as the technological depth of each function[70]. The UNIDO (2002) framework emphasizes the "nature of capacity building strategy and effort", which is congruent with the objective of this research.
- The framework is not limited to technological capability and includes other non-technical functions (i.e. linkage and marketing) as well. In addition, both the linkage and marketing capabilities are further divided into domestic and foreign; this is a useful disaggregation since for latecomer firms who often times had to develop (technology) linkage with foreign firms prior to any significant development of firm capabilities. Also for a latecomer firm who have grown to become a large conglomerate, it is able to significant move from only the domestic sales into the export market. This framework could capture the firm's transition into the export market.

[70] For example of empirical studies, see Ariffin and Figueiredo (2001), Figueiredo (2001) and Dutrenit (2000)

Table 3.4 Framework for Latecomer Firm Capability Development

Nature of capacity building strategy and effort	Investment		Production		
	Pre-investment	Project Execution	Process Engineering	Product Engineering	Industrial Engineering & Human Resources Development (HRD)
Basic: Based primarily on internal effort and experience	Prefeasibility and feasibility studies, site selection, arranging finance	Routine engineering of civil works, ancillary services, erection and commissioning	Debugging plant, routine process coordination; quality management; routine maintenance; quality certification (ISO 9000/QS 9000/TS16949)	Assimilation of basic product design; product quality management and certification (ISO 9000, QS 9000, TS 16949); minor adaptations to meet market needs	Work flow, scheduling, time/motion studies; innovative management and process/auto-part design optimization; skills upgrading and training
Intermediate: Based on search, experimentation and inter-firm and other cooperation	Search for sources of technology, equipment. Contract negotiation.	Equipment procurement, detailed engineering, recruitment and training	Capacity stretching; adapt/improve technology; use new techniques (JIT, TQM, etc.); routinized processing engineering; preventive maintenance	Product quality/ design improvement; licensing new technology; reverse engineering; continuous monitoring of new product technologies	Continuous and systematic productivity analysis and benchmarking; skill auditing and formalized training; supply chain/logistics management; advanced inventory control
Advanced: Based on purposive effort, R&D and advanced form of collaboration	Own project outline and design capability. Overseas project management and investment capabilities	Basic process engineering, equipment design and start up. Overseas investment capability	Continuous improvement; innovation; applied research; use of new process design methods Organizational capacity: generating, codifying, socializing knowledge	Mastery of advanced product design (e.g. CAD/CAM, CAE, finite elements); new product innovation; applied research. Strategic alliance. Organizational capacity for innovation and risk taking	Application of industrial engineering techniques and supply chain capabilities, training systems, inventory management

Note: The words "new" and "innovation" above refer to the items/techniques/processes that are "new to the firm and not new to the world".
Source: Own adaptation based on the research, from UNIDO (2002: 112-113) and Lall (1992)

Table 3.4 (continued). Framework for Latecomer Firm Capability Development

Nature of capacity building strategy and effort	**Technology (Linkage)**		**Marketing**	
	Domestic	**Foreign**	**Domestic**	**Foreign**
Basic: Based primarily on internal effort and experience	Local procurement systems and procedures, drawing in available knowledge from external organizations	Foreign sourcing; information from suppliers; industry networking; accessing public information	Market research; distribution and servicing systems; some advertising	Export market analysis; links with buyers and other export channels. Packaging capability
Intermediate: Based on search, experimentation and inter-firm and other cooperation	Technology transfer to and from local suppliers/carmakers, coordination in auto-part design and manufacture; links with technology and other institutions. Capacity to take collective action.	Vertical technology transfer; systematic coordination of international knowledge sources; links with technology institutions	Dedicated marketing department. Systematic monitoring, feedback analysis. Branding and differentiation	Systematic market building analysis of foreign markets. Alliances and networks abroad. Brand introduction. OEM arrangements
Advanced: Based on purposive effort, R&D and advanced form of collaboration	Form stronger links with R&D institutions and universities. Deep innovative links with other suppliers/carmakers. Specialization in context of networks and clusters	Cooperative R&D; strategic alliances; advanced leveraging strategies for new technologies. Foreign acquisitions, direct investment, sending "guest engineers" overseas	Brand creation; coordination with retailers/buyers; advanced product distribution systems	Brand deepening. ODM and OBM arrangements. Own marketing and design channels and affiliates abroad, set up representative office overseas

Source: Own adaptation based on the research, from UNIDO (2002: 112-113) and Lall (1992)

3.3 The Dynamics of Latecomer Firm Strategies, Learning Activities and Capability Development

This section reviews the dynamic capabilities framework and its applicability to the developing country context. Of interest are the firm-level changes in four key constructs: firm competitive strategy, learning strategy, learning activities, and firm capability development.

3.3.1 The Dynamic Capabilities of Latecomer Firms

As discussed in Section 2.2.4.1, dynamic capabilities framework lacks sufficient empirical studies and there is a need to establish more empirical foundations (Augier and Teece, 2006). The thesis will attempt to extend the dynamic capabilities concept further to include the latecomer firm empirical studies focusing on differences in firm strategies, learning activities and mechanisms, and the resulting different rates and types of capability accumulation[71]. The success of such attempt is likely due to David Teece who stated:

> "... [Dynamic capabilities framework] has [been] developed based on insights from the recent history of innovative firms in advanced industrial countries. While the institutional context is often rather different from what exists in newly industrialized countries [and other developing countries], many of the basic processes of learning and advancement taking place inside the firm *are applicable in other contexts* as well" [italics added] (Teece, 2000: 106).

He added,

> "Firm-level work on competency and capabilities in developed countries is put forward to assist the understanding of economic development in newly industrializing economies (NIEs)" (Ibid.: 122).

Consequently, the latecomer firms' dynamic capabilities framework should learn from the advanced country research findings. Even though latecomer firms are at a disadvantage in terms of poor resources and insufficient capabilities, there is still some hope for these firms to catch up through proper management of learning "processes" and careful choice of development "paths".

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[71] In this regards, Hobday (2005: 136) stated the importance of such an attempt on the extension of the dynamic capabilities framework, "An elaboration of latecomer firm *'positions, paths and processes'* would be useful in understanding why innovation [and learning] occurs in [latecomer firms in] some developing countries but not in others [i.e. other firms] and for identifying the barriers and enablers of innovation at the company level" [italics added].

> "While the *positions* of firms in NIEs may not initially be advantageous, firms in NIEs can catch up by being better at [learning] *processes*, and by astutely selecting and following desirable *paths* ... the disadvantages associated with [latecomer firms'] poor market and asset positions can be readily overcome if there is the organizational commitment to do so" [original italics] (Teece, 2000: 123).

Consequently, it is argued that for latecomer firms to be better at their learning processes, they must commit themselves to properly manage their choices of: competitive and learning strategies (i.e. their "paths" and assessment of current "positions"); well-organized implementation of firm learning activities; and synergistic combination of semi-automatic and purposive learning mechanisms (i.e. their "processes"). In short, these firms must consciously manage their dynamic "learning system" comprising – firm strategies, learning activities, and learning mechanisms – to overcome the initial disadvantage of inferior asset positions.

3.3.2 The Dynamic Multiple Alignments

The dynamic capabilities framework emphasizes integration, reconfiguration, and framing, and reframing of latecomer firm's resources and capabilities in order to create superior advantage. These activities require a firm to continuously align (and re-align) its competitive strategy, learning strategy, learning activities (and mechanisms) in order to develop firm capability. From the SRBL, alignment could be defined in many ways. For instance, Ward et al. (1996: 622) referred to the alignment between manufacturing strategy, competitive strategy, external environment, and organization structure. In doing so, they developed a framework for different strategic configurations. Similarly, Beer et al. (2005) defined the organizational alignment concept as "fit" (i.e. strategy should fit with the external environment, organizational design, culture, and leadership) and "fitness" (defined as the firm's ability to learn). Both fit and fitness are dynamic, and needed to be continually revised and adapted to the changing external environment (Ibid.: 455).

In this research, the "dynamic multiple alignments"[72] refers to the synergistic relationship between the firm competitive strategy, learning strategy, learning activities, and learning mechanisms. In addition, the firm choice of strategies has to be constrained

[72] It is "dynamic" because it involves continuous re-alignment over time. It is "multiple" because it involves more than one elements to be aligned.

(or supported) by its existing stock of capabilities. Below is the description of **four** types of alignment which the latecomer firm must continuously manage.

First is the alignment between meso-level changes and firm competitive strategy (Antonacopoulou et al., 2005; Ward et al., 1996). Here the issue is firms normally do not set ambitious competitive goal for no apparent reasons, and firms that do usually will probably not survive for very long. Usually the impetus for such competitive goals may come from new customer requirements, increased competitive pressure within the market and/or firm own perception (sensing) of possible technological and market opportunities (Tidd et al., 2005). Likewise, firm competitive strategy could be affected by the industry undergoing structural changes such as deregulation, technological advances and globalization (Ratnabhas, 2003). Regardless of the factors impacting firm-level competitive strategy, the key point is that firm's competitive strategy must be well aligned with: *both* the evolution of opportunities and threats within the external environment and the stock of internal firm's resources and capabilities.

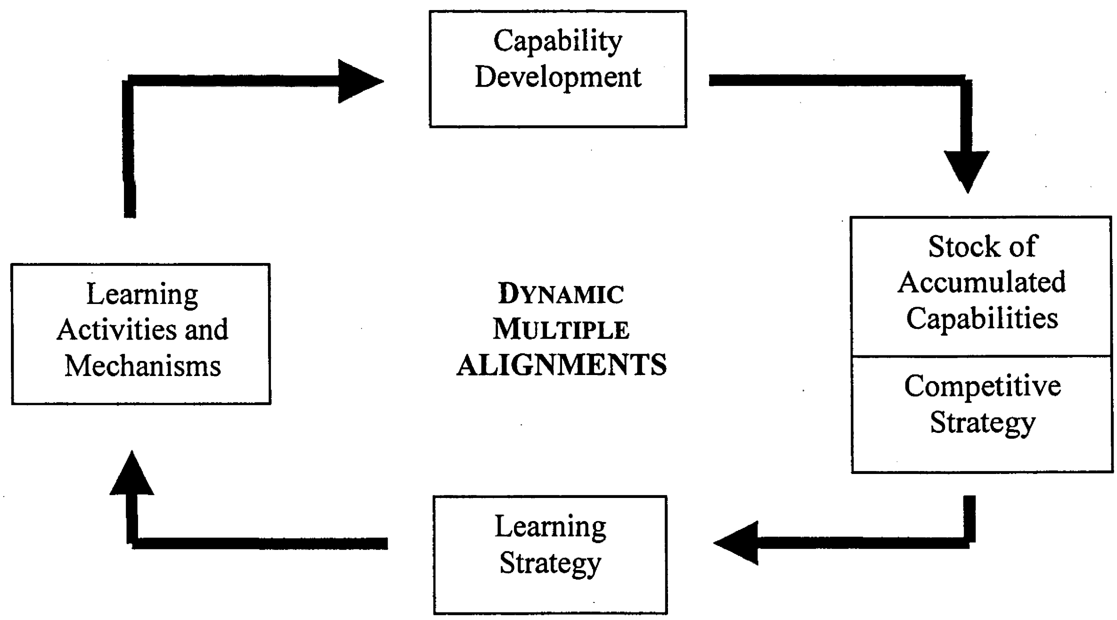
Second is the alignment between firm competitive strategy and its learning strategy (Lin et al., 2001; McKee, 1992: 243-244; Tidd et al., 2005). Since learning is not automatic and most firms are "reluctant learners" (i.e. they are not interested in learning investment unless it is really necessary to do so) (Tidd et al., 2005: 82); hence, the learning strategy must support the firm's competitive rationale. For instance, if the firm set as its competitive rationale, "to become a first-tier auto-part supplier", then its learning strategy should comprise: the ability to set learning goal focusing on achieving the various dimensions of operational competitiveness (for e.g. high quality, punctual delivery and low cost). In addition, a first-tier auto-part supplier must also be committed to invest in sufficient learning of new technology and equipment in order to properly collaborate with the carmakers. Here the key point is that firm learning strategy is linked with firm competitive strategy and that the two must be aligned. The implication is amidst the turbulent external environment where firm competitive strategy is under constant flux, the learning strategy must be continually re-aligned accordingly as well.

Third is the alignment between firm learning strategy and its learning activities and mechanisms (Kenny, 2005: 110). Once the firm competitive and learning strategies are aligned, then it must ensure that the implementation of learning activities and the choice of learning mechanisms are properly managed and aligned with its strategies. For instance, in the first-tier auto-part supplier example, to achieve firm operational competitiveness (i.e.

high quality, low cost and punctual delivery) the firm must execute business/corporate-wide learning activities such as benchmarking, total quality management and just-in-time. In addition, the learning mechanisms involved would include a synergistic combination of semi-automatic (doing-based) mechanisms as well as the purposive (more active) mechanisms. These learning activities and mechanisms must be properly aligned with firm learning strategy.

At times, the firm may set ambitious competitive goal, which in turn lead to stretch learning goal and wide capability gap. This would then require a diverse set of learning activities and mechanisms to achieve the stretch goal. Here part of the alignment issue between firm learning strategy and activities is the ability to continually maintain alignment between learning strategy and learning activities (and mechanisms). When the learning strategy is stretch, there is a high possibility that the firm will have to re-align its learning activities and mechanisms.

Figure 3.3 Dynamic Multiple Alignments of a Firm



Source: own elaboration based on the research

Finally, there must be an alignment between firm learning activities (and mechanisms) and the – firm capability development (see Figure 3.3). The issue is starting with firm competitive strategy that senses the business opportunities (and threats) within the external environment, then this translates into firm learning strategy, which in turn directs the implementation of learning activities and mechanisms. The loop returns back to the original position, when a firm has developed new (or enhanced its existing) capabilities to meet the market needs and augmented its capability stock. Equipped with higher level of capability, a firm is now able to formulate more ambitious competitive and learning strategies and embarked on more diverse (yet focused) set of learning activities and mechanisms. For a "strong learner" firm, this self-reinforcing positive "learning system" tends to continue and fuels firm growth.

3.3.3 Summary: Framework on Firm Learning System and Capability Development

This chapter sets out to integrate all the concepts introduced and produces a more holistic analytical framework based upon firm dynamic capabilities and multiple alignments. It attempts to explain the process of firm learning (in a systematic, strategic way) and its rate of capability development through the following factors: sequence of evolutionary changes within the external environment; firm-level competitive strategy; firm learning strategy; and the learning activities and learning mechanisms; and finally the rate and type of capability development.

Today, it is widely acknowledged in innovation management and learning studies that change is ubiquitous, inevitable and is an important pre-requisite for survival. Consequently all things are changing and nothing is at rest: the global, national and meso environment are changing; the firm's strategies as well as the internal resources and capabilities are also changing. So the central issue is firm dynamic alignment[73] (Beer et al., 2005; Ferguson-Amores et al., 2005; Hung and Lien, 2005; Lin et al., 2001; Saint-Onge, 1996; Ward et al., 1996). Here the chapter has explicated that multiple alignment requires to the ability to adjust whatever is necessary (firm competitive strategy, learning strategy, learning activities and learning mechanisms) in order to achieve an increased rate of firm capability accumulation. From this explanation, the implication is that the managers must possess (or learn to possess) the ability to adapt, reconfigure, and integrate both internal and external capabilities. In other words, the managerial dynamic capability certainly impacts the ability to concurrently perform multiple alignments. Not only does multiple alignment includes the ability to balance the tension of competing for today (exploitation) and tomorrow (exploration) and monitor the changing environment with foresight, but it also includes the ability to put in place a well-functioning overall firm learning system.

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[73] Porter (1996) called this as "fit". However, the alignment concept emphasized here is more than Porter's idea of external competitive industrial positioning.

Furthermore based on the premise that firm heterogeneity exists and is persistent among different firms, it is expected that different latecomer firms will achieve different degree of multiple alignments (i.e. a continuum from total misalignment to full alignment). It can be hypothesized that firm who achieves multiple alignments (and continual re-alignments) in a timely manner will be able to fully capitalize the benefits arising from the implementation of its learning strategy and properly managed learning activities. These firms will be able to build capability and achieve competitiveness. On the other hand, firms who failed to manage the multiple alignments will be less likely to fully realize the positive impacts of the implementation of its strategies and learning activities. It is conjectured that at best, these firms will survive the competition, but their stock of accumulated capability would be insufficient to support future growth.

Chapter 4 - Research Methodology and Design

This chapter explains the choice of research method used and the research design for data collection and analysis. It also outlines the tools and techniques that were used for the data analysis. This study sought to examine firms' strategies, learning activities, and capability development over as long a period as possible in order to explore the dynamics of firm learning processes.

4.1 Revisiting the Research Questions and Objectives

This study focuses on **three** questions:

1. What were the competitive and learning strategies of Thai auto-part firms?
    a. How did these firms perceive the opportunities and challenges arising from changes in the macro- and meso-environment?
    b. How did firms respond, in terms of their firms' competitive and learning strategies, to these external changes?
2. To what extent can the differences in firm learning activities and mechanisms be explained by the differences in firm competitive and learning strategies?
3. What are the implications of the firm "learning system" – the dynamic alignment (and re-alignment) between the key characteristics of firm competitive and learning strategies and the learning activities and learning mechanisms – on the rate of firm capability accumulation?

The objectives of this study are:

- To elaborate the sequence of policy, market, and institutional changes within the Thai automotive industry since its inception in the early 1960s and link these to the dynamics of firm-level competitive and learning strategies.
- To assess the impact of differences in firm strategies upon the firm-level learning activities and learning mechanisms
- To explore and explain the issue of the dynamic alignment (and re-alignment) among three key conceptual variables – firm strategies, learning activities (and mechanisms) and firm capability development – and how such multiple alignments could lead to accelerating or slowing down the rate of capability accumulation, again aiming to differentiate "strong learner" firms from the others

This research assumes that no two firms are alike and that firm heterogeneity prevails even if these firms are operating within the same industry and locating within the same country. It also assumes that how different firms perceive the changes within the external environment will influence how firms differently acted in engaging in a set of learning activities in order to build its capability.

4.2 Research Scope and Analytical Framework

4.2.1 Research Scope

As elaborated in the analytical framework below (see Figure 4.1), central to this research is the relationship between **four** firm-level characteristics:

- competitive strategies
- learning strategies
- learning activities and mechanisms
- capability development

The research acknowledges that other firm-level factors such as organizational culture and individualistic leadership behavior exist and have certain influences on firm strategies, learning activities, and capability development. However, these issues are largely outside the scope of this research and are not discussed extensively here.

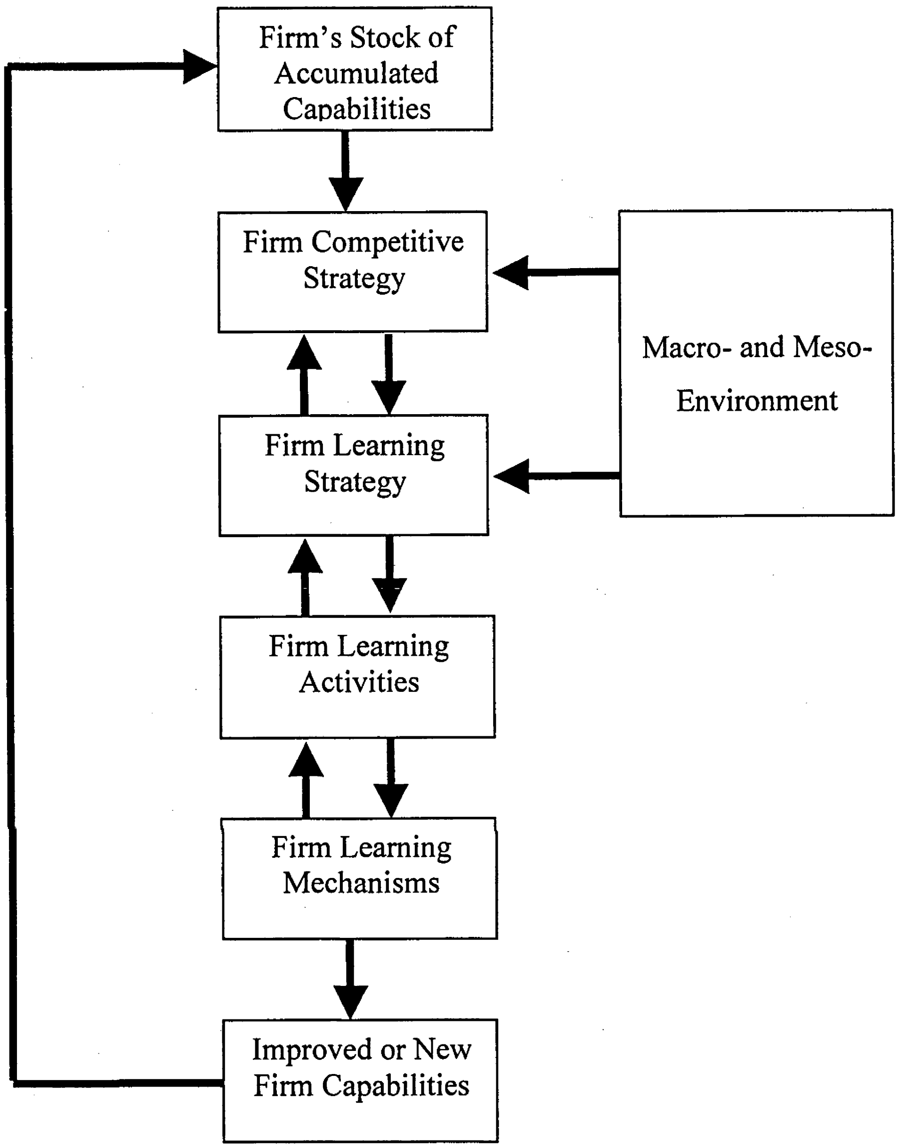
4.2.2 Unit of Analysis

As a general rule of thumb, the unit of analysis should be defined in relation to the way the research questions have been defined (Yin, 1994: 22) and how one defined what a "case" is (Ibid.: 21). In this study, the research questions concern relationships between firm strategies, learning activities, and capability development, and these occur at the firm-level. Hence, the appropriate unit of analysis is the Thai auto-part firm. As the research is explicitly concerned with the influence of the external environment on firm strategies, the research identifies and assesses the characteristics of the external environment and changes within that environment (see Chapter 5).

4.2.3 Analytical Framework

The conceptual framework for this research was described in Chapter 3, and the analytical framework is summarized in Figure 4.1.

Figure 4.1 Analytical Framework (elaborated)



Source: own elaboration based on the research

Seeking to capture external opportunities and neutralize threats, firms formulate their competitive strategies. These competitive strategies are then translated into firm learning strategies, which are in turn translated into firm learning activities, and then learning mechanisms. Through the effective implementation of learning mechanisms and learning activities, firms improve existing capabilities and/or build new capabilities. This increase in the firm's stock of capabilities may enable a firm to formulate more competitive strategies to further seize the external business opportunities and/or to neutralize threats. The double arrows in Figure 4.1 denote that there is an interaction between the two strategies and learning activities and mechanisms. This assumes that the strategies that a firm develops are appropriate and that the learning mechanisms and activities are also consistent with the strategies.

4.2.4 Operational Variables and Rating Criteria

The analytical model requires the operationalization of **five** key conceptual constructs:

- Meso-level sequence of changes
- Firm competitive strategy
- Firm learning strategy
- Firm learning activities
- Firm learning mechanisms

The operational variables selected for each construct above are set out in Table 4.1.

4.3 Research Design

This section explains the researcher's choice of a multiple-case study method, and discusses sample selection, the design of research instruments, and the design and outcome of the pilot fieldwork.

4.3.1 Why Case Study?

The choice of the case study method was based on **three** analytical decisions. **First**, the research questions aimed at explaining "how" the *sequence* of changes within the external environment impacts the firm-level competitive and learning strategies and "how" these different firm strategies (over time) lead to different ability to manage the learning activities and mechanisms. According to Yin (1994; 2003), "how" and "why" questions are best answered via the case study method. Since the study aims at understanding the dynamic firm-level changes over time, the use of mail-questionnaires and other cross-sectional survey methods would be inappropriate.

Table 4.1 Operationalized Variables

Conceptual Construct	Operationalized Variables (Assessable Indicators)
Meso-level Changes, Thai Automotive Industry	Objective: To investigate industry evolution, implications to firm strategies and learning Policies: investment promotion, import substitution industrialization, rationalization, export-oriented industrialization, trade agreements, and industrial promotion (e.g. Automotive Master Plans, Detroit of Asia Project). Market Characteristics: protective measures, economies of scale, product fragmentation, growth rates, demand growth, increase in division of labor, international division of labor, liberalization, and product mix (e.g. market share of one-ton pick-up trucks). Opportunities/threats to firms. Public Organizations: changing roles played by Ministry of Industry, Office of Industrial Economics, Board of Investment and Ministry of Finance. Private (Quasi-Public) and Business Associations: changing roles played by Federation of Thai Industries (Automotive Industry Club, Auto-Part Industry Club), Thai Automotive Industry Association, Thai Auto-Parts Manufacturers Association, and Thailand Automotive Institute. External Events: oil crisis of 1970s, Plaza Accord in 1985, AFTA since 1993, 1997 financial crisis, and WTO regulations on local content requirement.
Firm Competitive Strategy	Objective: To measure past and current changes in firm competitive strategy Perceptions: business opportunities or threats/challenges, from changes within the external environment. Competitive Goal: which development path to take, for e.g. to become an OEM auto-part supplier or to become an ASEAN regional OEM auto-part suppliers. Competitive Positions: product offerings with respect to market, capabilities with respect to market, and capabilities for survival/growth/collaboration Other Plans/Ways to Compete: cost leadership, product differentiation, enhancing product quality, purchasing/outsourcing strategies, process and product improvement plans, human resource strategies, business diversification strategy, and improved supply chain management.
Firm Learning Strategy	Objective: To measure past and current changes in learning strategy, learning plans Learning goal: The required target knowledge. Knowledge is required to fulfil the competitive strategy, learning plan implementation, knowledge-acquisition activities. Capability gap: Awareness of the existing and/or future gap and the learning plans to address these gap(s) Learning plan: strategy to close capability gap, what to learn, learn from whom, and human resources training plan Balancing the tensions: learning modern technology for future competition versus learning to exploit today's technology, learning to balance as well as integrate internal resources with external ones.

Source: own elaboration based on the research analytical framework (Figures 3.3 and 4.1)

Table 4.1 (continued). Operationalized Variables

Conceptual Construct	Operationalized Variables (Assessable Indicators)
Firm Learning Activities	**Objective**: To assess the various types of firm learning activities, and linking them to firm strategies and types of learning mechanisms Learning investment activities: For e.g. plant expansion, new plant construction, and project execution and management ability, domestic or overseas, and collaboration in investment projects Learning production process improvement activities: lowering defect rates, improve yield/efficiency/productivity, and enhancing process quality Learning product improvement activities: Improving or modifying the existing product, designing products, advanced design ability, and product testing. Link and learn activities: Relationship with domestic and foreign technology suppliers, informal links, licensing, formal links (foreign joint ventures), and relationship with the public organizations and business associations Learning market activities: For e.g. ability to market the products and/or services, conduct market research, and systematic brand management, and domestic market and/or export
Firm Learning Mechanisms	**Objective**: To assess the various types of firm learning mechanisms, and linking them to firm learning activities and new/improved firm capability Semi-automatic mechanisms: For e.g. learning-by-doing production activities, by modifying simple production/product activities, and by performing minor changes. Obstacles during learning. Purposive mechanisms: For e.g. learning-by-searching, -visiting, -hiring, -training, -design and R&D, learning-before-doing, and by performing major changes. Obstacles during learning.
Firm Capabilities	**Objective**: To measure the rates, levels, and assess the types of firms' accumulated capabilities. Also to link firm's accumulated stock of capabilities to its ability to formulate competitive and learning strategies. Functions: Investment, production, products, industrial engineering, human resources development, technology (linkage), marketing. Levels: basic/routine, intermediate/adaptive/duplicative and innovative. Rate: Changes in the levels through time, the final levels accumulated, fast, moderate, or slow.

Source: own elaboration based on the research analytical framework (Figures 3.3 and 4.1)

Second, the case study approach allows the researcher to examine a phenomenon of interest in its natural setting and meaningful theory could be generated from the understanding gained through multiple sources of evidence (Voss et al., 2002; Yin, 1994; 2003). Overall, the study attempted to "explain" the functioning of the firm learning and its contribution (positive or negative) to the development of firm capability. Consequently, given that the main objective is (again) to answer the "how" questions by "explaining" the dynamics of firm learning and *not* simply describing the historical events, the case study approach is appropriate (Yin, 1994).

Third, several prior empirical studies focusing on similar concepts had effectively used the case study approach to gain greater understanding. For instance, Figueiredo (2001; 2002a) used an in-depth comparative case study approach to successfully describe and explain the inter-firm differences in the technological capability-accumulation paths. Similarly, Dutrenit (2000) chose a single case study approach to successfully explain the failure of a latecomer firm to upgrade from innovative capability into a strategic (knowledge management) capability. In both studies, the case study approach was used to address the key questions related to "how" and "why" learning and knowledge management processes were functioning adequately or poorly.

4.3.2 Why Multiple-Case Design?

This study adopted the multiple-case study approach (Voss et al., 2002; Yin, 1994) due to **three** reasons[74].

First, based on the assumption that firms are heterogeneous with respect to their strategies, learning activities, and accumulated capabilities, the research not only seeked to identify relationship between the variables based on changes over time in one firm, but also attempted to comparatively analyze the difference of these variables *between* firms.

Second, "the evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust" (Yin, 1994: 45). A multiple case study approach gives the researcher confidence that the emerging analytical framework is more generic (Leonard-Barton, 1990; Miles and Huberman, 1994: 29). In

[74] A single-case design has limitations (Leonard-Barton, 1990), one of which is the limits to the generalizability of the findings, conclusions, empirically-derived model from just one case study (Voss et al., 2002: 201). A multiple-case design could reduce the depth of study when resources are constrained; however, it could also augment the external validity, and assist in guarding against the researcher's bias that occurs when using only a single case study (Ibid.: 202-203).

other words, multiple-case study design allows the researcher to enhance the external validity[75] and "analytical generalization" (Yin, 1994: 10). The approach also enables the researcher to perform:

- Within case data analysis
- Cross-case analysis – "searching for cross-case patterns" (Eisenhardt, 1989: 533)

It is argued that both analyses are necessary for this research to achieve a better understanding of how Thai firms manage their learning.

Third, this research analyzes the inter-firm differences in temporal patterns of capability development. There are two issues here: the temporal pattern and the inter-firm comparison. Since learning processes and other change processes are complex, an analysis on only the *current* firm learning and competitive strategies and capabilities will *not* suffice because these current capabilities and strategies are shaped by the previous strategies and other related historical events. In short, each firm's unique path plays a crucial role here. Moreover, the issue of inter-firm comparison over time is also important since the research attempts to differentiate the inner workings of a well-functioning firm from that of a poor-functioning one. A multiple-case approach is necessary for this analysis.

4.3.3 Why the Thai Automotive Industry?

There are **two** reasons why this study chose to focus on a single industry – the Thai automotive components industry. **First**, the study was interested in exploring neither the inter-sectoral nor cross-national differences in these relationships. Therefore, the study adopted the "specific industry" criterion to assist in eliminating the bias that could arise from selecting firms that are located in different industries. Since doing so would confound the firm-level differences with the sectoral-level differences. Furthermore, it would also confound the difference in firm-level strategies, learning activities and its capability development with the sectoral-level differences. In addition, this criterion also assisted in isolating the causes of heterogeneity among firms exclusively related to firm-level factors, and minimized the effects from either the sectoral-level or the cross-national differences.

[75] Here "external validity" is taken to mean "analytical generalization" (Yin, 1994: 36-37), and in this study, the aim is to build a general explanation (i.e. an analytical model/framework) that fits each of the individual cases (i.e. the auto-part firms), even though the cases will vary in their idiosyncratic details.

Second, the Thai automotive industry is an industry that has been in existence since the 1960s; and there exists a large supplier base of auto-part producers (see Figure 5.5). This provided the researcher with the ability to systematically select a sample of firms based on the availability of public information and adequate access to senior managers of the firm. The industry also offers a rich ground for exploratory research on issues such as the dynamics of firm-level strategies and the interaction between firm strategies, its learning activities, and capability development.

4.3.4 Sampling Issues

4.3.4.1 Sample Size

In conducting case study research, "there is no ideal number of cases [and] ... the number of cases to be studied depends on the focus of the research question" (Darke et al., 1998: 281). As a rule of thumb, Eisenhardt (1989) suggests that for theory building using a case study approach, the desirable number of cases should be between four and ten. While drawing on both Darke et al. (1998) and Eisenhardt (1989), the decision on the number of firms to be sampled was also based on two other considerations:

- The number of cases should be sufficiently large to enable the researcher to encompass a range of variation more or less representative of the sector[76].
- The number of cases should realistically take into account the issue of resource and time constraints, and feasibility of firm-level access, in order to realistically assess the collection of the required data.

Considering these factors, the study chose to focus the bulk of data collection on nine Thai auto-part firms. These nine Thai auto-part firms were *not* selected at random (i.e. random sampling in a statistical sense), but were selected purposefully.

4.3.4.2 Purposive (Theoretical) Sampling

In general, qualitative research samples tend to be purposive, rather than random (Miles and Huberman, 1994: 27), and case study research is no exception. This study chose the nine auto-part firms purposively (see Table 4.2), and Yin's (1994: 46) two types of

[76] This is not to be misconstrued that the sample chosen was representative in a statistical sense. This issue generally does not apply for the case study method (see Yin (1994; 2003) for detailed discussion).

Table 4.2 Profiles of the Sampled Firms

Firm	Number of Employees	Registered Capital[1]	Year Established	Joint Venture[2]	Corporate Group (# firms)	Position in the Supply Chain	Listed in Securities Exchange
Firm AH Group	628	240	1985	Yes	Yes (6)	First-tier (auto[5])	Yes
Firm CPC	272	30	1965	No	Yes (6)	First-tier (motorcycle) Second-tier (auto)	No
Firm CSP	300	100	2000	Searching	No	First- Second- Third-tier (auto)	No
Firm D Group	>3,000	265	1976	Yes	Yes (>20)	First-tier (auto and motorcycle)	No
Firm L	300	435	1986	No	No	REM[3] (auto)	No
Firm SOM	40	1	1995	No	No	Third-tier (auto)	No
Firm S Group	1,285	220	1960	Yes	Yes (>15)	First- Second-tier (auto) REM (auto)	Yes
Firm TS Group	> 10,000	NA[4]	1976	Yes	Yes (>30)	First-tier (auto and motorcycle)	Considering
Firm TKT	750	208	1972	Searching	Yes (3)	Second-tier (auto)	Yes

Source: based on the collected research data
[1] Unit in million Baht
[2] "no" means the firm is 100% Thai-owned
[3] Replacement Equipment Market
[4] Not available
[5] auto = 4-wheel vehicle

"replication logic" guided the choice of firms (see Table 4.2). Through Yin's "literal replication", the study chose a subset of firms that were broadly *similar* in terms of their strategies, learning activities and mechanisms, and rate of capability development, and through the use of "theoretical replication", the study chose another subset of firms that were *different* in terms of the above concepts. The overall purpose of performing both "literal replication" and "theoretical replication" was to spread the selected cases (firms) on conceptual grounds (i.e. wide range of difference in strategies, learning activities and mechanisms), and not on (statistical) representative ground. In this way, if the proposed analytical model could explain the relationship between variables in *all* the sampled firms, the model has a higher explanatory power and is more robust (Miles and Huberman, 1994; Yin, 1994).

4.3.5 Preliminary Design of Case Study Interviews

About two months prior to the pilot fieldwork, the design of the interview questions started and was based on the analytical framework (Figure 4.1). The operationalized variables (Table 4.1) guided the development of detailed interview questions. The interview questions were divided into **three** distinct sets.

The **first** set dealt with firm-level strategies and targeted the firm top management personnel (for example firm owners, chairman/president, or managing directors) (see Appendix C). The **second** set of interview questions targeted the operational personnel within the business firms (for example engineers, technicians and other shop-floor workers). The **last** set of interview questions focused on the external organizations[77] (if any) that assisted the business firms in formulating their upgrading/learning strategies, providing consultancy advice on learning activities and aiming to speed up the capability building process. These three sets of interview questions were tested during the pilot fieldwork (Section 4.3.6)

In addition to the interview questions, secondary data related to the nine Thai auto-part firms was actively sought. The search techniques included on-line searches and contacting researchers working in Thailand, including Thai academics who conducted past research within the Thai automotive industry. All of these served as important sources of

[77] Examples of these organizations are the Thailand Automotive Institute (TAI) and Thai Auto-Parts Manufacturers Association (TAPMA).

information and ideas both for further modifications to the interview questions during the pilot fieldwork and for the overall research.

4.3.6 Pilot Fieldwork

The pilot fieldwork started in March 2004 and ended in May 2004. The objective of pilot fieldwork was to put the above three sets of interview guides through a "test", and to determine the appropriateness of using a tape recorder during the interview.

4.3.6.1 Pilot Sample Firms and Organizations

The choice of sample firms and organizations within the pilot case study was based on the following factors:

- Convenience, accessibility (Yin, 1994) and relatedness to the conceptual issues
- A recommendation made by an ex-advisor[78] to the Thailand Automotive Institute on which firms could serve as exemplary case study candidates, given the research conceptual and analytical frameworks and objectives.

Five business firms and five organizations were chosen for the pilot case study (see Table 4.3).

Additionally, two public conferences[79] attended during the pilot fieldwork served as a useful exploration to assess the feasibility of the research design. These conferences enabled the researcher to have direct face-to-face contacts with the prospective firms' key informants (usually senior level executives) and to provide first impressions that later built accessibility to firm-level interviews and internal documentation. In addition, the conferences also allowed the researcher to meet with people in the Thai automotive businesses, leading to informal conversation regarding the industry context. For instance, the information obtained comprised past government policies that assisted or hindered the auto-parts firms, the current status of Thai automotive industry development, and the current learning obstacles and opportunities facing the auto-part firms.

[78] This ex-advisor earned his doctoral degree from Science Policy Research Unit (SPRU), University of Sussex.

[79] The first conference (Thai Automotive 2004) occurred on March 22-23, 2004, and the second (Automotive Manufacturing 2004) was held on May 6-8, 2004.

Table 4.3 List of Firms and Organizations Visited During the Pilot Fieldwork

Description of the Respondent	Type (Firm / Organization)	Date Interviewed
Automotive brake manufacturer	Firm	29 April 2004 12 May 2004
Automotive alloy wheel manufacturer	Firm	4 May 2004 5 May 2004
Automotive synthetic leather manufacturer	Firm	10 May 2004
Automotive general assembly plant	Firm	22 April 2004
Automotive seat manufacturer	Firm	14 May 2004
Ex-advisor to Thailand Automotive Institute who now operates his own consultancy firm	Organization	6 April 2004
International policy researcher who had worked closely with the Thai Board of Investment (BOI) and previously conducted qualitative study on Thai automotive industry	Organization	27 March 2004
International policy researcher who previously conduct large-scale survey study of Thai automotive industry	Organization	7 April 2004[80]
Policy researcher at National Science and Technology Development Agency (NSTDA)	Organization	30 April 2004
Academic who completed his PhD thesis on Thai automotive industry[81]	Organization	26 April 2004

Source: own elaboration based on the data collection

4.3.6.2 Use of Tape Recorder

Using a tape recorder to capture the interviews has certain advantages and disadvantages. One advantage is the researcher can obtain complete transcripts of the interviewees' responses as well as comments. The disadvantage is that the interviewees may be reluctant to disclose confidential and sensitive information. Drawing on Darke et al. (1998), who advocated the use of a tape recorder[82], the researcher experimented with the use of tape recorder during the pilot fieldwork and discovered the benefit of a set of "warm up" questions[83] asked during the first few minutes of the interview. This would allow the interviewees some lead time to get acquainted with the tape recorder and may lower their reluctance to disclose some important information. As a result, with the use of "warm up" questions, interviewees' reluctance to tape recording appeared less significant.

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[80] After the interview, the person responded to the researcher's request for assistance. He commented on the pilot interview guides and the overall approach to data collection strategy suitable for the Thai automotive industry.
[81] The thesis topic focuses directly on the inter-firm and intra-firm technology transfer and local (Thai) firm capability formation.
[82] Darke et al. stated "... if the research is being undertaken as part of higher education thesis process [i.e. PhD thesis], *full* transcripts of interviews should be obtained" [italics added] (Ibid.: 283).
[83] The "warm up" questions refer to the questions that are quite easy to answer. For instance, the questions could be related to the background of the firm or the firm current operating characteristics. An international consultant, who is also one of the key informants during the pilot fieldwork, provided this advice.

Consequently, the benefit of having a full transcript of the interviews outweighed the potential disadvantage of using a tape recorder.

4.3.6.3 Resulting Pilot Analysis

After completing the pilot fieldwork, the researcher performed pilot data analysis which comprised combining the interview data with the firm secondary data and wrote a short analytical text for each firm (i.e. case). In addition, the researcher attempted cross-case comparison to highlight the differences in firm strategies, learning activities and capability development, and conducted a public presentation (a "midterm report"[84]) stating the preliminary findings. Both the pilot case study and the presentation assisted in uncovering **three** important design and analytical issues.

First, during the pilot fieldwork, one of the interviewees was "put off" by the requirement to have to sign the Written Consent formed provided by the university Ethics Committee (see Appendix A). As a result, this person was highly skeptical and quite reluctant to divulge any crucial information, in particular that relating to firm strategies.

Second, the issue of firm learning process needed to be made more explicit and more problem-focused. In other words, the learning concept by itself is quite complex and rather abstract for these practical firms. To enable these firms to understand what is being asked and enhance their ability to answer the interview question, the interview questions related to learning strategy and activities were based on specific problems that occurred within the firm's natural setting.

Third, the issue of stimuli for learning is also important and appears to be under-emphasized in the pilot interview guide. In particular, it is of interest to seek out why some firms took on an ambitious learning strategy and what are the particular costs and benefits. An issue raised by an academic colleague during the "midterm report" was the impact on firm learning that were caused by the external factors. For instance, most first-tier Thai auto-part firms have intimate contact with the multinational carmaker; therefore, the carmaker's upgrading strategy would certainly have great impact on the local firm's decision to learn.

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[84] This was conducted as a requirement of the Australian National University PhD guideline. The audience comprised academic colleagues (lecturers, researchers, and fellow PhD students) from the National Graduate School of Management, Innovation Management and Policy Program, and the Research School of Social Science (Development Economics).

In all, these three issues were incorporated into the design of detailed interview guides for the main fieldwork.

4.4 Data Sources and Purpose

4.4.1 Primary Data

The study utilized **two** main sources of primary data: semi-structured interviews and direct observation. The purpose was to gain an understanding of the contextual as well as current issues relating to firm strategies, learning activities, and the overall process of capability development (see Table 4.4).

First, in-depth semi-structured interviews[85] were the main source of information. The rationale for using semi-structured interviews was to maintain flexibility as well as sufficient rigor. This "flexibility" meant that the interviewees received the opportunities to suggest any other related responses that were occasionally missed by the researcher, and at the same time, not constraining them to answer according to certain pre-specified rating scales or answer choices[86]. On the other hand, it was also undesirable to use the open-ended questions since this would allow the respondents too much freedom (i.e. lack of "sufficient rigidity"), which would eventually lead to the researcher facing the problem of irrelevant data or data overload. Hence, neither the formal-structured interview nor the open-ended interview was chosen, and the selection of semi-structured interview was most suitable for this study.

Second, direct observation was used as a complementary source of information. After each interview with a business firm, the researcher asked for a permission to have a production site tour. While on tour, the researcher had the opportunity to look at the product while it is being manufactured, and also conversed with production line foremen

[85] Yin (1994: 85) stated the advantage of using a semi-structured interview, "... the interviews may still remain open-ended and assume a conversational manner, but you are [also] more likely to be following a certain set of questions derived from the case study protocol."
[86] The semi-structured design is very much suitable to issues such as firm competitive and learning strategies since for heterogeneous firms each top manager (or owner) has his/her own vantage point of the current market trends and pressures that push their firm to either urgently or slowly develop certain types of capability. As such the interview guides for top managers and operational personnel should be different.

and technicians regarding the sequential production steps as well as the technology utilized during production process[87].

Table 4.4 Sources of Data and Purpose

Type	Sources of Data	Purposes
Primary Data	**Semi-structured Interviews:** • Interview with firms' top management • Interview with firms' operational staff – engineers and technicians • Interview with non-firm organizations such as Thailand Automotive Institute, Thai Auto-Parts Manufacturers Association, Federation of Thai Industry (Automobile Industry Clubs), National Science and Technology Development Agency, academics, and external consultants	- Gain deeper understanding of firm-level strategies, learning activities and process of capability development - Gain deeper understanding of the Thai automotive industry context, public assistance and other upgrading policies
	Direct Observation: • Plant site visits (including conversation with shop-floor foremen and technicians) • Corporate meetings and minutes of meetings • Firms engaging in the continuous improvement activities and human resources training	- Multiple sources of evidence, enhance interview validity and control researcher's bias - Opportunity for the researcher to assess the validity and reliability of the research interviews
Secondary Data	**Documentation:** • Corporate annual reports, internal documents and on-line web pages • Corporate press releases, brochures, minutes of meeting and newsletters • Industry conference proceedings • Industry handbooks and directories	- Multiple sources of evidence and enhance construct validity - Gain deeper understanding on Thai automotive industry & the nine sampled firms
	Public Seminars: • Thai Automotive 2004 Conference • Automotive Manufacturing 2004 Conference	- Gain deeper understanding of Thai automotive industry context - Validate interview from key informants
	Training Courses: • These were courses offered by Thailand Automotive Institute. Examples comprised Metal Fatigue Analysis and Computer Aided Design and Engineering.	- Multiple sources of evidence and control of researcher's bias

Source: own elaboration based on the research

Additionally, the technicians also described any production problems that they were trying to solve as well as the level of operational performance. For some firms (especially the

[87] The researcher graduated with an undergraduate and a postgraduate degree in Industrial and Operations Engineering (The University of Michigan) and had some experience with the automotive manufacturing environment.

small-and-medium-sized enterprises), the researcher directly observed the workers who participated in the training sessions (both on- and off-the-job) conducted by both the Japanese and Thai experts[88]. Moreover, the researcher gained permission from Thailand Automotive Institute (TAI) to follow several Japanese experts and Thai "engineer counterpart" into the field. This enabled the researcher to directly observe the actual learning activities and mechanisms (for example off-the-job training and on-the-job problem solving sessions) taking place within the firms. Such observations enabled the researcher to better assess the interview data, eliminating the possibility that the firms may "say one thing, but does another".

4.4.2 Secondary Data

In addition to the primary data, the study aimed to achieve triangulation, enhance the construct validity of interview findings and counteract the researcher's bias during data collection and analysis (Darke et al., 1998: 286). Hence, **three** sources of secondary (complementary) data were collected.

First, documentation was another source of complementary information. These included company annual reports, corporate brochures, newspapers, newsletters, minutes of meetings, bulletin board announcements, conference proceedings, Thai automotive industry handbooks or directory[89], progress reports and other articles that appeared in press releases and mass media.

Second, public seminars and conferences constituted other sources of information, the **two** main conferences attended by the researcher include: Thai Automotive 2004[90] (March 22nd-23rd) and Automotive Manufacturing and Automotive Assembly Congress 2004[91] (May 6th-9th). In both conferences, two key informants (also interviewees) publicly

[88] For example, at one instance the Thailand Automotive Institute personally asked the researcher to "stand in" as an "engineer counterpart" (i.e. an engineer who worked in the field alongside the Japanese expert). The experience served as an excellent opportunity for the researcher to assess the firm's empirical learning activities, and again, to assess the validity of interview data.

[89] There were two types of directory. The first was a publication (in 2003) that results from the collaboration of Automobile Industry Club, Auto-Parts Industry Club, Thai Auto-Parts Manufacturers Association, and The Thai Automobile Industry Association. Second were the publications by the Society of Automotive Engineers, Thailand (TSAE). Three volumes, from 2001 to 2003, were acquired. These handbooks aid in the selection of firms for case study.

[90] Organized by The Asia Business Forum and the conference titled, "Trends, Developments and Challenges Facing Thai Automotive Industry"

[91] Organized by Reed Tradex, Thailand and supported by the Thailand Ministry of Industry and the Thailand Automotive Institute.

presented their views on the Thai auto-part firms' upgrading strategy and the role of public policy.

Third data source included the researcher participation in training courses offered by the Thailand Automotive Institute[92]. The objectives (and the benefits) of attending these courses were **twofold**: to meet and get acquainted with the engineers from targeted case study firms and to survey what courses the targeted firms were interested in as part of their human resource development programs (i.e. off-the-job learning strategy). Achieving these objectives assisted the researcher in formulating a more focused set of subsequent questions during the main fieldwork interviews. These questions solicited more information on the issues such as human resource development strategy and personnel off-the-job training programs, and how these contributed to speeding up firm's capability development.

4.5 Main Fieldwork Preparation and Strategy

The main fieldwork started in September 2004 and ended in December of 2004, and its preparation started in July 2004. Drawing on "lessons learned" during the pilot fieldwork and the comments from the "midterm report" presentation, main fieldwork preparation comprised adjustments to the operationalized variables, some modifications to the detailed interview questions, and the overall interview strategy. Overall, the interview preparation was divided into two main types: business firms and non-firm supporting organizations. In addition, the business firm interview guide was further subdivided into: top management (and managers) guide and operational staff guide. In about a month prior to the intended interview date, the targeted interviewee was first contacted through a formal invitation letter[93] stating a brief synopsis of the research and seeking permission for an interview.

4.5.1 Interview Preparation for Business Firms

The focus of the business firms' interviews was on their perception of the changes within the external environment (i.e. the opportunities and threats), firm-level competitive

[92] With background training in engineering (both bachelor and master degree), the researcher was able to adequately understand the concepts explained during lecture. In addition the researcher met some key informants from the targeted case study firms, who participated in the same training course.

[93] This letter also received a formal endorsement from Thai Board of Investment (BOI), stating the importance of the research and persuading Thai firms to participate in the research study (see Appendix B)

and learning strategies, learning activities and mechanisms, and the rate and type of capability accumulated.

4.5.1.1 Top Management and Managers

Here the interview guide aimed to solicit information related to firm-level strategies and the perception of changes within the external environment. Each interview was divided into **three** sections (see Appendix C1.1). The **first** section is related to the firm's general background information. The **second** section solicited information on external factors that were considered by the managers to be opportunities or threats as well as the impact on firm strategies. The **final** section consisted of questions related to firm strategies and requirements for further capability development. Overall, this interview guide was much shorter than the one used for operational staff[94].

4.5.1.2 Operational Staff

The aim of this interview guide was to solicit detailed information related to firm-level learning activities, learning mechanisms, and capability development. Each interview guide was divided into **seven** sections (see Appendix C1.2). The first section is the general background information and the other five sections focus on the learning activities (investment, production process, product, linkage, and marketing) and implemented learning mechanisms (passive, active, or combination). The last section focuses on the outcome of these learning activities.

4.5.2 Interview Preparation for Non-firm Organizations

The interview with non-firm organizations was designed to target the support activities provided by these organizations for the business firms, in terms of assisting Thai firms with strategy for upgrading and engagement in various learning activities. The responsibilities of these organizations range from supporting and enhancing private sector competitiveness (such as Thailand Automotive Institute) to business associations who lobby the Thai government for increased industrial protection (such as the Thai Auto-Parts Manufacturers Association).

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[94] The shorter interview guide for top management is appropriate since it is reasonable to assume that firm executives were always busy, and therefore the main focus of the interview should be on firm's strategies and not on operational activities.

The interview aimed to solicit information regarding the environmental factors (inclusive of public policy and incentive factors) that retarded or facilitated the implementation of Thai firm learning strategies, learning activities and the process of capability accumulation. Each interview guide was divided into **three** sections (see Appendix C2). The **first** section asked about the organization's background and its objectives (or its mission statement). Then the **second** section included the questions about how the organization perceived the impact of the external factors on the Thai auto-part firms. In particular, the organization should state what it viewed as Thai firms' learning enablers and/or obstacles. The **third** section comprised strategies for assisting Thai firms for learning and capability development, in particular, what significant role did the organization played in the Thai firms' capability development[95].

4.6 Data Collection Process

This section describes the interview strategy implemented during the main fieldwork, the construction of a "case study database", and the resulting data collected.

4.6.1 Interview Strategy

The study utilized the following steps and information solicitation techniques during the interviews.

- Once the organization accepted the request for an interview, the follow-up telephone call was made to confirm the organization's choice of appropriate meeting time, date, and place.
- For each organization, the first person interviewed was usually the Director (in the case of non-firm organizations) or the firm owner (or chief executive, in the case of business firms), who is mainly responsible for drafting and implementing the overall firm strategy. The focus was on this person's perception of the changes within the external environment, and the formulation of firm competitive and learning strategies.

[95] For example, the interview guide prepared for the Thailand Automotive Institute (TAI) included questions relating to specific technological assistance programs, the timing and duration of such programs, and the availability and appropriateness of consultancy programs. Also solicited were information about the composition of the consultancy group, the expected program outcomes, and the major obstacles encountered during the program implementation. In addition, the TAI also provided other related information such as the Thai Automotive Master Plan (2002-2006), the Automotive Human Resource Development plan, and the "Detroit of Asia Project".

- Even though the tape recorder captured the interviewee's response, the researcher also actively wrote down notes on the important key points during the interview. These notes later assisted the researcher, when reviewing the interview transcripts during data analysis, to remember to highlight the key points. Additionally, often times the engineers wrote down the technical (schematic) drawings on pieces of paper during the interview. These were collected by the researcher after the interviews.
- If the upcoming interview was the second time with the same interviewee or firm, then the tape recording from the previous interview was studied and notes were taken[96]. In addition, a review of other relevant (or updated) complementary data was also conducted about the interviewee or firm. These activities were conducted to ensure that the researcher did not suffer from faded memory or asking the same questions twice. Rather the objective of the second interview was to probe into deeper analytical issues related to a concept or event described by the interviewee (during the first interview). This procedure assisted in modifying the interview guide for the second interview. It also assisted in locating the second interview response within the context of the first one; and in essence, the researcher was conducting a simple preliminary data analysis while collecting data.
- After each interview with a business firm, the researcher asked the company for corporate brochures, annual reports, and other information that is relevant to the key issues explored in this research. In addition, the researcher also requested for a guided plant tour.

All interview questions always started out with simple ones relating to the background of the interviewee and his or her job responsibilities[97]. Then it proceeded to a more challenging set of questions such as firm learning strategies, policy issues, product improvement, production process capability and the type of technical assistance received. Following this guideline, the "general questions" achieved the objective of broadly probing the general issues relating to the interviewee and his/her role within the firm or organization. These questions also assisted the interviewees to feel more confident as the interview session progressed.

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[96] This was usually done the night before the next interview.
[97] These were the "warm up" questions referred to earlier in Section 4.3.6.2.

In contrast, the more "specific questions" were targeted at specific "critical incidents" or episodes that had occurred or currently occurring. For instance, when an engineer described the production process improvement techniques, the researcher asked him to provide a concrete example of such activity[98]. Questions relating the rationale of the engineer's action were also used; these questions usually begins with "why did you do this" or "why don't you do this".

4.6.2 Case Study Database

Prior to data collection, the researcher followed the suggestions provided by Yin (1994: 95) and Darke et al. (1998: 283) and established a "case study database". Each case has one corresponding database, which comprised *all* the primary and secondary data associated with the case[99]. The aim was to create a systematic method for storing information, enabling the researcher to accurately retrieve them for later data analysis. Here, Darke et al. (1998: 286) stated that a well-organized case study database, during the data collection process, provides the researcher with a good foundation for cross-referencing and citations of important evidence for later data analysis. As a result, this would ensure the reliability as well as relevancy of the data collection process.

4.6.3 Outcome

The data collection process was completed when the criteria of "saturation" was reached (i.e. diminishing return on receiving marginal information about the case when performing an additional interview or direct observation) (Miles and Huberman, 1994). Table 4.5 provided a summary of all the collected data. In total, the main fieldwork data were collected from nine Thai auto-part firms, four multinational carmakers and assemblers, seven non-firm automotive organizations, and more than 45 interviews. Additionally, there were more 15 direct observation episodes made at the business firm production sites and during their human resources training programs. For secondary data, the researcher had collected over 300 pages of data (on average) for each firm.

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[98] Often times, technical drawings on scratch paper and whiteboard usually accompanied the engineer's explanation to clarify the conceptual ideas conveyed.

[99] For data that are hard copy such as field notes and corporate brochures, the individual case information was stored in a separate filing cabinet. Similarly, for electronic data (for example MS Word files, electronic memos and notes), each case information was stored in a computer using a clearly defined, separate folder.

Table 4.5 Summary of the Collected Data

Organization	People Interviewed	Direct Observation	Secondary Data
Firm AH Group[100]	Senior Manager (twice)[101], two production engineers	Plant tour and casual conversation with technicians	Two annual reports, a presentation of productivity improvement program, press releases, previous published research reports, corporate websites, and minutes of a board meeting
Firm CSP	General Manager, one engineer	Plant tour, casual conversation with technicians, casual conversation with general manager, observations of off- and on-the-job training sessions offered by Thailand Automotive Institute (TAI)	Company brochure, company bulletin board, information from TAI
Firm CPC	President, one engineer	Plant tour, casual conversation with technicians, observations of off- and on-the-job training sessions offered by Thailand Automotive Institute (TAI)	Corporate press releases, information from TAI, company websites
Firm D Group	Founding president (twice), Engineer Manager (twice)	Plant tour, casual conversation with technicians, conversation with the president during the public seminar	Corporate websites, information from ex-advisor of TAI, and information from an ex-engineer of TAI
Firm L	Managing Director, Plant Manager, two design engineers, one production engineer	Plant tour and design department tour, casual conversation with two engineers during off-the-job training course offered by TAI[102].	Company websites and press releases, information from ex-advisor of TAI, company product brochure
Firm S Group	Vice president, general Engineering Manager, production engineer	Plant tour, casual conversation with production engineer, observations of off- and on-the-job training sessions offered by Thailand Automotive Institute (TAI), stood in as a "counterpart engineer"[103]	Corporate websites, annual report, press releases, public speeches of the vice president (see footnote #26), information of productivity improvement from TAI
Firm SOM	President, and one engineer	Plant tour, observations of off- and on-the-job training sessions offered by Thailand Automotive Institute (TAI)	Information from TAI
Firm TKT	Managing Director, one engineer	Plant tour, casual conversation with the president during the public seminar	Corporate websites, annual reports, press releases, and company digital presentation file

[100] The word "group" signifies that the firm is a corporate group consisting of more than one subsidiary firm, some of which are foreign joint ventures.
[101] Meaning interviewed the same person twice.
[102] The title of the training course is "Metal Fatigue".
[103] "Counterpart engineer" means Thai engineer who accompanied the Japanese expert during the technical assistance program organized by TAI. The researcher participated as a counterpart engineer for Firm S Group.

Table 4.5 (continued). Summary of the Collected Data

Organization	People Interviewed	Direct Observation	Secondary Data
Firm TS Group	Vice President, Plant Manager, R&D manager, design engineer, general Administrative Manager, three production engineers	Plant tour of the R&D facility, Plant tour of the production line, casual conversation with quality control engineer, conversation with executive President during public seminar	Corporate websites, public speeches of the Vice President[104], information of productivity improvement project from TAI, and corporate press releases
Assembler B	Ex-Managing Director[105] (twice) and production engineer	Plant tour	Not applicable
Carmaker H	Vice President	Plant tour	Corporate website, press releases
Carmaker M	President and two engineers	Plant tour	Corporate website, press releases
Carmaker T	Vice President	Plant tour	Corporate website, press releases
Policy research firm	President and Vice President	Not applicable	Not applicable
National Science and Technology Development Agency	Policy Researcher	Not applicable	Organization website, documents on industrial technical assistance programs, and other policy measures
Thailand Automotive Institute	Senior Manager, Supplier Development Manager, consultancy engineer, ex-advisor, head of Japanese technical experts and a policy analyst	Not applicable	Organization website, published case study, published automotive master plan, various issues of newsletter and quarterly magazines
Thai Auto-Parts Manufacturers Association	President, one engineer	Not applicable	Organization website, published conference proceeding, and published Thai automotive industry directory
Thai Automotive Industry Association	Ex-President	Not applicable	Organization website, published Thai automotive industry directory
ASEAN Automotive Federation	President	Not applicable	Organization website, press releases, and magazine articles
Society of Automotive Engineers, Thailand	President	Not applicable	Automotive industry directory, from 2001-2003 (3 volumes), various issues of newsletters and magazines.

Source: own elaboration based on the research

[104] These speeches were given during the two conferences in Bangkok: the Thai Automotive 2004 and the Automotive Assembly Congress 2004.

[105] This person works in the Thai automotive industry for more than 35 years and had witnessed many important historical events within the industry. After retiring from assembler B, he went and worked as operation director of a company, a sibling company of Firm TS Group.

4.7 Data Analysis Process

Drawing on Eisenhardt (1989), Miles and Huberman (1994), and Gibbs (2002), there were **four** stages in data analysis:

1. Categorizing the extensive field notes, interview transcripts and other secondary sources into themes.
2. Performing within-case (i.e. within firm) data analysis and writing case study reports
3. Searching for cross-case patterns in order to gain deeper understanding into analytical issues that cause the differences in firm learning and capability development, and writing a case study report
4. Ensuring the analytical validity and reliability

4.7.1 Tools for Preliminary Analysis – NVivo

The completed interview transcripts and field notes contained more than 400 pages of raw data. Analyzing this amount and variety of information created a complex process that required proper, systematic data management. NVivo is a "computer-assisted qualitative data analysis" tool that assisted the researcher to achieve such purpose[106] (Gibbs, 2002: 10-11). Assisted by NVivo, the researcher was able to efficiently accomplish **two** data management tasks. **First**, NVivo assisted the researcher in efficiently as well as systematically sorting the raw data into the pre-specified analytical categories (see Table 4.1 and Figure 4.1). **Second**, the sorting process was conducted iteratively and flexibly, but not rigid. This meant that the researcher was always conscious of any new important empirically-derived categories that could arise from interpreting and analyzing the raw data. Throughout this process, the researcher maintained an active engagement with the raw data, constantly writing down conceptual ideas as interim "memos"[107] (i.e. analytical

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[106] It is important to note that the researcher implemented NVivo as a complementary assisting tool and *not* as a substitute for in-depth data analysis. As Gibbs (2002: 10, 13) correctly stated "The real heart of the analysis requires an understanding of the meaning of the texts, and that is something that computers are still a long way from being able to do so. ... [NVivo] is just a tool for analysis, and good qualitative analysis still relies on good analytic work by a careful human researcher..." Additionally, one could argue that usefulness of NVivo is in assisting the research to achieve the prerequisites of really effective qualitative analysis, that is, to efficiently, consistently and systematically manage and process the raw data (Ibid.).

[107] Miles and Huberman (1994: 72) commented on the benefits of using memos during data analysis: "Memos are primarily conceptual in intent. They don't just report the [raw] data; they tie together different pieces of data into a recognizable cluster, often to show that those data are instances of a general concept." In NVivo,

annotations) as they arose (Gibbs, 2002; Miles and Huberman, 1994). Writing these memos constituted the preliminary analysis of the raw data.

4.7.2 Within-Case Data Analysis

Drawing on Eisenhardt (1989: 540) and Miles and Huberman (1994), the individual firm's case study database was analyzed for within-case patterns of changes through time, according to the conceptual themes. The process followed **two** steps. **First**, a list of chronological events related to firm-level strategies, learning activities and capability building activities were created. Tables and data display matrices assisted the researcher to tabulate the firm's evolution of product offerings, series of technological assistance, and joint venture agreements. **Second**, the preliminary write-up of each individual firm followed. During the write-up, the researcher paid attention to **two** things: the sequential nature of events and the analytical analysis under each time period. As a result, each individual firm write-up consisted of **three** main sections: 1) the firm background (inclusive of its start-up) and current operating characteristics, 2) the changes in meso-environment, firm-level strategies and learning activities during the firm's intermediate phase, 3) the changes in meso-environment, firm strategies and learning activities during the current phase[108].

The within-case data analysis allowed the researcher to analytically capture the dynamics of the analytical constructs through an intimate familiarity with the evolution of each firm. The analysis allowed the researcher to characterize each firm's choice of strategies, learning activities and mechanisms, and its rate of capability development. In other words, for each firm the researcher was able to gain an understanding of:

- how the sequence of changes within the meso-environment impacted on firm-level competitive and learning strategies
- to what extent the changes in firm-level strategies impacted the set of firm learning activities and learning mechanisms
- how each firm strategies, learning activities, and capability accumulation co-evolved

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these memos can be electronically attached to a specific position within the raw data (either interview transcript or description of a direct observation), providing the researcher with the original reference source (Gibbs, 2002: 84-85).

[108] For definitions of these different phases, see Table 6.1.

Through this deeper understanding, the researcher sought to understand the relationship between firm strategies, learning activities, and learning mechanisms, and finally, how these elements mutually contributed to a firm capability development.

4.7.3 Cross-Case Data Analysis

Cross-case (i.e. between firm) comparison was even more complex than within-case analysis. Two issues needed to be described and analyzed concurrently across firms: the comparative evolution of each dimension of firm behavior (e.g. strategies, learning activities, and mechanisms) and the interdependencies (or relationships) among these dimensions as they constantly evolve. Moreover, since each firm had different establishment dates, the cross-case comparison was more challenging. To facilitate the analysis, the common phases were defined for all the firms. These common phases were: start-up phase (i.e. the firm's establishment period), expansion phase (i.e. the firm's growth period) and adaptation phase (i.e. the firm's current period). Additionally, in each phase, the firms were initially grouped according to:

- the similarities and differences in the defining characteristics of their competitive and learning strategies (see Table 4.1). (For instance, firms that perceived changes within the external environment as opportunities and implemented rather ambitious learning strategies were grouped together.)
- the similarities and difference in their leaning activities and choice of learning mechanisms (see Table 4.1). (For instance, firms that possessed a diverse (yet focused) set of learning activities and a synergistic combination of more purposive learning mechanisms were grouped together.)

To ensure reliable analysis, multiple tables as well as matrix data displays were constructed. For each conceptual construct (for example, firm strategies or learning activities), the researcher developed an analytical table, and compared this performance across all the firms for a particular time period (for example, during start-up phase). This procedure was repeated twice for the other time periods (i.e. one for the expansion phase and another for the adaptation phase). Consequently, for each dimension of performance, there were three tables, each describing a different time period and seeking to uncover the convergent (or divergent) pattern across all firms. This pattern-searching procedure allowed the researcher to explore the data in many divergent ways, guarding against the possible of drawing immature conclusions without considering the rival explanations[109].

4.8 Research Ethics

In late 2003, the researcher applied for the ethics approval prior to commencement of any fieldwork activities. The process comprised:

1) submitting an outline of the research methodology used

2) a synopsis of the interview questions

3) a Written Consent form (for interviewee to sign) (see Appendix A)

The Written Consent form stated that each respondent has the right to choose to either accept or refuse the researcher's request for an interview. The ethics application was approved in February 2004.

[109] Yin (2003: 163-164) stated that one of the criteria that makes an "exemplary case study" is the ability for the study design to consider the alternative (rival) explanations.

Chapter 5 - Thai Automotive Industry Analysis

The aim of this chapter is to map the evolution of Thai automotive industry since its inception in the early 1960s. This chapter serves to elaborate the main actors whose actions have shaped the context in which Thai auto-part firms have operated, planned their strategies and upgraded firm capabilities. This main focus is on the technological and organizational development of the Thai automotive firms. The history of the Thai automotive industry spans roughly four and a half decades of development. Within this duration there were many important historical events; some were policy-related whereas others were politically related.

Thai automotive industrial development can be divided into **three** distinct periods. **First** is the period from 1960s to 1980s; it started with simple assembly activities and most firm learning activities concentrated on importing completely knock down (CKDs) auto-parts and assembling them in Thailand. There were initially no manufacturing activities. In the early 1970s, some assemblers, to comply with increased LCR, started some manufacturing activities. At this stage some Thai and foreign joint venture firms setup small manufacturing facilities and started simple production activities[110]. By the late 1980s, the intermediate manufacturing and some export activities had begun. Progressive localization schemes had compelled many Japanese-owned carmakers to search for local manufacturers who could produce auto-parts. In most instances, the Japanese called upon their supplier affiliates[111] in Japan to come and invest in manufacturing operation in Thailand. Throughout this period, the automotive industry had registered trade deficits (see Figure 5.1) and government rationalization policies attempted to remedy this problem[112].

The **second** period starts with the early export-oriented policies in the late 1980s and ends with peak automotive sales prior to the 1997 crisis. During this period, the Thai government decided to remove the restriction on the import of completely built units (CBU) cars, decreased the import tariff of CKD auto-parts and increased openness to FDI and ownership of assembly plants. In terms of regional collaboration,

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[110] Simple parts such as car batteries, wheel rims and exhaust pipes were produced.

[111] Japanese carmakers have three types of suppliers: 1) affiliates, 2) close associates and 3) general vendors. Among the three, the "affiliates" are arguably the most capable (in terms of design technology and capabilities) and have made joint investment with the carmakers (Kaosa-ard, 1993: 11). This implied the intimate long-term relationship between the carmakers and their affiliates; hence arguably the affiliates are also very trustworthy business partners.

[112] For e.g. implementation of import ban on small vehicles in the late 1970s.

Thailand, decided to commit itself to develop the ASEAN Free Trade Area (AFTA). The Thai economy grew at an unprecedented rate during late 1980s to mid 1990s; this caused an upsurge in demand for vehicles, especially one-ton pick-up trucks. The sequence of these events increased the pressure for Thai firms to start to shift their learning strategies and to build technological capabilities.

The **third** period of Thai automotive industry is the full liberalization phase with the government aiming to build a regional export base. After the 1997 financial crisis carmakers experienced a sharp decline of the domestic market sales and were forced to export their products in order to survive. In 2000, the local content regulations were abandoned[113] along with a revised automotive tariff structure. The following sections will delineate each period in greater details, linking changes in policy and market conditions with changes in firm-level competitive and learning strategies and efforts of local auto-part firms.

5.1 From Assembly to Semi-Manufacture: the Localization and Protection Phase (1960s to 1980s)

5.1.1 The Institutions

Prior to the 1960s the automobile industry in Thailand was virtually non-existent; but some Thais were passionate about automobiles. For instance, the first Mercedes Benz arrived in Thailand only four years after it was born in the 1900 in Germany (ASEAN Autobiz, 2005)[114]. Prior to and during the 1960s almost all the vehicles on Thai roads were brought in by either the members of the royal family or the wealthy social elites[115]. These vehicles were brought in as completely built-up (CBU) cars and they were distributed via a small number of distributors (Abdulsomad, 2003: 45). These distributors dominated the market during the time and there were negligible domestic manufacturing activities (Nawadhinsukh, 1983).

In the early 1960s the Industrial (Investment) Promotion Act[116] (IPA) was enacted and a wave of assembly operations in Thailand started. The automotive

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[113] The local content regulations were abandoned in January 2000. At the same time, the import tariff on the CKD auto-parts was increased to 33% in order to continue to provide some protection for the local auto-part firms.

[114] The first Mercedes made its arrival to Siam (former name of Thailand) on December 19, 1904 and served the royal activities of King Chulalongkorn (King Rama V) (ASEAN Autobiz, 2005: 58)

[115] Popular imported vehicle brands were Austin, Morris, Hillman, Vauxhall, Standard, Triumph, Ford, Renault, Peugeot, Fiat, Opel and Volkswagen (Nawadhinsukh, 1983: 114).

[116] Prior to the 1960 and 1962 Industrial Promotion Acts, there was the 1954 Industrial Promotion Act. It was the first time that the Thai government granted promotional privileges to the industries and also the

industry was classified under category B and, as such, the IPA allowed a 50 percent reduction of import duties and trade taxes on completely knock-down (CKD) units. This led to the establishment of a handful of automotive assembly plants (see Nawadhinsukh (1983: 181)) of which the Thai Motor Industry Company was the first (OIE, 2004: 6). Later during 1970-1977, nine more assembly plants were established (see Nawadhinsukh (1983: 182)).

During the period of 1961 to 1968, the Thai government built more roads and other infrastructure under the National Economic Development Plans. Vehicle sales increased from 3,934 units in 1961 to 70,946 units in 1968 (Nawadhinsukh, 1983: 184), of which only 13,639 units were locally assembled. In 1975 the production capacities of assemblers were six times more than the sales of vehicles (Doner, 1991: 198) and this led to the problem of lack of economies of scale and fragmentation, and later the problem of the severe trade deficits (see Figure 5.1). To rectify the over-supply problem, the Board of Investment (BOI) decided to end the promotion of investment for assembly plant by 1969 and MOI issued policies to address the problems of the trade deficits and market fragmentation.

To remedy the problems, in 1969 under the guidance of the Ministry of Industry (MOI) the government set up Automotive Industry Development Committee[117] (ADC) whose responsibility was to oversee the future development of the automotive industry. The setup of ADC signified the beginning of an active role by the Thai government in the development of the industry. In issuing the Automobile Industry Development Policy in July 1971[118], the committee (ADC) attempted to accomplish **two** goals.

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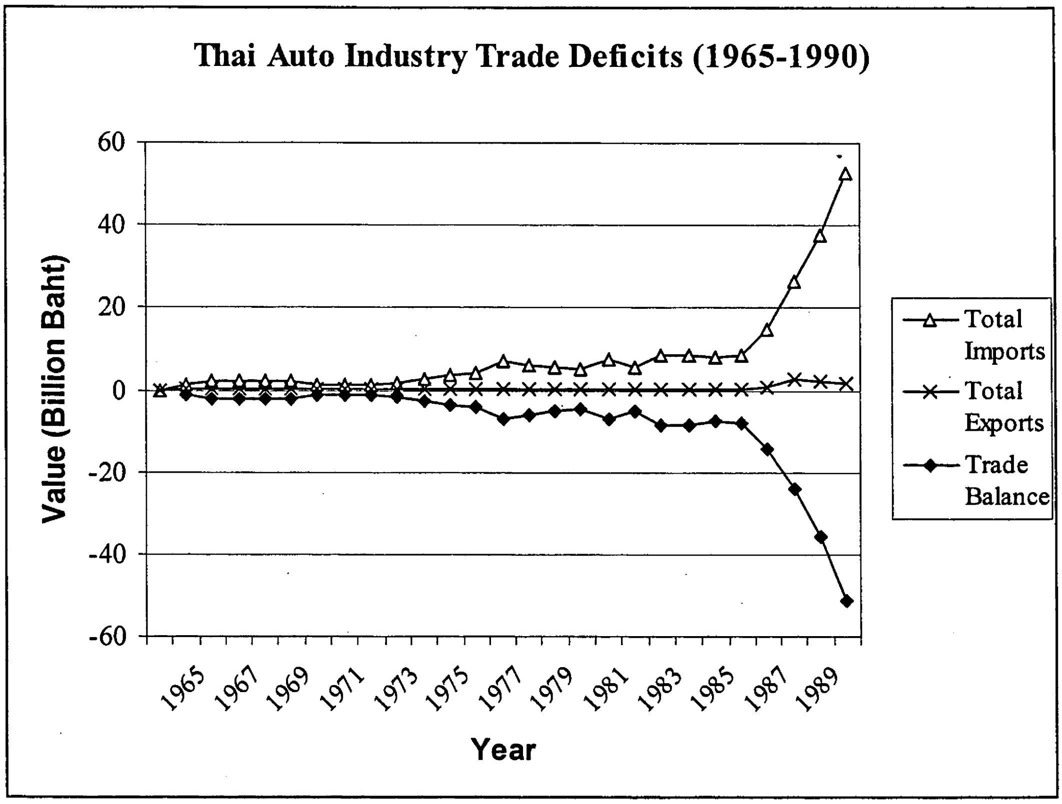
first time that the government focused the industrial development strategy on private business enterprises. Since the Thai government lacked experience in implementing such act, the 1954 Act was unsuccessful in promoting private investment (Thanamai, 1985: 29-34). Later in 1959 the Board of Investment (BOI) was established to provide investment incentives to industries that were deemed vital to economic development (Kaosa-ard, 1993: 13). It issued the Industrial Promotion Acts (1960 and revised in 1962) (Thanamai, 1985) and Industrial Investment Act (1965) (for more details see Nawadhinsukh (1983: 187)).

[117] The AIDC was established on August 26, 1969 (Nawadhinsukh, 1983: 187; OIE, 2004: 6). Later it was called Automotive Development Committee or simply Automotive Committee (Thanamai, 1985: 112). The committee comprised high-ranking officials representing the Ministries of Industry and Commerce, the Customs Department, the Land Transport Department and the Board of Investment.

[118] The 1971 automobile industry was the first of its kind issued by the MOI via the ADC. "The heart of the policy was a 25 per cent LCR (Thanamai, 1985: 117)."

Figure 5.1 Trade Deficits



Sources: adapted from Department of Customs and Kaosa-ard (1993: Table 2)

First this policy attempted industry rationalization, limiting the number of assembly plants and model series. To reduce the degree of market fragmentation and achieve economies of scale, the ADC issued a ban on the establishment of new assembly plants for passenger cars and restricted the number of car models that were assembled locally and the engine sizes (Terdudomtham, 1997: 9). Specifically the passenger car assembly plants currently in operation were not allowed to produce more than three models and three engine sizes, of which only one could exceed 2,000 c.c. in capacity. In addition to these limitations an assembly plant might produce either passenger cars or commercial vehicles (truck, bus and others), but not both. Therefore existing assembly plant that had been producing both passenger cars and commercial vehicles must now concentrate on only one type of vehicle; this one-type-rule was effective at the end of 1972 and applied to newly established assembly plant (Nawadhinsukh, 1983: 188; Thanamai, 1985: 129-130). Moreover there was a restriction on setting up new assembly plant; new plant applying for a license from MOI must be: 1) producing at a daily rate of thirty cars on an eight-hour work schedule and 2) have a minimum investment in machinery and buildings not less than 20 million Baht (Thanamai, 1985: 130).

Second, the ADC's 1971 policy discussed the minimum LCR in 1971 which later became effective by the end of 1974 (Terdudomtham, 1997: 4). The rationale for choosing local content as the main strategy of automobile industry policy was the belief that this would create business in industries that were linked with automobile production and in turn would create employment. In addition, it was the government expectation that the local content scheme will encourage the transfer of know-how (from foreign to local firms) and assist in the upgrading of technical standards of local auto-parts industry (Thanamai, 1985: 119).

In addition to setting up the rationalization and LCR, the ADC would act as a policymaker. Additionally, the ADC would act as a coordinating agency among the Ministries of Industry, Finance, Commerce and Customs Department and the Board of Investment. The coordination was necessary since the automotive policy is a "package policy"[119] which required a combination of various policy measures such as tax protection, tax exemption, import restrictions and financial support (Thanamai, 1985: 113-114). The 1971 automobile policy sought to ensure the industry transition from merely assembly to semi-manufacture through compulsory use of local content (Nawadhinsukh, 1983: 188). By the end of 1971, just when the first automobile policy was about to be implemented, the military coup took place and the policy was revised to become the 1972 automobile policy. The one difference between the two policies was the omission of car models and engine sizes restriction in the latter policy (Thanamai, 1985: 139); thus the 1972 policy contained only the restriction on minimum capacity and investment levels for new assembly plants. This partially explains why the attempted rationalization failed during the latter half of the 1970s and the Thai market remained fragmented. Despite the differences, both 1971 and 1972 policies shared a similar emphasis on the LCR. In all, the localization policy was the main force shaping the Thai automotive industry (Anonymous, 1994), thus it is worth going into some depth regarding its historical origin.

5.1.1.1 The Local Content Requirements and the Phased Increases

LCR policy has been used by many countries to accomplish the following two objectives (Abdulsomad, 2003: 106):

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[119] This package policy concept was suggested to the Head of Industrial Economics and Planning Division at MOI by UNIDO experts assistance program during 1967-1971 (Thanamai, 1985: 115).

- To develop a country's automobile industry from simple assembly to semi- or full manufacture
- To create and enhance the local auto-part industry

In Thailand, the first LCR policies were implemented at the beginning of 1975 and stated that vehicle assembly plants must used at least 25 per cent local content for passenger cars, van and pick-up; 20 per cent for commercial cars (chassis-with-windshield); and 15 per cent for other commercial cars (chassis-with-engine, without windshield) (Nawadhinsukh, 1983: 183; OIE, 2004: 6; Terdudomtham, 1997: 4).

The policy for the phased increase in LCR was declared in 1978. It comprised the following requirements (Abdulsomad, 2003: 107; Higashi, 1995: 18) (see Figure 5.2):

- The currently operating assembly plants must increase the local content of passenger cars from 25 to 50 per cent within five years (1980-1984) (OIE, 2004: 6) and in the first two years must reach a LCR level of 35 per cent and gain a yearly increase of 5 per cent for the next three years (Nawadhinsukh, 1983: 190).
- The medium-to large-sized trucks must have an increase in LCR from 20 per cent in 1980 to 45 per cent in 1985 with a 5 per cent increase per annum.
- Similarly pick-up trucks must have a phased increase from 20 per cent in 1980 to 61 per cent in 1989. In addition from July 1989 the government required assemblers to fit locally produced engines into pick-up trucks with engine capacity up to 2,500 c.c. and the LCR for engine parts must increase from 20 per cent in 1990 to 80 per cent in 1996 (a 10 per cent increase per annum) (Higashi, 1995: 18; OIE, 2004: 8).

By 1982 when the government was about to follow the next phased increase of local content, it had re-examined the original plan. The re-examination was undertaken as part of a larger industrial restructuring plan[120].

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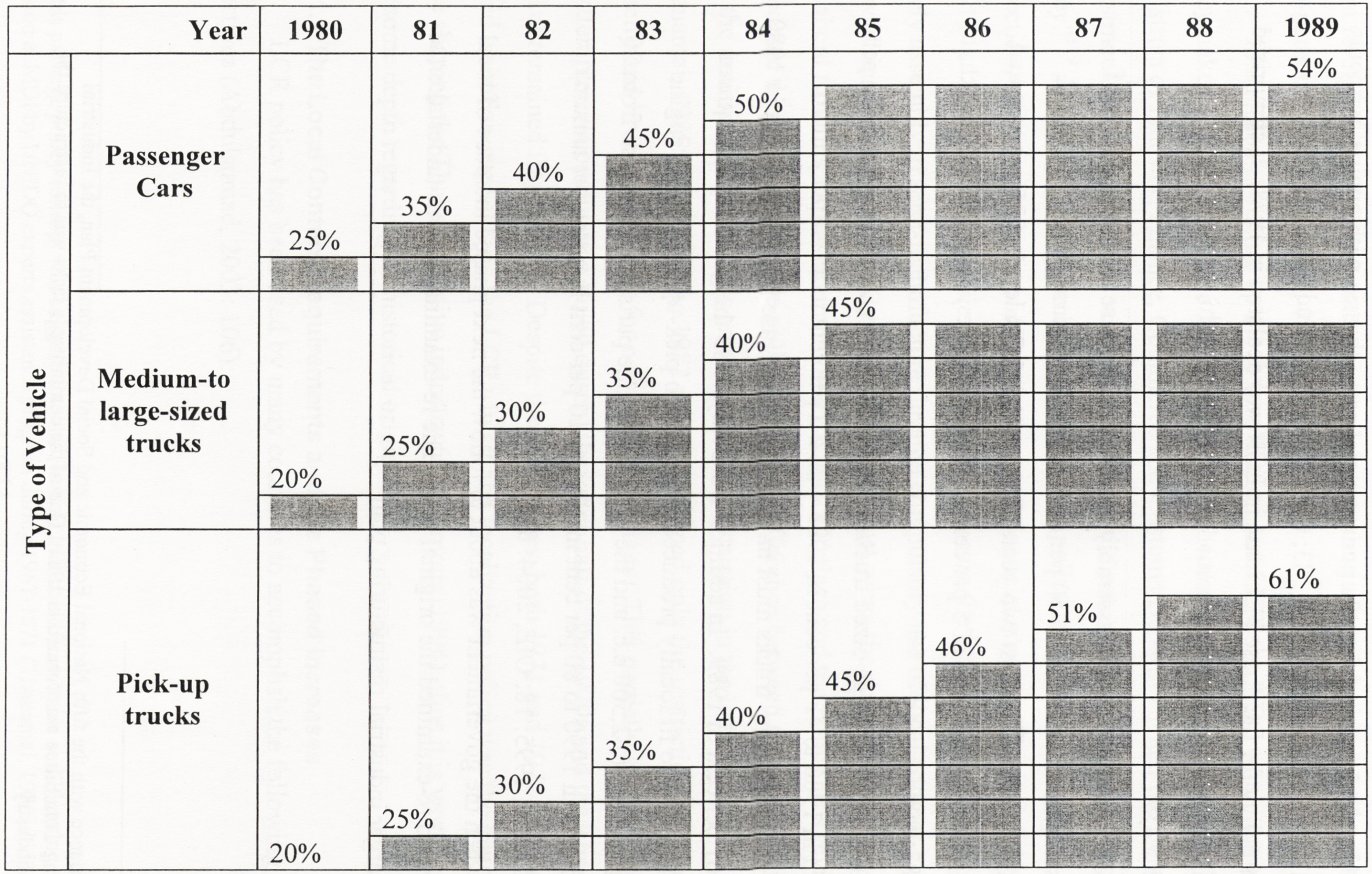
[120] In accordance with the fifth National Economic and Social Development Plan, the Industrial Restructuring Committee was formed in 1981. One of the committee's tasks was to restructure the automotive industry.

Figure 5.2 Proportion of Local Contents in the Automobile Assembly



Sources: adapted from Ministry of Industry and Higashi (1995: 18)

In 1984 the decision was to freeze the local content for passenger cars at 45 per cent[121] with introduction of the compulsory auto-parts list applied to the overall contents (OIE, 2004: 7). Later in 1986 the freeze at 45 per cent was replaced with the two annual lists of LCR, developed by the ADC, for passenger car assembling[122].

In addition to the LCR, the government also introduced measures to make localization and rationalization policies more effective.

- Total ban on the import of CBU passenger cars[123] was initiated on January 31, 1978. Later in 1985, the ban was partially lifted for passenger cars with engine larger than 2,300 c.c. (Panichapat and Kanasawat, 1997: 3)
- The prohibition on establishment of new car passenger assembly plants was announced in 1978 (OIE, 2004: 6; Panichapat and Kanasawat, 1997: 3).
- In 1978 the MOI issued a restriction on the introduction of new series of passenger cars (OIE, 2004: 6); the anticipated outcome was to promote economies of scale (Panichapat and Kanasawat, 1997: 3).
- In addition the "mandatory deletion" of specific auto-parts (brake drums and exhaust systems) was introduced. In the 1980s, the ADC announced the seven auto-parts that were required for truck assembly[124].
- In 1984 the MOI announced the limitation of up to 42 series of passenger cars could be produced by the whole industry and that only 2 models were allowed for each series. In addition, there was an environmental standard restriction; any domestically produced cars must use the exhaust-pipe systems certified by the Thailand Industrial Standards Institute (OIE, 2004: 7).

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[121] Prior to the decision to freeze local content at 45 per cent, there was a plethora of political infighting, a "policy deadlock" (Thanamai, 1985: 182), between the multinational carmakers, the private auto-part firms, the National Economic Social and Development Board (NESDB) and the Ministry of Industry (MOI). The NESDB and the World Bank expert believed that the local content should be frozen as soon as possible (during the time it was at 40 per cent for passenger cars); however the private auto-part firms believed that they could supply parts up to at least 80 per cent of the local content of the carmaker assembly plants and they expressed their disagreement via the Association of Thai Industries (ATI). The MOI believed that a 100 per cent LCR was possible via appropriate tax incentives. Finally after a meeting with associated parties the MOI and the ADC announced that local content should be frozen at 45 per cent starting from August 1983 (see (Thanamai, 1985: 168-173, 180) for more details).

[122] These were Parts List A which was compulsory for all assembly and Parts List B which allows assemblers to choose the auto-parts. The requirement stated that the combined local content of auto-part from List A and B shall be at least 54 per cent (OIE, 2004: 8).

[123] The ban included both car and motorcycle and was initiated by the Ministry of Commerce (MOC) in order to reduce the trade deficit (OIE, 2004: 7). "The only CBU imports allowed were by Thai nationals returning home from their overseas stay of more than 18 months, provided that their cars were less than 2 years old. However, these importers were required to pay high import duties of 150%" (Panichapat and Kanasawat, 1997: 3).

[124] These auto-parts were radiator, exhaust pipe set (inclusive of muffler), battery, leaf spring, tire and inner tube, safety glass and drum brake (OIE, 2004: 7).

Despite these stricter measures, the localization and rationalization policies from early 1970s to mid 1980s were not effective and faced several problems (Panichapat and Kanasawat, 1997: 3):

- Prior to the import ban in 1978, many imported CBU automobiles directly competed with locally assembled cars. In addition the tariff incentives for CKD assembly were not adequate to compete with CBU import (Panichapat and Kanasawat, 1997: 3).
- By 1986 despite the progressive localization policy, only a handful of new component manufacturers were set up in Thailand (Panichapat and Kanasawat, 1997: 4).
- There were too many assembly plants and car models to achieve economies of scale (Panichapat and Kanasawat, 1997: 3). The government attempts at rationalization during the 1970s did not succeed in reducing the sector trade deficit[125] (Thanamai, 1985: 162).
- Assemblers could manipulate the local content formula by inflating the prices of locally purchased components.

5.1.2 The Private Business Firms

5.1.2.1 Assembly Firms

As a result of the government import substitution strategy and the 1960s' Investment Promotion Acts, many automotive assembly plants were established. Nawadhinsukh (1983: 181-182) reported the establishment of the following local and foreign joint venture assemblers:

- Thai Motor Industry Company in 1961[126]
- Thonburi Automobile Assembly Plant Company in 1961
- Karnasutra General Assembly in 1962
- Siam Motors and Nissan Company in 1962
- Toyota (Thailand) Company in 1964 and 1975[127]

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[125] Even though the CBU imports decreased the imported CKD kits however were on the rise; this contributed to prolonged trade deficit problem.

[126] This firm is a joint venture between Anglo-Thai Motor and Ford from England (which later became Thailand Ford Motors). It was the first automotive assembly plant that started operation in 1961. The production volume was 310 passenger cars and 215 trucks; its market share was 12 per cent while the total sales of vehicles (in 1986) were 3,934 units (Terdudomtham, 1997: 3).

- Prince Motors (Thailand) Company in 1965
- Isuzu Motors Company in 1966
- Thai Hino Industry Company 1966
- United Development Industry Company in 1966
- Thai Pradith Assembly Plant Company in 1968

Many of the foreign automotive producers were granted generous incentives from the BOI and decided to enter local assembly. These carmakers utilized a product diversification strategy to capture the existing market demand. But given the small size of the domestic market and negligible exports[128], this increase in the number of assemblers and the number of vehicle models per assembler had led to an inefficient, import-dependent assembly industry. The situation also led to serious foreign exchange deficits in the late 1960s (Abdulsomad, 2003: 46). "In 1966 the deficit amounted to US$233 million and in 1969 it increased to US$554 million" (Thanamai, 1985: 106). Despite the policy restriction, the number of assembly plants increased from twelve to eighteen due to the following reasons (Thanamai, 1985: 145):

- Speculation (prior to the early 1970s) that the government might issue a ban on CBU import, whereas the government did not implement a total ban on imported passenger cars until the beginning of 1978
- The continuing growth of the domestic automobile market

Coping with Increased Localization

In the late 1970s, after the LCR and protective measures were implemented, most carmakers and assemblers coped with the increased localization policy using three strategies: 1) internalization of body sheet stamping and painting processes; 2) encouraging foreign investment by their affiliated auto-parts suppliers and 3) procurement from local auto-part firms (Panichapat and Kanasawat, 1997: 2).

The Western carmakers who could not cope with the 1978 import ban on CBU, and the phased increase in LCR, were forced out of the Thai market (Janssen, 1987: 18;

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[127] In 1975 Toyota invested in the second assembly plant. The major reason for the investment was that most investors expected the Thai government to ban the importation of CBU cars. They speculated correctly as the Thai government did ban the import of CBUs in 1978.

[128] By 1978 the auto-parts exports from Thailand were about 78.4 million Baht (Anonymous, 1989b) and the export of CBUs did not occur until 1988 when Mitsubishi exported its passenger cars to Canada. It was the first time that any assemblers in Thailand had exported vehicles (Terdudomtham, 1997).

1994)[129]. On the other hand, despite the bitter complaints about the phased increase of LCR[130] and the lack of economies of scale, the Japanese carmakers were more resilient and did their best to "blend in and control" the Thai automotive organizations and complied with Thai government policies. To meet with the progressive increase in LCR, the carmakers lured their affiliated auto-part suppliers from overseas to invest in Thailand.

5.1.2.2 Auto-part Firms

In 1961 the auto-parts that were produced domestically included technologically simple items such as rubber parts, batteries and leaf springs (OIE, 2004: 6). In 1970, there were several dozen firms most producing simple replacement parts (Doner, 1991). This number increased to 112 in 1977 (Terdudomtham, 2004: 34). Most of these were Thai-owned as during the first half of 1970s the Japanese auto-part firms were not interested in investing in Thailand due to the country's small and fragmented market size, high production costs, and frequent labor strikes (Thanamai, 1985: 156).

During 1978-1986, a handful of new local auto-part firms were set-up and the expansion of existing firms was significant (Maennel, 2001: 20). In addition, most local auto-part firms started with production of replacement equipment parts (spare parts) as these did not require the same level of quality control as original equipment manufacture (OEM) parts. Examples of such parts included tires, batteries, and paint[131]. After 1975 as the phased increase of LCR came into effect, the domestic auto-parts on all vehicle models grew to include the exhaust system, fuel tank, radiator, seat assembly, glass, carpet, interior soft trim, door-trim panel and wiring harness (Nawadhinsukh, 1983: 207). During the first half of 1980s when the Thai automotive industry was under the "progressive localization scheme", most Japanese carmakers found it necessary to invite their more sophisticated suppliers to invest in Thailand (Kaosa-ard, 1993: 11). Moreover during the latter half of 1980s when the Japanese yen

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[129] For example, "General Motors and Ford, in an attempt to avoid political and economic risks, pulled out of Thailand completely in the late 1970s. Fiat also withdrew from Thailand because it could not meet the higher local content ratio and then sold its factory to Isuzu" (Panichapat and Kanasawat, 1997: 4).

[130] The Japanese assemblers did not like the LCR because of: 1) the high cost penalty for locally produced auto-parts, 2) the lack of discipline of local firms to achieve on-time delivery and 3) the poor quality of locally-made auto-parts (Siroros, 1997: 15).

[131] Nawadhinsukh (1983: 207) pointed out that these auto-parts were procured locally for three reasons: 1) they are bulky or easily damaged parts, 2) they are available locally at competitive prices and 3) they are standardized products and non model-specific

appreciated under the Plaza Accord agreement even more Japanese carmakers and their affiliated suppliers came to Thailand (see "peak #2" in Table 5.1).

Table 5.1 Movements of Japanese Component Manufacturers to Thailand

Year	Prior 1965	66-70	71-75	76-80	81-85	86-90	91-	Total
Production Bases	5	5	11	5	4	32	5	67
Technical Assistance	0	2	3		7	21	7	42
			Peak #1			**Peak #2**		

(Unit: number of incidences)
Source: adapted from Higashi (1995: 19)

5.1.3 The Non-firm Organizations

Prior to the 1970s, the number of carmakers and auto-part firms was limited. There was little development of business associations to link with the government on policy planning and implementation. With the exception of the Association of Thai Industries (ATI) which was established in 1967, the other sectoral organizations were established during the mid-to-late 1970s. These included the Automotive Industry Club, the Auto-Parts Industry Club, Thai Auto-Parts Manufacturers Association, and Thai Automobile Institute Association. To fully understand the functions of each these organizations a bit of ATI history is in order followed by the specific histories of the inception of each of the following **four** automotive organizations.

First is the establishment of ATI. In 1967, a group of Thai industrialists organized an association which they called the "Association of Thai Industries". The ATI was responsible for protection of its members' interests and to act as a linkage between the government and the industries. For instance, during the formation of the 1971 automobile policy the ATI provided **three** suggestions (Thanamai, 1985: 127):

1) policy should be clear-cut and consistent

2) policy should protect the local industries from foreign competition

3) policy should contain restriction measures on the new entrants

These ATI members were not limited to just Thai nationals, foreign carmakers and joint ventures were allowed to be members. In fact, these foreign firms and foreign joint ventures dominated most ATI decisions[132].

In 1976, both the Automotive Industry Club (AIC) and Auto-Parts Industry Club (APIC) were established and both were under the supervision of the Federation of Thai Industries[133]. The AIC consists of assemblers (mostly foreign carmakers) who coordinated with APIC and the government in overseeing the development policies. In addition the AIC also organized training courses and technical seminars for its members (Media Overseas, 2003: 48-49). The AIC comprised mainly the Japanese carmakers (Abdulsomad, 2003: 71). Likewise, the APIC was to coordinate with AIC on issues such as the development of the Thai auto-part industry, assistance in solving problems related to auto-parts industry, research promotion and support and providing policy recommendation to the Thai government (Media Overseas, 2003: 52-53).

Dissatisfied with their limited voice within the AIC and APIC, which were dominated by the foreign and joint venture firms, the Thai Auto-Parts Manufacturers Association (TAPMA) was established in 1978 as an independent entity. About two-thirds of TAPMA's management board were all Thai with no foreigners (Siroros, 1997: 15-16)[134]. TAPMA's objectives were to pursue the interest of locally-owned auto-part firms and to lobby the Thai government for increased protection via a higher level of local content and high import tariff and taxes. TAPMA successfully lobbied the government to increase the LCR from 25 per cent (in 1974) to 50 per cent by the end of 1983 (for passenger cars) and to 45 per cent for commercial vehicles by the end of 1984[135] (Siroros, 1997: 18-19; Terdudomtham, 1997: 5).

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[132] Within the association there were industrial clubs, each associated with a particular industry. Each club has an elected chairperson from its members; an example of a large firm that was (and still is) influential in the automobile club was Toyota, which represented the Automobile Assembly (Industry) Club (Thanamai, 1985: 123).

[133] The name "Federation of Thai Industries" (FTI) was used in 1987. Prior to this, the association was known as the "Association of Thai Industries" (ATI). The FTI operated under the supervision of Ministry of Industry (MOI); similar in its objective as the ATI, FTI was designed to enable close co-operation between public (MOI) and private sectors in Thailand in policymaking and implementation.

[134] The deeper issue here was the fact that most local auto-part firms were unhappy with the way the foreign carmakers impeded the phased increase of LCR. They wanted to be able to exert more influence on the Thai government to further increase the localization of auto-parts production. Through the establishment of TAPMA, these auto-part firms' bargaining power against the foreign carmakers had increased.

[135] In addition from the early to mid-1980s the auto-part firm association were gaining strength in both expanding membership base as well as exerting more policy influence on the Thai government (Doner, 1991: 208).

In addition, the Thai Automotive Industry Association (TAIA) was established in 1981. Its objectives were to coordinate among the other industry organizations; specifically it assisted in coordination among the vehicle assemblers, the auto-part firms and the engine manufacturers. The coordination was not limited to cars as it included motorcycle manufacturers as well. In addition the TAIA represents the Thai automotive industry in the ASEAN Automotive Federation (AAF) and it relays back important regional business information to the Thai automotive businesses and the government[136] (Media Overseas, 2003: 42-43).

5.1.4 Summary and Implications on Firm Strategies and Learning

On the whole, several observations could be drawn related to limited firm learning (and strategy for upgrading) from the analysis of Thai automotive industry from the 1960s to 1980s:

- The growing number of assemblers and vehicle models led to a fragmented market and diseconomies of scale in production. This also led to truncated firm learning since most firms had to cope with shifts in production model or small-batch production, lacking continuity in learning of production of auto-parts. Policies implemented were aimed at alleviating the balance of payment problem. *Little* was the government worried about the strategy for firm upgrading. The government was not focused on using rationalization plan and LCR as tools for enhancing technical knowledge transfer from the multinational carmakers to the local Thai firms (Kaosa-ard, 1993: 15).
- Despite the failure of government policies to facilitate the knowledge transfer, the analysis indicated that some upgrading activities did occur. The localization requirements provided by the government led to moving the industry forward, from merely assembly of imported CKD kits to the semi-manufactured of auto-parts. However, this did not occur until mid-1970s; since during the 1960-1973 the Thai automotive industry was mostly assembly-oriented and not manufacturing (Thanamai, 1985: 104). After the enactment of policy in early 1970s and the implementation of LCR from 1975, the government provided the local auto-part firms with the opportunities to learn via the manufacturing of

[136] This role of "information broker" and market intelligence assists the stakeholders in improving awareness of market trends and in policy formulation.

simple auto-parts such as batteries, exhaust system, wheels, and seats and so on. As it was easier for firms to start their learning with technologically simple auto-parts prior to progressing to more complex ones; this localization scheme appeared to provide a good starting point for the systemic and sequential accumulation of firm capabilities.

- By the end of 1980s, the challenge remained for Thai auto-parts to meet the requirements of foreign assemblers and carmakers on three criteria: high quality, low manufacturing cost, and on-time delivery. But most local auto-part firms were accustomed to the production of simple replacement equipment parts for after-market sales, and they lacked the necessary capabilities to meet these requirements. This is because the focus of government policies (for e.g. LCR) was not on firm upgrading, but on solving the trade deficits problem per se. Consequently, there were no systematic programs to assist the local auto-part firms in becoming more competitive (Kaosa-ard, 1993: 15).
- The challenge for the government was to create an environment whereby not only more localization could occur via FDI, but also the quality of the technology being transferred would increase. By the mid 1980s, the government was working on the localization of engine production. It was expected that this project will lead to building the Thai automotive industry as a full-manufacturing industry and not merely assembly plants of imported CKD auto-parts.

5.2 From Protection to Partial Liberalization Phase (late 1980s to pre-1997 crisis)

5.2.1 The Institutions

From mid- to late-1980s, it was realized that the Thai automotive industry had been over-protected (Poapongsakorn, 2004: 161), and that the import substitution industrialization had failed to substantially transfer technology (knowledge) to the ancillary firms. Specifically the policies had failed to promote learning and the enhancement of firms' competitiveness[137]. The Thai government issued more liberalization policies that encouraged increased FDI, increased openness and a

[137] "The auto industry is one of Thailand's largest and *least* competitive, and suffers from having too many players" [italics added] (Handley, 1991: 34).

commitment to regional ASEAN free trade area[138] (AFTA), and promoting manufacturing export (Janssen, 1987: 18). These early liberalization policies, in the context of a stronger Japanese yen, encouraged more FDI into Thailand (Ibid.). As the automotive industry underwent liberalization, many local firms and organizations lobbied harder for continual increase in LCR and prolonged industrial protection.

5.2.1.1 Incipient Lowering of Protection and Increased Competition

In 1990, the MOI removed the limitation on the maximum number of allowed series for passenger car assembling[139] (OIE, 2004: 8). Other liberalization policies of the Thai automotive industry occurred during the Anand government in July 1991[140]. For instance, for vehicles over 2,300 c.c. duties were reduced from 300 to 112 per cent, and for smaller vehicles the reduction was from 180 to 60 percent and CKD parts duties were reduced from 112 to 20 per cent (Handley, 1991: 34). In addition, the import ban on new cars with engines under 2,300 c.c. was lifted (Anonymous, 1991b).

The liberal policy impact were twofold: 1) narrowing the price gap between locally assembled vehicles and imported CBUs; "the cuts reduced the passenger car retail prices by 12 to 33 per cent, although the prices are still very high" (Anonymous, 1994: 20) and 2) increased competition of imported CBUs with domestically assembled vehicles. The Thai government aimed to make local carmakers work harder under a more competitive environment (Handley, 1991: 34). The lowering of these duties were done almost overnight and the highly-protected Thai automotive industry was abruptly exposed to external competitive pressure (Kaosa-ard, 1993: 15). Despite the liberalization, the policy of high LCR continued (see Table 5.2).

5.2.1.2 The Push to Maintain and Increase Localization

The LCR continued to increase throughout this period. By 1991, the local content for passenger car reached 50 per cent, and in 1994 the minimum LCR was 54

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[138] "The ASEAN Free Trade Area was established in January 1992 to eliminate tariff barriers among the Southeast Asian countries with a view to integrating the ASEAN economies into a single production base and creating a regional market of 500 million people. The Agreement on the Common Effective Preferential Tariff (CEPT) Scheme for the ASEAN Free Trade Area requires that tariff rates levied on a wide range of products traded within the region be reduced to no more than five percent. Quantitative restrictions and other non-tariff barriers are to be eliminated. Although originally scheduled to be realized by 2008, the target of a free trade area in ASEAN was continuously moved forward" (ASEAN Secretariat, 2002: 1).

[139] The maximum number was set at 42 series for the whole industry and the restriction was imposed in 1984.

[140] This government was dominated mainly by the liberal technocrats who felt that most customers had to carry the "unfair" burden of paying excess prices for domestically assembled vehicles and decided to slash import duties on motor vehicles.

per cent for passenger cars, 81 per cent for pick-up trucks, and 70 per cent for pick-up truck engines. The distinction was made between petrol- and diesel-engine vehicles. The LCR for the former was increased to 60 per cent in 1994 and for the latter it was set at 72 per cent (Terdudomtham, 2004: 39) (see Table 5.2).

Table 5.2 Local Content Requirement (LCR) in 1994

Vehicle Type	LCR (percentage ranges)
Passenger Cars	54 per cent and compulsory parts from a list
Pick-up Trucks • Diesel engine • Gasoline engine	72 per cent and 111 compulsory parts 60 per cent and 103 compulsory parts
Trucks and Buses • Cab or chassis • Chassis and windshield • Chassis and engine	50 per cent 45 per cent 40 per cent

Sources: adapted from Ministry of Industry (MOI) and Abdulsomad (2003: 109)

To further increase the local production of more complex auto-parts, the government revived the diesel engine project[141] and issued mandatory policies for domestic engine production: engines for passenger cars in 1987 and diesel engines for pick-up trucks issued in 1989 (OIE, 2004: 8; White, 1988).

More attention was paid to the pick-up truck production due to the far less fragmented nature of production and the higher likelihood of achieving economies of scale. The "diesel engine" policy which re-emerged in 1985 had a specific focus on engines for one-ton pick-up trucks (Panichapat and Kanasawat, 1997: 4). This policy impacted the carmakers' strategy; since the Thai market lacked the economies of scale for any one carmaker to produce a complete facility to manufacture all the engine parts, the carmakers collaborated in a joint venture to manufacture the engines (Panichapat and Kanasawat, 1997: 13). Moreover to further increase the production scale and

[141] This project was started back in 1978 by the Board of Investment (BOI), who allocated 25 million Baht to the three Japanese firms who agreed to start the engine production by 1981 with a 20 per cent local content for the first four years. However in 1978-79, the demand for diesel engines was minimal (i.e. lacking minimum efficient scales for production), and these firms could not start the production. The project re-emerged in 1985 due to three reasons: 1) diesel engine was suitable for the Thai economy where the most popular vehicle has been the pick-up trucks , 2) there was a trend that in the future that the government may ban the import of diesel engine, hence the production of domestic diesel engine had a bright future, and 3) there was an improvement in the relationship between the public and private sector to pressure the Japanese firm to set up more joint ventures and to engage in active technology transfer to Thai firms (Siroros, 1997: 29).

achieve minimum efficient economy of scale, a portion of the manufactured engines were designated for exports[142] (Siroros, 1997: 29).

5.2.1.3 Research and Development Promotion

The Thai government had been promoting research and development (R&D) activities since the 1980s and organizations that promoted R&D included:

- The Ministry of Science, Technology and Environment (MOSTE), who since 1987 has provided the Research and Technology Development Revolving Fund (soft loans)
- The National Science and Technology Development Agency (NSTDA) has provided soft loans and grants since 1988. But these were limited to only three areas: 1) bioscience and biotechnology, 2) materials technology and 3) applied electronics and computers technology.
- The Board of Investment (BOI) has granted R&D promotional privileges since 1989.

Most of these incentives were "supply push" rather than "demand pull" technology development[143] (Ghani et al., 2002: 55). Furthermore due to the limited resources, few of the R&D promotions were in the automobile industry and this led to a small impact on the rate of firm-level learning activities and its capabilities accumulation (Terdudomtham, 2004: 41). Hence it could be argued that during the 1980s the overall impact of R&D policies were minimal.

5.2.1.4 Export Promotion and Further Liberalization

In August 1994, the BOI issued reduced import taxes for CKD auto-parts from 20 per cent to just 2 per cent. This new tax rate was applied only to auto-parts that were used in production of vehicles for export. The Thai government expected that through this and other investment incentives Thailand will become an export base of vehicles and auto-parts (Siroros, 1997: 64). In addition, in 1995 the Office of Industrial Economics (OIE) had drafted a proposal for developing the export of vehicles and auto-parts. Some of the suggested strategic measures included: a free trade zone, streamlined application process and paperwork processing for import and export,

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[142] At the time, the Thai market could handle about 70,000 engines per year while the minimum efficient production output is 140,000 per year; hence half of the engines produced will be exported (Siroros, 1997: 30-32).

[143] In addition, most R&D promotions had been spread widely over many fields and industries, i.e. they were non-sector specific.

removal of the restriction on the percentage of foreign equity in assembly plants, tax structure reform, and increased product standardization (Siroros, 1997: 70). Additional measure from the BOI included the investment promotion for assemblers (the last such promotion was provided in 1970) (Ibid.).

5.2.2 The Private Business Firms

Since the Plaza Accord agreement of 1985, most Japanese firms were enthusiastically seeking to invest overseas, and one of the main FDI destination within ASEAN was Thailand (White, 1988). From 1987 to 1996, the Thai automotive industry had grown rapidly with sales of one-ton pick-up trucks leading the way. FDI was not limited to Japanese carmakers; the US and European carmakers were investing heavily as well. FDI by carmakers also led to FDI by their affiliated first-tier suppliers. Hence, FDI into the sector had increased dramatically during this period.

5.2.2.1 Assembly Firms

In 1989, Isuzu, Mitsubishi, Nissan and Toyota collaborated together to make diesel engines for one-ton pick-up trucks (Janssen, 1987; Panichapat and Kanasawat, 1997: 13; White, 1988). The collaborative efforts enabled these carmakers to comply with the Thai government compulsory policy on the locally produced diesel engines. These engines were used in domestic pick-up truck assembly and for export to regional markets. The Vice President of a carmaker expressed the positive aspect of this project:

> "Until this [diesel] engine project came along, no one thought about exporting. Cost and quality control could be targeted solely at the Thai market. ... But now, with the yen appreciation, everyone is talking about exporting, and quality and cost must be aligned to the world market" (White, 1988).

By 1993, both Toyota and Isuzu had exported about 200 million Baht in diesel engines[144] (Janssen, 1994: 7). During this period, other carmakers who had exported were:

- MMC Sittipol (a local joint venture between Mitsubishi Motor Corp (Japan) and a Thai firm) started the export of Lancer passenger cars to Canada in 1988

[144] See also Siroros (1997: 20, 29-32) for more details on the development of Thailand's diesel engine project

(Kaosa-ard, 1993: 11; White, 1988). This was part of the firm's six-year 100,000 car contract with Chrysler Canada Ltd (Handley, 1988: 74).

- Siam Motors Co. also exported 40 locally assembled Sunny sedans to Brunei (Handley, 1988: 74; White, 1988). In addition the firm planned for a 2 billion Baht (the first-phase of a 6 billion Baht) investment to manufacture cars for export (Cua, 1991).

Throughout the latter half of 1980s and early 1990s, many Japanese carmakers were eyeing Thailand as their strategic regional production base, and encouraging their affiliate supplier firms (*keiretsu*) to come and invest in Thailand. Indeed this was what happened in the Thai automotive industry during the time.

By 1994, Thailand was the fastest growing automotive market in the world and it had the biggest market for pick-up trucks outside the US (Johnson, 1994). The US and European carmakers wanted to make their presence in Thailand more solid[145] (more specifically, a re-entry strategy for US carmakers after pulling out in late 1970s due to Thai government onerous local content regulation).

For instance, Chrysler International Corp formed a joint venture with Swedish Motors Corp in 1994 and assigned a local firm, Thai-Swedish Assembly Plant, to produce Jeep Cherokee in September of 1995[146]. And by November 1995, Ford and Mazda had formed a joint venture (AutoAlliance Thailand[147]) and invested about US$470 million in a plant to produce one-ton pick-up trucks; the targeted annual production capacity was 135,000 units[148] (Pruzin, 1996). Finally, the last of the US "Big Three" made its decision in 1996 (Naughton et al., 1996). General Motors (GM) decided to invest US$750 million for a production plant in Thailand with an annual production capacity of 80,000-100,000 units. The Board of Investment (BOI) had granted GM with an exemption on corporate income tax for export for 8 years, a US$

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[145] The growth rate definitely also attracted the attention from BMW[145] and the US "Big Three" (Peck, 1995).

[146] The joint venture was named "Thai Chrysler Automotive Ltd." and it did not have any local production facility. It was important to note that prior to this time, there was no vehicle of American design being manufactured in Thailand's local major assembly plants. Hence, Jeep Cherokees assembled at the Thai-Swedish Assembly plant signified the first re-entry of US cars in Thailand since their decisions to pull out of the Thai market since the late 1970s.

[147] For more background information on the Ford and Mazda alliance, please see Heller and Orihashi (2003: 125-126).

[148] The completed production plant began to produce pick-up models for Thai domestic market in mid-1998; and only about six months later, it began to export Ford and Mazda pick-up trucks to countries all over the world (except USA) (Heller and Orihashi, 2003: 130).

15 million support for construction of the General Motors University[149], and an exemption from the LCR in 1998[150] (Terdudomtham, 1997: 8).

5.2.2.2 Auto-part Firms

The strengthening yen during the latter half of the 1980s did not only lead to more FDI in assembly plants, but also an increase in the establishment of auto-part firms as well. By 1987, most foreign auto-part manufacturers (following the request from their associated carmakers) had invested in Thailand. The BOI estimated that by 1994 almost half of the auto-part firms in Japan had commercial or technical cooperation in Thailand (Anonymous, 1994). Specific examples of large, multinational auto-part firms (some are joint ventures) that had invested in Thailand included:

- Toyota affiliates such as Toyota Autobody (who produced exhaust pipes and stamp parts), Nippondenso (electrical parts), Siam Toyota Manufacturing (engines), and Thai Engineering Products (disc and drum brakes) (Anonymous, 1994)
- Siam Motors (Nissan) affiliates such as Siam NGK Spark Plug, Siam Parts and Engineering (trims and press parts), Siam Riken Industry (piston rings and cylinders), Siam Tsuchiya Manufacturing (air, oil and fuel filters), Siam GS Battery and Siam Kiki (air conditioners) (Ibid.)
- Twelve Mitsubishi affiliates had invested in Thailand to produce spare parts and CKD components for the Mitsubishi *L200* one-ton pick-up trucks[151] (Anonymous, 1990).

Most often these carmakers' affiliated first-tier suppliers were located around the assembly plant, in close geographical proximity to ensure effective use of just-in-time management[152].

For the local auto-part firms, most engaged in the production of simple stand-alone parts such as wiring harness, tires, upholstery and springs; these parts sourced

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[149] After the 1997 financial crisis, the plan to construct such a university did not materialized and the impact of the crisis caused GM to re-adjust its production plan and production model accordingly.
[150] The promise to GM to abandon the LCR in 1998 was two years earlier than what was mandated by the World Trade Organization (WTO). The idea of lifting LCR two years ahead of schedule was opposed by Thai Auto-Parts Manufacturers Association (TAPMA) and other organizations. These organizations claimed that the impact of 1997 financial crisis on auto-part firms was severed enough, and that the local firms should not have to deal with an additional challenge of LCR abandonment only one year after the crisis. The Thai government finally decided to stick with the WTO's original date, which is to abandon the LCR at the beginning of 2000.
[151] Most of these trucks were exported (Barnes, 1999).
[152] This is called "satellite policy", meaning that the Japanese carmakers encourage their own first-tier suppliers to relocate to Thailand and cluster around the assembly plants (Abbott, 2003: 141).

cheap, local raw materials. Consequently, by 1991 these auto-part firms have gained region-wide (i.e. ASEAN) competitiveness (Handley, 1991: 34). Part of the explanation for increased firm competitiveness was the establishment of the US carmakers. These carmakers required the Thai auto-part firms to obtain QS9000 quality system certification prior to becoming their suppliers (Poapongsakorn and Wangdee, 2000: 15). On the other hand, the auto-part firms that were most worrying and suffered from lack of competitiveness were the ones in passenger cars sector; these firms would not survive without continued government protection (Handley, 1991).

5.2.3 The Non-firm Organizations

The existing organizations, namely AIC, APIC, TAPMA and TAIA, were the same ones that were established during the 1970s and early 1980s. No new automotive-related organizations were established during the 1980s. By early 1991, the government had introduced several measures to liberalize the automotive market, and some organizations (such as TAPMA) opposed and continued to lobby continuously for maintained protection via sustained LCR (Anonymous, 1991a). In addition, TAPMA also criticized the government decision to cut import tariff and taxes, stating that the imports of CBU vehicles had caused slow sales in the automotive industry which in turn had affected the local auto-part firms. Another problem that local auto-part firms faced was the high import taxes on raw materials; TAPMA had been requesting the Thai government since the 1980s to lower such taxes but had achieved no tangible positive response (Ibid.). Similarly, other organizations such as AIC also criticized the government for the sudden liberalization via lifting of the import ban on CBU passenger cars, allowing the imported cars to compete with the domestically assembled vehicles. The criticism pointed out that this competition will in turn reduce the domestic production volume and could lead to production diseconomies of scale (Siroros, 1997: 43). On the whole, the Japanese carmakers disliked the government's liberalization policy and they fought for continued protection (Ibid.: 49-50).

5.2.4 Summary and Implications on Firm Learning

This analysis of the Thai automotive industry from late 1980s to pre-1997 crisis, when compared with the earlier periods of 1960s to 1980s, identifies the increase in both the government localization policy effort and the private firms' learning efforts as important processes.

First, the progressive localization scheme enacted by the government (especially the local production of diesel engines) led carmakers' to a level of cooperation never seen before in any car industry[153]. Arguably, this cooperation also led to the transfer of knowledge and sharing of know-how regarding engine parts production among the partnered firms. This knowledge transfer and sharing also led to effective joint learning activities, shared problem-solving sessions, and thus higher level of firm capabilities. Second, the government's export promotion scheme assisted the carmakers' need to satisfy the minimum production economies of scale. In the process the carmakers had to re-adjust their product standards from the domestic to the export market. To ensure product competitiveness for exports, product quality and low cost must satisfy the overseas buyers. Thus it is argued that both the adjustment from domestic to export market and increased firm cooperation led to the changes in firm learning activities and problem-solving processes, which in turn accelerated the overall accumulation of firm capabilities.

The only challenge (or threat) that remained during this period was the duration of protection for the local auto-part firms. Since 1975, they had been under heavy protection (e.g. progressive LCR). The pressure of competition from imported CKD auto-parts was negligible, and with high LCR, these local auto-part firms were guaranteed the domestic market. The government was worried that these local firms would be less competitive in the long run. Moreover, Thailand, as a member of World Trade Organization (WTO), must comply with Trade Related and Investment Measures (TRIMs) and *completely* abandon its LCR by 2000. Therefore, the issues of firm upgrading (and learning) strategy and competitiveness received greater attention in the 1990s.

5.3 From Post-Crisis to Full Liberalization: Current Phase

5.3.1 The Institutions

After the financial crisis, the government had paid greater attention to the issues of technology transfer and assistance to local auto-part firms (Terdudomtham, 2004: 48). This was evident during the Industrial Restructuring Programs leading to the

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[153] "The deal [cooperation among Toyota, Nissan, Mitsubishi and Isuzu] marks, for the *first time* in the world history, the cooperation of competing Japanese automakers in engine production" [italics added] (Panichapat and Kanasawat, 1997: 13).

establishment of the Thailand Automotive Institute (TAI) in 1998. Since the Thaksin government (elected in 2001), the Thai automotive industry was targeted as one of the five key strategic industries (The Nation, 2002). The push from the government continued with liberalization policy implementation in order to establish the country as a production base of one-ton pick-up trucks and a regional export base. This was evident in TAI's submission of the country's *first* five-year Thai automotive master plan (2002-2006) to the Office of Industrial Economics (OIE).

5.3.1.1 The LCR Abandonment and the Revised Tariff Structure

After protecting the Thai automotive industry for more than 25 years and surviving the bid by General Motors to be removed by 1998, the LCR were abandoned at the beginning of year 2000[154]. To ensure minimal disruption to the local auto-part firms, TAPMA lobbied the Thai government to raise the average CKD tax to 33 per cent[155] from 20 per cent in order to extend some form of protection for Thai firms. OIE (2004: 11) viewed the simultaneous abandonment of LCR and the revision in tariff structure with new CKD definition[156] as a package and considered this to be the "country's giant step toward the liberalization scheme."

As is usually the case, the policy sounded promising, but its implementation was problematic, especially the revision of automotive-tariff structure. This was succinctly expressed by TAI (2004b: 8-9): "the tax collection system for the Thai automotive industry is considered to be the *most* complicated in the world" [italics added]. Its revision was complex and progress was slow. The problem also was related to the classification scheme used for each type of vehicle. This problem is not new; as it was commented in 1991:

> "... Thailand was criticized for maintaining an archaic and often self-contradictory tax system that included some of the highest duty levels in ASEAN" (Handley, 1991: 35).

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[154] Through much debate, political infighting, and lobbying among the private organizations (for e.g. TAPMA and AIC), the Ministry of Industry had decided on how to ameliorate the effect of the LCR abandonment.

[155] Note that this is an average tax rate, implying that some imported auto-parts could pay taxes higher or lower than this value (personal interview with Senior Vice President, Carmaker H, December 23, 2004).

[156] The Office of Industrial Economics utilizes this new CKD definition to specify the characteristics of a CKD auto-parts set to determine if it is allowed to receive the special tariff rate.

5.3.2 The Private Business Firms

5.3.2.1 Assembly Firms

After the liberalization policies in the early 1990s, Thailand was the host of many carmakers who used the country as a production base for one-ton pick-up trucks. Examples of carmakers who had established pick-up production base include: Mitsubishi, AutoAlliance[157], Isuzu, Toyota and Nissan (2004a). After investing heavily, Mitsubishi has made Thailand the sole global source for its *L200/Strada* pick-up trucks (Media Overseas, 2003: 117). These trucks were sold domestically and exported around the world (personal interview with the Executive Vice President, November 30, 2004). In addition to trucks, Mitsubishi also exported passenger cars.

> "Mitsubishi was the first company to begin to export its Lancer model mainly to the [overseas] market, with the result that Thailand became Mitsubishi's major export base, as ninety percent of production were exported to 138 countries in 1999" (Lehmann, 2004: 120).

Similarly, Toyota had relocated its one-ton pick-up truck production from Japan and initiated a new large-scale production project (personal interview with the Vice President, October 1, 2004).

> "Toyota has moved its *entire* one-tonne pick-up truck production from Japan to Thailand and turned it into its world procurement centre by end-2002 under a US$ 815 million Innovative and International Multipurpose Vehicle (IMV) project" [italics added] (Soon, 2003: 14).

In addition, Toyota also requested its first-tier global supplier (Denso) to invest in massive plant expansion in 2002[158].

In addition to pick-ups, other Japanese carmakers used Thailand as an ideal place to build the "Asian cars"[159] with plans to export them. Honda had built the *City*[160], while Toyota had responded with the *Soluna*[161]. The *Soluna* received much

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[157] AutoAlliance is a joint venture between Ford and Mazda.

[158] Denso Corporation (Japan) planned to enlarge the Thai-based operation by more than 9 billion Baht (approximately US$ 225), of which 4.2 billion Baht was allocated for the new electronic common-rail (the latest diesel engine technology) plant, and the remainder for the expansion of the existing two factories (Wiriyapong, 2002).

[159] "Asian cars" are defined as low-cost, small engine (1,300 to 1,500 c.c. capacity) passenger cars. It was the Japanese carmakers' strategy to develop suitable products for the Asian markets. In addition, the design of these Asian cars utilized (as much as possible) the locally-made auto-parts. However, for the Toyota *Soluna*, the upstream research and development activities are still centralized in Japan (Lehmann, 2004: 135).

[160] "In April 1996, Honda Motor Co., Ltd., launched the *City* sedans as its strategic Asian car. The *City* is a 1,300 c.c., four-door sedan. At 398,000 Baht, it was 20 to 30 per cent cheaper than the Honda *Civic*" (Panichapat and Kanasawat, 1997: 23).

[161] "Toyota Motor (Thailand) Co., Ltd., also launched low-end line of *Soluna* passenger models in early

attention from car buyers during its launch; at some instances, the customers had to wait for six months for the cars to be available for delivery (Anonymous, 1997c). To achieve the low manufacturing unit costs on the *Soluna* and the *City*, both firms must cut costs and there were two ways: through efficient sourcing of local auto-parts and through continuous productivity improvement. Measures used to increase productivity comprised changing production plant layout, automation of some operations, and integration of production lines that had become complex (Panichapat and Kanasawat, 1997: 23).

The FDI was not limited to the Japanese carmakers. The US and the European carmakers had decided to expand their production capacities in Thailand (see Figure 5.3). All carmakers were expecting the Thai automotive market to continue its growth at rapid rates until the end of the millennium; unfortunately this was not the case after the 1997 financial crisis. The carmakers and their affiliated auto-part firms, who had invested heavily shortly before the crisis, were severely affected. They had to quickly re-adjust their strategies (from domestic market to export-oriented) in order to survive.

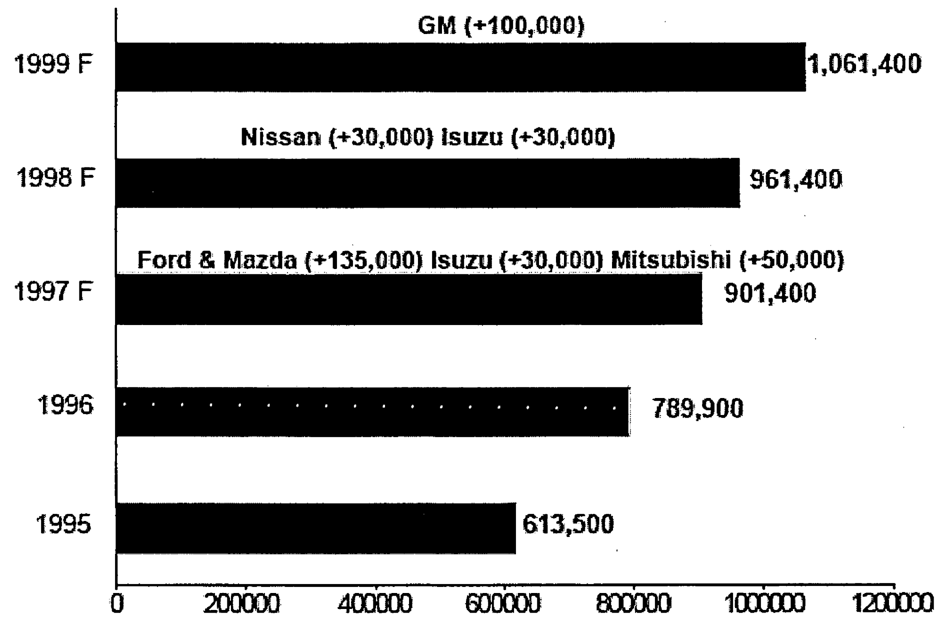
Impact of the 1997 Crisis on Assemblers

On the whole there were **three** main impacts on the automotive industry at the assembly (carmakers) level (Abdulsomad, 2003: 159-168). **First** is the change in ownership structure.

> "[The] recent financial crisis has transformed local [Thai-owned] assemblers into minority partners. ... [The former] local assembly partners have become local dealers instead ..." (Abdulsomad, 2003: 167).

1997. *Soluna* is the first car mass-produced in Thailand to cost less than 350,000 baht. The four 1,500 c.c. *Soluna* models on offer will range from 327,000 to 417,000 Baht. Toyota strafes to reduce costs by raising Soluna's local content ratio to 70% or higher ..." (Panichapat and Kanasawat, 1997: 23).

Figure 5.3 Planned Capacity Expansion Prior to 1997



Sources: Assemblers' Data, cited from Poapongsakorn and Wangdee (2000: 5)
Notes: 1) GM = General Motors
2) F = forecasted values
3) the number in the parentheses (+...) represented each carmaker planned capacity expansion

Since many Thai-owned assemblers had large amount of US dollar denominated debt, the 1997 financial crisis (which caused a severe Baht devaluation) had weakened the local ownership in the automotive industry. Hence the ownership of the foreign partners had increased through injecting more capital into both the assembly and auto-parts industry. Moreover in November 1997, the BOI had removed the restrictions on foreign equity shareholding and many foreign investors took advantage of this situation (Maennel, 2001: 23). All these factors contributed to the ownership structural change.

Second is the massive shrinkage of domestic demand for automobiles (Chitravas, 2005a) (see Figure 5.4). The automotive industry was hardest hit by the crisis (Dollar and Hallward-Driemeier, 2000) and this shrinkage in demand forced the carmakers to shift the market strategy to export (Barnes, 1999). General Motors, which had earlier planned for an annual volume of 80,000 to 100,000 units, re-adjusted its plan and decided to scale back to 50,000 units and waited to see which model would be appropriate for production (Bardacke, 1998). After postponing its former date of commencement of operations and change of business plans[162], in 1999 GM had decided to produce compact minivans (Chevrolet Zafira[163]) for both domestic market and worldwide export (Anonymous, 1999c). Other carmakers chose to either reduce or temporarily stop their production operations.

Figure 5.4 Production Adjustment of the Assemblers During the 1997 Crisis

Assemblers	Adjustments
1. Bangchan General Assembly	Production stoppage in August 1997; laid off workers
2. Honda Cars Manuf. (Thailand)	Reduced production and working hours
3. Isuzu Motor (Thailand)	Production stoppage in November 1997
4. MMC Sittipol	Reduced production and working hours, increased exports
5. Siam Motors and Nissan	Reduced production and working hours
6. Siam Nissan Automobile	Production stoppage in August 1997; plans to export
7. Siam VMC Yam Yon	Production stoppage in August 1997; laid off workers
8. Sukosol & Mazda Motor Ind.	Production stoppage in 1998.
9. Thai Hino Industry	Production stoppage in August 1997; lowered wages
10. Thai Swedish Assembly	Production stoppage in August 1997; laid of workers
11. Thonburi Automotive Assembly	Reduced production and cut down working hours
12. Toyota Motor Thailand	Production stoppage in November 1997; increased exports in 1998.
13. YMC Assembly	Reduced production and working hours; laid off workers

Sources: IFCT (1997), cited from Poapongsakorn and Wangdee (2000: 7)

The **third** impact from the crisis was the rise in exports. The Thai automotive industry became more export-oriented. Exports increased sharply from 16,419 cars in 1996 to 125,702 cars in 1999. Of these exports, Mitsubishi Motors has been the largest exporter of CBU cars, and is exporting pick-up trucks to Europe and passenger cars to New Zealand (Abdulsomad, 2003: 167). Toyota Motors began to export pick-up trucks to Australia and New Zealand in 1998, while Honda also exported the Honda *City* (the Asian car) to Singapore and Brunei in 1997 and Honda *Accord* sedan to Australia and New Zealand in 1998 (Ibid.).

5.3.2.2 Auto-part Firms

Recall that before the 1997 crisis, Thailand was one of the fastest growing economies in the world; and most of the carmakers were on the rampant capacity expansion (see Figure 5.3). Likewise, these carmakers requested their affiliated auto-part suppliers to pre-expand their production capacities (personal interview with the Managing Director of a major auto-part firm, November 5, 2004). In sum, at that time the future of the automotive industry was highly positive and no one expected any

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[162] The GM study group was formed soon after the 1997 crisis and made decisions regarding the question "Should GM pull out of Thailand?" In February 1998, the group "decided to stick with the project and absorb the short-term losses for the long-term strategic presence." Moreover due to harsh competition from the Japanese carmakers, GM decided not to produce Opel *Astra* sedan as had originally planned. It chose to setup a new niche with the Zafira (a minivan) on a more modest scale (Boley, 2000).

[163] The first Zafira was produced in May 2000 (Boley, 2000).

external shocks. The 1997 crisis came as an unexpected event, surprising all these firms.

During this post-1997 crisis period, the auto-part firms were mainly divided into **three** groups: 1) those that survived the crisis "intact", 2) those that survived the crisis but underwent change in ownership structure and 3) those that did not survived the crisis. The first category was mostly the multinational auto-part firms who received the overseas financial assistance from their parent carmakers. The second consisted of mostly Thai-foreign joint venture firms who had, prior to the crisis, invested in a major plant expansion via foreign debt financing, usually borrowed US dollars. The last group was small local auto-part firms who could not cope with the increased denominated US dollar debt. Once recovered from the crisis, the auto-part firms resumed their course in making Thailand the regional production base for export.

Impact of the 1997 Crisis on Auto-part Firms

For local firms, the economic crisis impacted in **two** ways (Abdulsomad, 2003: 169; Chitravas, 2005a). **First**, the drastic decrease in domestic vehicles sales translated into lower domestic market auto-part sales. Second, the Baht devaluation led to higher imported raw materials cost and higher Baht amount to repay any US dollar denominated debt. The overall damage was quite severe.

> "[Several years after the 1997 crisis,] about 600 local auto parts firms have been closed or taken over by foreign firms since the crisis struck in 1997" (Abdulsomad, 2003: 169).

Those Thai-foreign joint ventures that survived the crisis could not increase their capital in the new recapitalization; they lost their majority shares to foreign owners[164].

Some auto-part firms attempted to shift their strategies from domestic to export market. They formed "Auto parts Exporter Club"[165], whose aim was to cooperate among club members to increase exports. One of the pressing issues for the majority of Thai suppliers was their inexperience with exporting activities. In addition, these suppliers also lacked sufficient capabilities to produce high quality products at an

[164] For example, "Siam Cement Group [one of Thailand's largest conglomerate group] sold its equity in Thai Engineering Product Co. Ltd. and Siam AT Industry Co. Ltd. to Aisin Takaoka (a Toyota group) in 1999" (Ibid.).

[165] The club contained about 20 local suppliers. Export strategy for these suppliers was not easy since local auto-part firms were faced with stringent requirements on product quality and also on the selling price.

internationally competitive price (Chitravas, 2005a). However, despite these drawbacks, some auto-part suppliers have managed to learn to successfully export[166].

5.3.3 The Current Industry Structure and Performance

The Thai automotive industry has a tier structure, with the vehicle assemblers at the top and the auto-part suppliers at the lower tiers (see Figure 5.5). There are 15 assemblers (and carmakers) and 6 motorcycle manufacturers[167]. For the 4-wheel vehicles, the total annual production capacity in 2004 was well over 1 million vehicles (see Table 5.3). Among all the carmakers, Toyota has the highest production capacity, followed by Nissan and Isuzu.

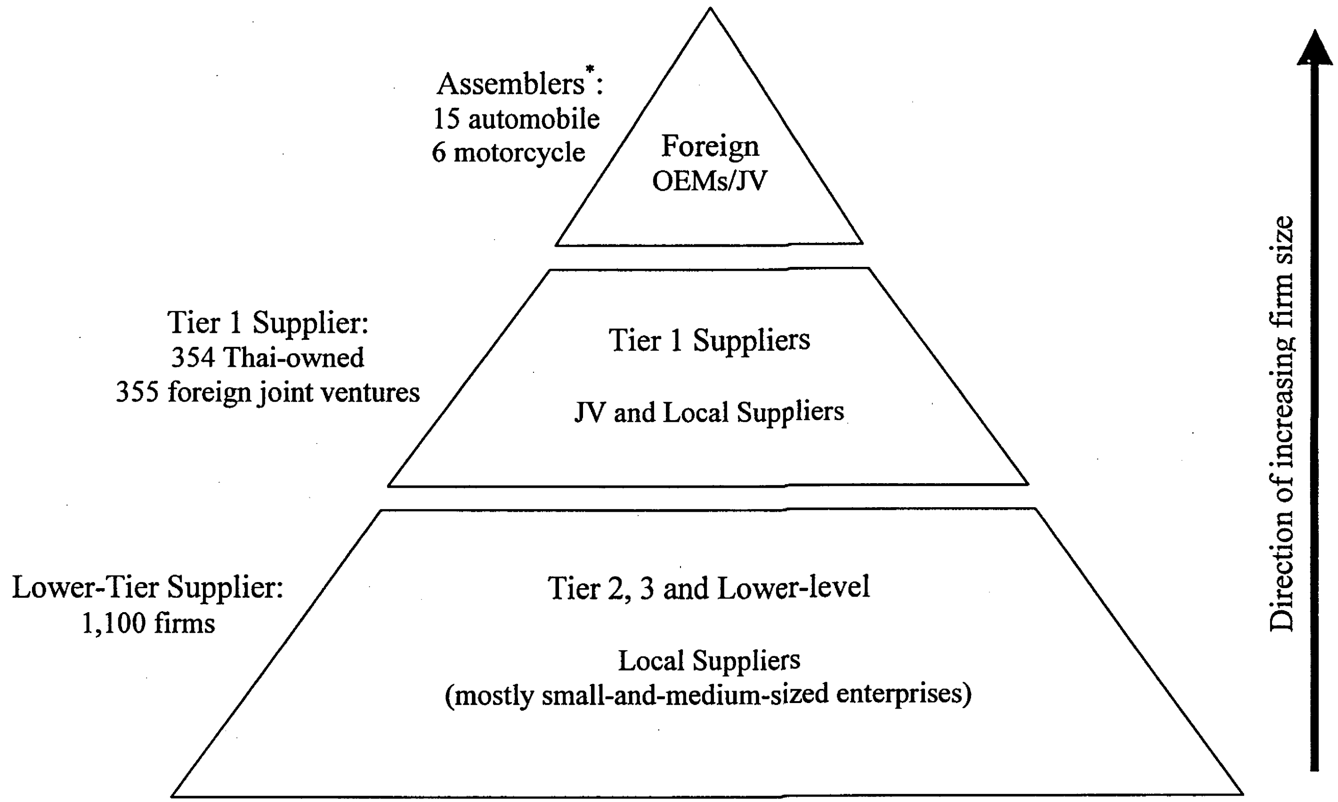
Table 5.3 Production Capacity for Vehicles in 2004

Rank	Carmaker/Assembly Plants	Units per Year
1	Toyota Motor (Thailand) Co. Ltd.	240,000
2	Siam Nissan Automobile Co. Ltd.	143,900
3	Isuzu Motors (Thailand) Co. Ltd.	140,000
4	Auto Alliance (Thailand) Co. Ltd.	135,000
5	MMC Sittipol Co. Ltd.[168]	126,000
6	Honda Assembly Co. Ltd.	120,000
7	General Motors (Thailand) Co. Ltd.	110,000
8	Bangchan General Assembly Co. Ltd.	20,000
9	Thonburi Automotive Assembly Co. Ltd.	19,500
10	Siam Motors and Nissan Co. Ltd.	12,267
11	Y.M.C. Assembly Co. Ltd.	12,000
12	BMW Manufacturing (Thailand) Co. Ltd.	10,000
13	Thai-Swedish Assembly Co. Ltd.	6,000
14	Hino Motors (Thailand) Co. Ltd.	2,969[169]
15	Siam V.M.C. Co. Ltd.[170]	N/A
	Total Units	**1,097,636**

Sources: adapted from OIE (2004: Appendix Table A1) and Thai Automotive Industry Association

[166] For example of these firms, see Sections 7.3.1, 7.3.4, and 7.3.9.
[167] This information was based on OIE (2004).
[168] As of 2006, the company changed its name to Mitsubishi Motors Thailand (MMTh).
[169] Estimated production volume from January to September 2002 (2003: 132-136).
[170] This was the first Thai assembly firm dedicated to producing one-ton pick-up trucks. It has temporarily stop production operations shortly after the 1997 financial crisis.

Figure 5.5 The Structure of the Thai Automotive Industry



Sources: Adapted from Thai Auto-Parts Manufacturers Association (TAPMA), Kitaphanich (2002: 4), and OIE (2004)
Note: * For more details, please refer to Table 5.3 and Table 5.4 JV = joint venture

For the motorcycles, the total annual production capacity in 2004 was about 2.7 million units (see Table 5.4). Among all the motorcycle makers, Honda has the largest production capacity with over 1.4 million units, followed by Suzuki and Yamaha. Almost all the producers of motorcycle are Japanese. In the recent years, there was an emergence of an indigenous Thai motorcycle brand, *Tigar*[171], and it was ranked fifth in the overall production capacity in 2004.

Table 5.4 Production Capacity for Motorcycles in 2004

Rank	Assembly Plants	Units per Year
1	Honda	1,400,000
2	Suzuki	500,000
3	Yamaha	450,000
4	Kawasaki	200,000
5	Tiger	60,000
6	JRD	144,000
	Total Units	2,754,000

Sources: adapted from OIE (2004: Table A2) and the Board of Investment

At the level of auto-part firms, there are 709 first-tier suppliers (including motorcycles) and 1,100 lower-tier suppliers (i.e. Tier 2 and 3 and others) (see Figure 5.5). The quantitative breakdown of first-tier suppliers based upon ownership is also shown in the figure. Note that most of the first-tier suppliers have either "pure Thai" or Thai majority ownership; however, to conclude that these first-tier Thai suppliers have high level of capabilities could be misleading.

It is important to look at the *qualitative* breakdown as well. The qualitative breakdown of the 709 first-tier suppliers is illustrated in Table 5.5.
Note that most of the Thai and majority Thai joint venture firms produced auto-parts that are either vehicle body parts or automotive accessories and others. Most Thai firms have insufficient capabilities to produce engine parts, automotive electronics and other high value-added parts.

[171] *Tigar* is the Thai-owned motorcycle brand, which was first launched in mid-2002. It was established by an ex-Managing Director of the Thai Kawasaki Motors.

Table 5.5 Structure of First-tier Auto-part Firms in Thailand

Auto-part Type	Ownership Type						Total
	100% Thai-owned	%	Thai Majority	%	Foreign Majority	%	
Engine parts	20	31.7	8	12.7	35	55.6	63
Electronics	15	38.8	10	19.2	27	51.9	52
Drive, Transmission & Steering Parts	17	32.7	6	11.5	29	55.8	52
Suspension & Brake Parts	13	37.1	1	2.9	21	60.0	35
Body Parts	57	47.9	17	14.3	45	37.8	119
Accessories	18	46.2	2	5.1	19	48.7	39
Mold and Dies	8	36.4	1	4.5	13	59.1	22
Others	206	63.0	23	7.0	98	30.0	327
Total	**354**	**49.9**	**68**	**9.6**	**287**	**40.5**	**709**

(Unit: number of firms)
Source: Adapted from the survey by TAI (2003g: 46)

For instance in 2004, the auto-parts that were *not* produced (as a complete turnkey unit) in Thailand were: passenger car engines, differential gears, electronic systems, electronic control units, (chemical) substrates for catalytic converters and anti-lock braking system (Wanapha, 2004). Likewise, the Japanese organization viewed the majority of Thai auto-part firms as lacking sufficient capabilities.

> "A member of Japanese International Co-operation Agency (JICA) reported that 80% of Thai parts and components production still falls short of international standards" (Abdulsomad, 2003: 73)

Hence it could be said that to move up the production value chain, the Thai government via the BOI should invite foreign parts producer to invest in facilities producing these high-value auto-parts. At the same time, the local firms should try to link-up with these foreign firms (through either joint venture or subcontracting agreement) and engage in the learning activities and build technological and organizational capabilities. This thesis will argue that this linkage activity must be made as part of a firm's learning strategy.

5.3.4 The Additional Non-firm Organization: Thailand Automotive Institute

In 1998, TAI was established under the MOI mandate as the main organization responsible for supporting and promoting the development of automobile industry in

Thailand, with the primary goal of enhancing global competitiveness (OIE, 2004: 9). The TAI is unique in **two** respects from the other previous business associations and organizations.

Firstly it has the responsibility of enhancing competitiveness of Thai auto-part suppliers. Historically, most of the organizations such as Thai Auto-Parts Manufacturers Association (TAPMA) were related to heavy political lobbying for the prolonged protection of the automotive industry; however, the TAI had shifted its emphasis from lobbying to embracing open competition and promoting technological upgrading of Thai firms. This was stated:

> "The primary goal of TAI is *no longer to lobby the government for protection but to enhance global competitiveness of Thai firms* in according with the new strategy of the automobile industry of the post protectionism period" [italics added] (Abdulsomad, 2003: 65).

Secondly, the TAI is an autonomous unit with extensive collaboration with the foreign carmakers and Japanese organizations. For instance,

> "The Japanese government and private sector are very active in the new assistance program through TAI. ... The Japan External Trade Organisation (JETRO) has selected Thailand as the first ASEAN country to receive assistance to upgrade its auto industry, in a programme designed to boost the competitiveness of 150 local auto parts firms within the next four years." (Abdulsomad, 2003: 73)

As a result, examples of collaborative programs currently undertaken by TAI include the Automotive Experts Dispatching Program (AEDP)[172], "Automotive Technology Build-Up Program (ATBP)", and the "Detroit of Asia" project. In addition, on September 2002, TAI drafted Thailand's *first* automotive master plan.

5.3.4.1 The Thai Automotive Master Plans

In 1999, the first five-year master plan (2002-2006) was prepared as a roadmap for the Thai automotive industrial development (personal interview with the Acting Director of TAI, November 20, 2004). It was the first time that the Thai government assigned an organization such as TAI to develop such a plan:

> "... Thailand does *not* have an Industrial Master Plan that can be regarded as the strategic outlines of her national industrialisation policy [for the automobile industry]. The *first* of such an Industrial Master

[172] Since 2002, the AEDP has been effective in upgrading the local auto-part firms, especially the SMEs, who lacked experience in continuous improvement activities and other simple routine production and organization management capabilities (personal interview with Firm CSP General Manager, December 15, 2004).

Plan in the Automobile Industry was proposed by Thailand Automotive Institute to the Ministry of Industry after Thailand committed to [full] liberalisation in 2000" [italics added] (Abdulsomad, 2003: 81).

The MOI assigned TAI to undertake this master plan to be in accordance with the 9th National Social and Economic Development Plan. The vision for Thai automotive industry by year 2011 is to become "the automotive production base in Asia that adds value to the country with strong domestic supplier base" and the four objectives are (TAI, 2002b: 2):

- Thailand will produce at least one million vehicles per year[173] (700,000 one-ton pick-up trucks and 300,000 passenger cars) with total production value of more than 500 billion Baht. Forty percent of which will be exported within 2006.
- Thailand will produce at least two million motorcycles per year with total production value of more than 100 billion Baht. Twenty percent of which will be exported by 2006.
- Thailand will produce internationally-recognized and standardized replacement equipment manufacturing (REM) parts with exports value of more than 200 billion Baht by 2006.
- Thailand will have the *capability* to produce auto vehicles and parts with local value added of more than 60 percent by 2006 [italics added].

And the two main corresponding strategies are (TAI, 2002b: 2-4):

- Creating a predictable environment for business operations in the Thai automotive industry
- Enhancing the competitiveness of Thai auto-part industry

On February 28, 2006, the TAI had arranged a meeting to accomplish two objectives: to evaluate the outcome of the first master plan and to draft a second five-year plan (2007-2011) (Tiasiri, 2006).

5.3.4.2 The Challenge of Human Resource Development

A shortage of trained human resources has been major problem for Thailand industrial development and the automotive industry is no exception (Gearing, 2000; Poapongsakorn, 2004; UNCTAD, 2003). The specialist training course such as Automotive Engineering has been severely limited. Among all the universities in

[173] The production volume of 1.12 million vehicles per year was accomplished by the end of 2005 and a forecast of 1.24 million units vehicle sales is anticipated for 2006 (Prachachart Turakij, 2005; TAI, 2005c)

Thailand, Chulalongkorn University is the only one with four-year Automotive Engineering curriculum (TAI, 2004d), and since 1994, Toyota Motor Thailand has been collaborating with Chulalongkorn by providing instructors and design courses for Automotive Engineering students (UNCTAD, 2003: 57). Apart from Automotive Engineering, Toyota has signed a memorandum of understanding with Thammasat University to develop the Industrial Engineering department. Dissatisfied with the poor public support, in 1996 Toyota developed its own technical training center, which can issues certificates to those who pass its course (Ibid.). Thus it could be argued that this private sector firm is quite active in the human resource development programs.

On the policy side, one way of developing human resource is to setup a national strategic human resource development plan together with a strong leader, a "HR champion", to push the plan forward. The plan should include a detailed outline of the upgrading strategies for improving the skill and competencies of the existing workforce within the automotive industry. It should also define the competency gaps, and look at competencies at different levels (for e.g. operational and managerial levels). In addition, this human resource development plan also needs multilateral cooperation among agencies, organizations (in particular TAI), and firms in order to function properly (Hongladarom, 2002: 10-11).

Following such recommendation, on December 2, 2003, the MOI established a strategic committee for automobiles[174]. The objective of the committee is to oversee that the implementation of the "Detroit of Asia" plans and to effectively reach the planned targets (Panthong, 2005b: 90).

5.3.5 Summary and Implications on Firm Learning

By 2006, the Thai automotive industry certainly had achieved the following:

- Economies of scale in one-ton pick-up trucks production via establishment of global production base and exports.
- Massive FDI from multinational carmakers around the world – virtually all brands have invested in Thailand.
- For the first time in Thai automotive history, the production volume for 2005 has exceeded one million units.

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[174] It comprised various people from different organizations such as TAI, TAPMA, AIC, APIC, BOI, Department of Industrial Promotion, Office of Industrial Economics, and a few private firms (TAI, 2004g).

Despite the achievements, the remaining challenges include:

- The Dean from Kellogg Business School[175] commented on Thai firms' R&D capabilities:

  "Although most global automotive giants have established their production bases in Thailand, they still have not transferred any know-how [on design technology]. He asserted that the key for a sustainable 'Detroit of Asia' was to have product design and research and development move their base to Thailand as well" (Pandey, 2002; Parnsoonthorn, 2002).

- The government measures to ensure that carmakers take "deep root" within Thailand and enhance knowledge spillovers to local firms are lacking (personal interview with ex-TAI advisor[176], April 6, 2004). Without deep roots, the multinational carmakers could easily shift their established production base to other larger, more attractive emerging markets such as India or China; this is the latent risk facing the industry.
- The TAI, TAIA, an independent policy analyst, and an academic pointed out the following challenges (Brimble, 2002; Chaithirapinyo, 2002; Vanichseni and Tiasiri, 2002):
  - Weak and disconnected R&D
  - Inadequate skilled workers and lack of coordination among training centers
  - Weak Automotive Engineering related curriculums at the university level
  - Some vehicle models lack the necessary production economies of scale
  - For SMEs (auto-part firms) they need assistance in linking up with the multinational carmakers and programs for human resource development for their technical and marketing personnel
  - Taxes and tariffs for the automotive industry are generally high and have very complicated structures (Sutivong, 2002; TAI, 2003i).
  - The basic infrastructures are either unavailable or inadequate (Sutivong, 2002).

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[175] This is the well-known Business School of Northwestern University in Illinois, USA.
[176] The ex-TAI advisor earned a doctoral degree from Science Policy Research Unit (SPRU), the University of Sussex in the UK. At the time of this writing, he was involved in the energy-conservation project with a first-tier auto-part firm based in Thailand.

The transfer of product design and the R&D activities did not fully take place in Thailand because: 1) the low level of Thailand's readiness and capability to conduct the R&D activities and 2) the issue of sharing of R&D activities between Japan and Thailand was not yet decided by the Japanese executives, as of now the engineers in Thailand are only allowed to participate in very little portion of the total R&D activities (personal interview with Japanese expert advisor[177] at TAI, December 20, 2004).

From the past achievements and remaining challenges above, the automotive industry upgrading strategies (or policies) will need to address the opportunities for the indigenous auto-part firms to "link up" with foreign carmakers (customers), to acquire the necessary know-how on process and product design, and finally, to create final product that satisfy their customers. These industry-level strategies can only provide either incentives or infrastructural support to enable firms to develop the capacities to compete, and it is only a portion of the whole solution. Irrespective of these policies' content and implementation, it is the Thai firms themselves who ultimately must act and want to be involved in such upgrading process.

Here the issue of firms' competitive and learning strategies is definitely important, since the learning engaged by these firms will involve their abilities to timely monitor the changes within the external environment as well as the assessment of their own internal resources and capabilities to seize emerging business opportunities or to neutralize the upcoming threats. Firms that failed to take into account this aspect of competitive and learning strategies will most certainly be the ones that suffered from a slow rate of capability accumulation and get "lock in" to produce low-value added products. Until they realized the strategic importance of learning and embarked on the change process, this "lock in" will tend to continue.

5.4 Summary: Shifting Importance of Firms' Strategies, Learning, and Capability Development

On the whole, the importance of firms' learning, both strategy and activities, shifted from that of limited learning within a highly protected automotive industry to significant learning that is highly liberalized (see Table 5.6). As the above analysis had shown during 1960s to late 1980s, the Thai automotive firms (both carmakers and auto-part firms) had very little pressure to learn. The market was domestically focused with

[177] This advisor was formerly a Managing Director of Hino Motors (Japan) for more than 30 years.

a high degree of fragmentation and frequent discontinuous learning activities. Since the late 1980s, when the Thai government encouraged higher localization of engine parts together with the Plaza Accord agreement, the Japanese carmakers began to augment their investment in Thailand and shifted their strategies from the domestic to the export market. The carmakers and auto-part firms were then required to understand the concept of product quality and cost deemed suitable for export. This prerequisite was an impetus for more intensive strategic effort invested in learning activities. Furthermore during the early 1990s liberalization policies, when the government started to lower the import duties and exposed the locally-made products to competition from imported products, the Thai firms were pressured to exert even higher efforts to learn. The 1997 crisis also served as an impetus to firm learning. Since the domestic market collapsed, the main survival route was to export.

Today, the Thai automotive industry is ripe with a multitude of learning opportunities. With the active role of TAI and the increasing presence of multinational firms' R&D facilities[178], Thai auto-part firms could enhance their competitiveness by collaborating with carmakers to oversee a profitable venture for all. More than ever, there is increasing evidence that some Thai auto-part firms actively engaged in building up their capabilities and invested in learning efforts to build capabilities in order to deliver exceptional value to their customers, both overseas buyers and the domestic carmakers. This evidence at the firm-level will be provided in Chapters 6 to 8.

[178] For instance in mid-2005, Toyota officially opened its Toyota Technical Center Asia Pacific in Thailand (TTC-AP) (Thailand4.com, 2005). This center will perform R&D related activities (for e.g. vehicle base model development) and respond to the diversifying and increasingly sophisticated demands of the Asian markets. Additionally, this center will conduct extensive training of its employees which include: in-depth tuition covering vehicle components, language training, and professional skills development (Toyota Motor Corporation, 2005).

Table 5.6. Shifting Importance of Firm Strategies and Learning

Issues	Time Period		
	Localization and Protection Phase (1960s to early 1980s)	**Export-Oriented and Early Liberalization Phase (late 1980s to pre-1997 crisis)**	**Full Liberalization Phase (post-1997 crisis to current)**
The Institutions – policies, incentives, regulations	Import substitution industrialization Investment incentives LCR Rationalization policies	Transition to export oriented industrialization Removal of protection (increased open competition) Incipient R&D promotion Increase in FDI	Industrial Restructuring Programs Removal of LCR Revised automotive tariff structure Committed to free trade agreements Increase in FDI
Business Firms – markets, product and process technology	Small and fragmented domestic market, lack economies of scale Limited production capacity Limited exports Simple assembly process, limited local manufacturing activities	Improving economies of scale, rapid domestic market growth Production capacity expansion Inception of product exports Transition from simple assembly to full-scale manufacturing activities Cooperation to locally produce diesel engines	Achieved minimum efficient economies of scale (especially for one-ton pick-up) Production base for export Global production base for pick-ups Implemented more complex, local manufacturing activities (e.g. "Asian car")
Organizations – public, private business associations, quasi-public	Establishment of the Federation of Thai Industries (FTI), Automotive Industry Club (AIC), Auto-Parts Industry Club (APIC), and Thai Auto-Parts, Thai Automotive Industry Association (TAIA) Manufacturers Association (TAPMA)	No new establishments of organizations Existing organizations continue to lobby for more protectionist policies	Establishment of Thailand Automotive Institute (TAI) Increased technical and managerial assistance programs to local firms Drafted the Automotive Master Plans
Firm Strategies and Learning	*Limited* firm-level strategy for learning, know-how transfer, and capability development	*Moderate* role of firm strategy for learning, increased linkages with foreign firms, transfer of know-how, and capability development	*Significant* role on firm competitive strategy for learning, knowledge transfer, and capability development Competition at the Asian regional level

Source: own elaboration based on the research

Chapter 6 – Firm Competitive and Learning Strategies –

The objective of this chapter is to describe and then analyze the differences in firm-level competitive and learning strategies of the nine case study companies over their lifetime. These findings will set the stage for the description of firm learning activities and capability development in Chapter 7, and the analysis in Chapter 8. Since the start dates and ages of the case study companies are different, common phases were defined to assist in the organization of the empirical findings and the analysis (see Table 6.1). There are **three** common phases:

Table 6.1 The Main Common Phases for Each Case Study Firm

	Start-up Phase	Expansion Phase	Adaptation phase
Firm AH[179]	1979 to 1988	1989 to pre-1997 crisis	Post-1997 crisis
Firm CPC	1965 to 1970	1971 to pre-1997 crisis	Post-1997 crisis
Firm CSP	1995 to 2001	2002 to 2004	2005 to current
Firm D[180]	1966 to 1979	1980 to pre-1997 crisis	Post-1997 crisis
Firm L	1972 to 1990	1991 to pre-1997 crisis	Post-1997 crisis
Firm S[181]	1941 to 1965	1966 to pre-1997 crisis	Post-1997 crisis
Firm SOM	1990 to 1995	1996 to pre-1997 crisis	Post-1997 crisis
Firm TKT	1973 to 1990	1991 to pre-1997 crisis	Post-1997 crisis
Firm TS[182]	1960 to 1980	1981 to pre-1997 crisis	Post-1997 crisis

Source: own elaboration based on the research

- **The start-up phase**

  This covers the firm competitive and learning strategies of the entrepreneur(s) (the company founder) prior to the firm incorporation date as well as the first few years of the firm's establishment.

- **The expansion phase**

  This covers the period during which the firm strategies include plans for business expansion, usually in production capacity and/or product diversification. This phase, for most of the firms, coincides with the industry's import substitution policy (i.e. prior to 1985) as well as the transition into the export-oriented regime during the rapid growth years (i.e. 1985 to pre-1997 crisis)

[179] Sometimes refer to as Firm AH Group.
[180] Sometimes refer to as Firm D Group.
[181] Sometimes refer to as Firm S Group.
[182] Sometimes refer to as Firm TS Group.

- **The adaptation phase**[183]

  This covers the time period from post-1997 crisis onwards, including the more recent stage of development. This phase, for most firms, will coincide with the Thai automotive industry approaching a full liberalization status, inclusive of a complete abandonment of local content requirements since 2000.

The chapter concludes with a summary (Table 6.5) on the emerging patterns of firm-level learning strategy, aiming to discern the differences in the key characteristics of learning strategy between the firms.

6.1 Learning Strategy During the Start-up Phase

6.1.1 Firm AH Group (1979-1988)

External Factors Shaping Firm AH Group Strategies

In the late 1980s, the Thai automotive industry had low production volume and the challenge was to reach the minimum economies of scale[184]. Firm AH Group product addressed this small market characteristic when it designed low-volume jigs, a niche product with few competitors. For each car model, there was low volume production and thus the need for low-volume jigs[185]. The Group's low-volume jig was unique and could manage to simultaneously keep the cost low and operate at low production rates, without sacrificing the product quality.

After the Plaza Accord Agreement in 1985, many Japanese carmakers and their associated suppliers invested in a Thai manufacturing facility. Due to the limited domestic market, these carmakers also had plans to collaborate regionally and to build an export base. Firm AH Group's President had been involved with the automotive industry for almost a decade and understood the Japanese OEMs move towards an export strategy. In 1988, the Group's President intended to do the same by laying down the export strategy for

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[183] The word "adaptation" was used instead of "liberalization" because in Chapter 5 liberalization was used to mean the *liberalized* automotive industry. Here in Chapter 6, the focus is on the firm and not the industry. Therefore, the *adaptation* of firms' strategies is more appropriate.

[184] Janssen (1987) reported that in the late 1980s Thai automotive industry had a small market size with 100,000 vehicles sold annually. This leads to the problem fragmentation cross vehicle makes and models (see Chapter 5 for more discussion)

[185] Here low volume means at a production rate of about 10 cars an hour (which is typical of any assembly plants in most Southeast Asian countries). This is in contrast to high volume production in Japan and USA where production rate is at about 50 to 60 cars per hour (Fairclough, 1995).

the Thai-made auto-parts. To ensure successful export, the Group needed to ensure that the quality and manufacturing cost of his product was at least as competitive as his regional competitors. The President[186] realized that he had to build a talented team of managers, design engineers, and technicians to accomplish the export task.

Competitive and Learning Goals

Having been in the automotive dealership (both in Malaysia and Thailand) for almost a decade, Firm AH Group's President decided that the strategic goal of further development of his business lay in the auto-part manufacturing business. He realized that the Thai automotive market was small and lacked production economy of scale; thus the manufacturing business must target the export market. In order to ensure successful transition from a mere automotive dealership and engage in auto-part manufacturing business and export, Firm AH Group's President delineated the following as the firm capability gaps.

Capability Gap and Gap-Closing Strategy

There were **two** strategic capability gaps. **First** was the lack of manufacturing experience. Since 1979, Firm AH Group had never been involved in any manufacturing businesses; all of its industrial experience was related to simple business of automotive dealership. However, the involvement with car dealership enabled the Group to establish linkages with the executives of several carmakers (Ford and Mazda). This assisted the Group in the search strategy and later on the acquisition of OEM manufacturing experience.

Second is the lack of capable human resources. Since the Thai automotive industry during the 1980s was small, all the universities lacked formal training courses in automotive engineering and it was not economically feasible for firms to invest large sum of money into formal training courses. To overcome this problem, using the information provided by the contacts from the automotive dealership business, the Group planned an acquisition of a Thai manufacturing firm[187]. Such acquisition will provide the Group with the experienced engineers and technicians that belong to the acquired firm. The Group

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[186] From here onwards, the words "President" will be used to refer to the President of the particular case study firm under investigation. For instance, in section 6.1.1 "President" means "Firm AH's President" and in section 6.1.2 "President" means "Firm CPC's President", and so on.

[187] Firm AH Group's President is somewhat a firm believer in strategic acquisition rather than a "greenfield" investment. He stated that buying up a firm is much quicker than starting a new one, in terms of building human resources and operational capacity (Anonymous, 2004d).

planned to engage these personnel in intensive, internal trainings and continuous improvement activities; the firm also provided incentives to retain the skilled workers.

6.1.2 Firm CPC (1965-1970)

External Factors Shaping Firm CPC Strategies

In 1965, the Thai automotive industry was in its infancy stage with: 1) newly launched investment promotion policy, 2) a handful of automotive assemblers were established and 3) local content requirements (LCR) were in the early planning stage. With such meagre industrial development, Firm CPC learning strategy did not focus on auto-part industry at all. It was focusing on the production of household plastic goods and plastic children toys (personal interview with Firm CPC President, December 18, 2004).

Competitive and Learning Goals

During its start-up period, Firm CPC did not aim to supply any auto-parts and there was no strategic goal related to learning the production of auto-parts. Firm CPC wished to produce simple household plastic goods and planned to engage in sporadic, trial and error process improvement activities. Overall the firm learning strategy lacked an explicit strategic goal for process and product improvement plans and had no initial focus on the automotive parts.

Capability Gap and Gap-Closing Strategy

During its start-up, Firm CPC lacked sufficient manufacturing experience on even the simple plastic parts. The firm suffered from poor quality product produced using the manual injection machines. In addition, often times the firm could not manufacture, maintain or adapt the plastics injection mold. To remedy these problems, Firm CPC planned to hire foreign experts (Hong Kong and Chinese) to assist with the production process operations (personal interview with Firm CPC President, December 18, 2004). Furthermore, through expert assistance, Firm CPC also planned to engage in much learning by trial and error and experimentation; there was neither systematic process improvement nor any product improvement activities. Moreover, the production of auto-parts during the start-up period was mostly nonexistent.

6.1.3 Firm CSP (1995-2001)

External Factors Shaping Firm CSP Strategies

Since the early-1990s, the Thai automotive industry had been approaching a liberalized regime. The liberalized measures included: a) the 1993 decision to abandon restrictions on foreign equity, thus opening for 100 per cent foreign share ownership in the automobile assembly; b) the free entry of assembly plants in March 1994 and c) the decision to totally cancel the local content requirements (LCR) by year 2000 (Lauridsen, 2000: 31). In addition Thailand was committed to the ASEAN Free Trade Agreement (AFTA), which was established since 1992 (ASEAN Secretariat, 2002). In responding to these industrial changes, Firm CSP promptly invested in the ISO 9000 quality accreditation and received the accreditation in 2001 (from www.tisi.go.th, accessed March 15, 2006).

Hence it could be said that during start-up phase, Firm CSP was well aware of the liberalized regime and the urgent need to plan its learning strategy to include accreditation of the internationally, well-accepted quality standard. But having started as a small family operated business, Firm CSP lacked the awareness that hiring the knowledge workers such as engineering graduates is crucial to the success in upgrading the quality standards. It was not until during the expansion phase that Firm CSP started to realize the importance of human resources and their continuous, systematic training.

Competitive and Learning Goals

The General Manager of Firm CSP had been working as an engineer in an aluminium die-casting company; he had extensive experience on the manufacturing process of aluminium products. But he lacked the experience in running his own business and supplying the OEM auto-parts to the carmakers, as a first-tier supplier. Hence the strategic goal of Firm CSP during the start-up phase was to acquire the technical knowledge on the aluminium die casting manufacturing experience, particularly for the supply of OEM auto-parts as first-tier supplier. The firm planned to adjust itself to the 'OEM culture' of low cost, high quality and good punctuality.

Capability Gap and Gap-Closing Strategy

During its start-up, Firm CSP lacked systematic work arrangement to undertake the large-scale production of OEM auto-parts and electrical appliance parts. This was part of the reason why it undertook the ISO 9000 accreditation project. Moreover, in the near future, Firm CSP planned to engage in more systematic quality accreditation system to secure its status as a capable, OEM auto-part supplier. Firm CSP lacked the strategic focus and production experience on becoming a first-tier auto-part supplier; it would supply virtually any customers (not limited to just auto-parts, but include electrical appliance and electronics parts). This was because the firm needed to ensure substantial early cash inflows to meet its scheduled financial payback period (personal interview with Firm CSP General Manager, December 15, 2004).

6.1.4 Firm D Group (1966-1979)

External Factors Shaping the Firm D Group Strategies

In 1964, the Thai Office of Industrial Economics promoted the establishment of the motorcycle assembly plants, and later in 1971 the Ministry of Industry (MOI) announced the first motorcycle industry policy with local content requirements (LCR) of 50 per cent, to be achieved by 1973 (OIE, 2004: 6). About four years later, the MOI required that the motorcycle parts LCR be subject to a phased increase to reach at least 70 per cent within 1979; this applied to all existing motorcycle assemblers. This early localization policy shaped the learning strategy of Firm D Group. The President said:

> "Once the Thai government announced the phased increase in LCR, by 1977 the Suzuki motorcycle maker had invited its first-tier affiliated supplier, Nissin Kogyo (Japan), to come and invest in a manufacturing facility in Thailand. This prompted the Japanese to search for appropriate Thai firm [i.e. Firm D Group] as a potential joint venture partner" (personal interview with Firm D Group's President, May 12, 2004).

By implementing the joint venture learning strategy, Firm D Group was planning for the future collaborative learning opportunities open up through future technical collaboration with the Japanese experts. It could be said that Firm D Group was quite alert to changes in the industrial environment and searched for more learning as well as future business opportunities.

Competitive and Learning Goals

Firm D Group's early strategic goal was to form foreign joint ventures, and to gain a secure foothold in the manufacturing of original equipment manufacturing (OEM) motorcycle and auto-parts. The foreign joint venture was intended to facilitate the transition from an aftermarket (REM) auto-part distributorship to a manufacturing business. The following perspective on foreign joint venture was expressed:

> "The purpose of a joint venture is to create a win-win situation for all the partners. Each partner must be fully committed to contribute equally in the venture. The mutual benefit must exist and fairly distributed across the partners" (personal interview with Firm D Group's President, May 12, 2004).

Both Firm D's President and his older brother thought that the future business opportunities lie not only in the REM auto-part distributorship, but also in the investment of a joint venture OEM auto-part manufacturing (Ibid.).

Capability Gap and Gap-Closing Strategy

Having been in the auto-part trading (aftermarket) business since 1966, Firm D Group was quite accustomed to the imported auto-parts. However, since the firm had not been involved in the auto-part manufacturing business, it lacked the technical knowledge and experience needed to produce the high-quality OEM auto-parts. To remedy such weakness, Firm D Group learning strategy was to have its employees and President trained in the production technology in Japan. Firm D Group's President and his older brother were good friends of a Japanese firm and planned to invite this firm to invest in a joint venture. During the start-up phase, Firm D Group's President stayed in Japan for two years, during which he received extensive, technical training on-the-job. After two years, he was fluent in speaking and listening in Japanese language (though could not formally read and write). The President described his experience,

> "My elder brother had requested me to travel to Japan soon after I finished my junior grade in high school[188] and once in Japan I stayed at the house owned by the President of the Japanese firm. Since I was trained in a hands-on manufacturing environment, most of the learning activities were conducted on-the-job; there were no formal lecture theatres or textbooks" (personal interview with Firm D Group's President, May 12, 2004).

After his training, Firm D Group's President planned to invite the Japanese firm President to invest in Thailand. The Japanese firm declined the invitation, due to the firm unprepared-ness for overseas investment activity. It was not until over several years later that this Japanese firm decided to come and invest in Thailand (Ibid.).

[188] In Thai education system, this grade level is called *Ma-tha-yom* 5.

6.1.5 Firm L (1972-1990)

External Factors Shaping Firm L Strategies

From 1972 to 1980, the significant changes in the Thai automotive industry included the introduction of local content requirements (LCR) and the import ban of vehicles; these were protective measures to support the import substitution regime. The protection measures led to much investment in vehicle assemblers and their foreign affiliated suppliers. Most of the production activities were incipient[189], simple and involved no complex manufacturing process. Following the market trend, Firm L was an aftermarket (REM) auto-part trader, supplied simple auto-parts such as tires and wheels. Firm L did not have any manufacturing activities. The firm early learning strategy was shaped mostly by the President's experience and passion for automotive wheel and tire accessories. But in the mid-1980s, other significant industrial changes comprised the 1985 Plaza Accord Agreement, the incipient rapid growth of the Thai automotive industry and the continued increase of LCR. Consequently many Japanese carmakers and auto-part firms were attracted to invest in Thailand. In 1987, Firm L joined the bandwagon and expanded through forming a Japanese-Thai joint venture; this was part of its learning strategy to upgrade itself, from auto-part trader to a manufacturing firm.

Competitive and Learning Goals

Having been an REM auto-part trader for more than a decade, Firm L decided that it wanted to enter into the alloy wheel manufacturing business; this was its strategic goal since it expected that future business opportunities lay in manufacturing and not simple trading. Firm L also planned to learn the following from its joint venture partner (Manager Online, 1994):

- To learn to supply alloy wheels to the Japanese carmakers in Thailand such as Toyota, Honda, Nissan and Mitsubishi[190]
- To learn to manage a large distribution network of more than 400 distributor shops in Thailand

[189] The word "incipient" refer to the firm's early stage of engaging in the activity. For example, "incipient production" means the firm had engaged in starting-up a new/improved production process and had not gained significant experience in it.

[190] This was considered as learning benefit since prior to the joint venture Firm L was only an importer and distributor supplying the replacement equipment manufacturing (REM) auto-parts, thus the foreign joint venture was the first time that Firm L started to supply auto-parts to the Japanese OEMs.

- To learn to export, with Japan as the firm's main market

Capability Gap and Gap-Closing Strategy

Firm L lacked the alloy wheel technical knowledge and manufacturing process experience; hence, in mid-1980s it planned to engage in a Japanese-Thai joint venture. During this period, the joint venture was possible since the Japanese auto-part manufacturer had been a close business associate to Firm L (when it was a trading firm) and this Japanese firm wanted to expand its manufacturing operation overseas. Involved in a foreign joint venture, Firm L had to transform itself from a mere trader to become an active manufacturer involved in production technology such as aluminium die-casting. Since the joint venture was a supplier to Japanese carmakers, the products had to comply with stringent quality control as well as meeting the competitive cost.

6.1.6 Firm S Group (1941-1965)

External Factors Affecting Firm S Group Strategies

During the early 1940s, the Thai automotive industry was virtually non-existent. Furthermore, most of the industrial development in Thailand was at a very early stage; there were only small pockets of auto-part traders and distributor. It was not until the early 1960s that the Thai automotive industry started with simple assembly activity. During the time, there were no complex manufacturing activities. Most of the vehicles on the road were imported. Hence the local trading firms focused on only aftermarket (REM) auto-parts satisfying the maintenance need of these imported vehicles. In 1941, Firm S was an auto-part trader with no manufacturing activities. But once the automotive industry started in 1961, Firm S aimed to be involved in auto-part manufacturing business, specialized in the production of undercarriage suspension parts.

Competitive and Learning Goals

In the early 1960s, Firm S decided to transition itself from a mere auto-part trader into a manufacturer for the REM auto-part market; this was the firm strategic goal. It started with the familiar product that the firm used to sell, the leaf springs and other undercarriage parts. The transition into manufacturing business was not effortless; Firm S planned to import the first lot of machinery from Japan and engaged itself in unpacking the technology through trial and error experimentation and informal technical assistance offered by the foreign experts.

Capability Gap and Gap-Closing Strategy

Realizing that the background of auto-part trading was insufficient to assist in successful transition into the manufacturing business, Firm S President (founder) planned to engage in more trial and error experimentation with his well-acquainted auto-part, the leaf springs. Production in the early days involved much sporadic foreign expert assistance. Operating as a small family-run business, the process and product improvement plans were at best informal and ad hoc, nothing was systematic during the time. It was not until mid-1990s that Firm S Group started to engage in the development of systematic work procedures.

6.1.7 Firm SOM (1990-1994)

External Factors Shaping Firm SOM Strategies

The Thai automotive industry during the 1990s underwent incipient liberalization (for e.g. the removal of import ban on small car, the commitment to ASEAN Free Trade Agreement (AFTA) in 1992 and the allowance for foreign firm to hold 100 per cent equity ownership in investment, see for example Siroros (1997)). These measures led to rapid growth rate of the industry through increased foreign direct investment (FDI). Firm SOM President, who had been working within the manufacturing industry for some years, decided to set up his own small, job shop producing simple auto-parts. The early learning strategy was quite parochial and passive, since at the time Firm SOM had only about 4 to 5 employees. All employees only had technician background with limited formal education. There were no professional managers to guide the firm learning strategy, and the firm basically relied on *only* single production order from its *only* customer.

Competitive and Learning Goals

Viewing the rapid growth of the Thai automotive industry as future business opportunities and having experience working as a technician for other manufacturing firms, Firm SOM President set up a small manufacturing facility in 1995 to produce simple auto-parts (personal interview with Firm SOM President, November 24, 2004). This was regarded as a conservative goal, lacking sufficient strategic focus on learning since the Firm

SOM President neglected (was unaware of) other aspects of running a successful business, such as the hiring of capable personnel with sufficient management skills. Since all the firm personnel had low formal education and lacked managerial experience, consequently there was no one who could precisely formulate the initial, strategic learning goal for Firm SOM.

Capability Gap and Gap-Closing Strategy

Having been a technician with limited exposure to international competitive manufacturing processes, Firm SOM President lacked the wider perspective on manufacturing excellence and did not fully understand the managerial dimension of a business. Furthermore, during start-up, Firm SOM also lacked sufficient financial resource to properly invest in a manufacturing facility[191]. In terms of production order, it relied solely on one major customer (personal conversation with TAI Supply Development Manager, November 15, 2004). Due to deficient management background and lack of employees who are proficient at professional management, Firm SOM had poor search and learning strategy. Consequently during its start-up, the firm was unaware of other sources of technical knowledge. Firm SOM President was also unaware of any significant, technical changes within the competitive environment that could affect the firm future business opportunities.

6.1.8 Firm TKT (1973-1990)

Industrial Factor Shaping Firm TKT Strategies

During the 1970s, the Thai automotive industry was small, in terms of production volume and domestic demand and the local content requirements (LCR) were in its development stage. Most of the auto-parts produced were simple and did not require any sophisticated manufacturing technology. Firm TKT was performing simple chromium plating of plastic parts, which were either supplied to the local assembly plants or to the aftermarket automotive accessories. Therefore, the firm learning strategy during the start-up focused mostly on simple plating processes and there were no formal plans to either implement manufacturing or design activities, and there were no export plans.

[191] Firm SOM had debt financing since start-up, the primary lender comprised the banks and its main customer, Firm SML (personal interview with Firm SOM President, November 24, 2004).

Throughout the 1980s, the automotive industry grew with more manufacturing activities, and in the mid-1980s there was a shift from import substitution to export oriented promotion. In addition, the 1985 Plaza Accord agreement impacted most Japanese carmakers, prompting them to relocate some manufacturing facility overseas (to Thailand) (see for example, Terdudomtham (1997)). Responding to these changes, Firm TKT increased its production capacity accordingly, but there was nothing substantial in terms of investment in new manufacturing plant. Most of the firm production processes still focused on simple plating of plastic parts and the substantial plant expansion did not occurred until the late 1980s and 1990.

Competitive and Learning Goals

Firm TKT simply had routine goal of regularly meeting the domestic customer demands and there was no specific focus on strategic learning during start-up. Firm TKT wanted to produce simple REM auto-parts, satisfying the domestic market, and expanded its production accordingly as new demand arose from new investment by the foreign carmakers. From 1973 until late 1980s, the sequential plant expansions were not significant and the firm did not aim at engaging in substantial OEM auto-part production. It was not until the early 1990s that Firm TKT engaged in a more systematic production process.

Capability Gap and Gap-Closing Strategy

Having been a simple REM part manufacturer, Firm TKT lacked the capability to engage in mass production of auto-parts with systematic quality control. Most of its learning strategy focused on trial and error and there was no systematic, strategic learning plan. In addition having grown from a small family business, most of its employees had at most first-year high school formal education (TAI, 2003i: 7). In addition, sporadic technical assistance was sourced from the foreign experts; most of these came from the customer OEMs. Until the systematic plant expansion, which occurred in 1990, Firm TKT learning strategy was at best ad hoc and during start-up phase, there was no systematic program to ensure the systematic accumulation of technical knowledge.

6.1.9 Firm TS Group (1960-1980)

External Factors Shaping Firm TS Group Strategies

Both Firm TS President and his elder brother knew that within the Thai automotive industry there were two important changes during the 1960s and 1970s: the government investment promotion policies and the imminent increase in foreign direct investment (FDI) by the Japanese carmakers. During the mid-1970s, Thai government policy was keen on increasing the local content requirements (LCR) as well as encouraging the production of import-substituted auto-parts in order to reduce the country severe problem of budget deficit. These two conditions had dramatically shaped Firm TS Group early learning strategy.

In 1977 when Firm TS Group just started, the Thai government had been implementing the local content requirements (LCR) for roughly two years. And in 1978 the minimum LCR were subjected to a phased increase to 50 per cent by 1983 (see for example, OIE (2004)). Hence many Japanese auto-parts and vehicle assembly firms were on the lookout to either invest in wholly owned subsidiaries or form joint ventures with Thai firm and invested in the manufacturing facility. Firm TS Group was considered as an attractive candidate for joint venture; "The Japanese companies see the potential of the motorcycle seat maker [i.e. Firm TS Group] ... and that this could be good future supplier; the [J][192] family enter auto-part business from that day onwards" (Panthong, 2005a: 43). Since the early days, Firm TS President viewed the Japanese joint ventures as a learning opportunity and promptly seized it through the signing many joint venture agreements. In addition for Japanese firms, who did not prefer to invest in joint ventures, Firm TS Group had agreed to sign the technical assistance agreements. All these technical collaboration agreements (joint venture and technical assistance) formed a major part of Firm TS Group early learning strategy.

Competitive and Learning Goals

Since its inception in 1977, Firm TS Group learning strategy consciously aimed to gain more technical knowledge on the motorcycle parts production and later to use such knowledge to diversify to produce other products (automobile parts, electrical appliance,

[192] As part of an agreement with the Australian National University's Ethics Committee, the family name has to remain anonymous.

agricultural engine parts and plastic auto-parts). Despite its origin as a small family business, Firm TS Group goal was strategic since it was planned (each joint venture served a knowledge-acquisition purpose) and addressed the significant technical capability gap, and furthermore, executed to ensure effective technology transfer.

Capability Gap and Gap-Closing Strategy

Having operated the small job shop and manufacturing of REM auto-parts, Firm TS Group, during the start-up phase, lacked the necessary technical knowledge and experience in the OEM auto-part manufacturing process. Firm TS Group planned to set up more foreign joint ventures, each engaging in different business group, producing different products. In this way, each firm could achieve a much more efficient technology transfer from the foreign firms, and contributed positively to the corporate group as a whole. Each firm would be responsible for its own technical collaboration, be it a formal technical assistance or license agreement(s) or joint venture agreement(s). Each firm was responsible for interacting with the foreign, dispatched engineers and experts, trying to acquire and absorb the technical knowledge. In addition, each firm participated in sending its engineers overseas to absorb the technical knowledge.

6.1.10 Summary of Different Firm Strategies (start-up phase)

The pattern of competitive and learning strategies of the nine case study firms during the start-up phase is summarized in Table 6.2. During this phase, none of the firms engaged in formal planning of comprehensive or ambitious learning strategies. Some of the firms (Firm AH Group, Firm D Group, Firm L, and Firm S Group; see Table 6.2) were in transition from a small auto-part trader (dealership) to an auto-part manufacturing firm (either foreign joint venture or wholly Thai-owned). Other firms (Firm CPC, Firm CSP, Firm SOM, Firm TKT and Firm TS Group) were planning (or attempting) gradual business expansion from small job shops to becoming OEM auto-part manufacturers. All firms had competitive and learning goals that focused on the acquisition of routine production knowledge through two primary means: learning by trial and error (experimentation with small batch production) and, to varying degrees, sporadic sourcing of foreign, external expertise.

Table 6.2 Summary of Firm Strategies During the Start-Up Phase

FIRM	START-UP PHASE		
	Competitive and Learning Goals	**Capability Gap**	**Gap-Closing Strategy**
Firm AH Group	• To set up a local auto-part manufacturing facility and learn the OEM tooling production process for carmakers • Incipient plan to learn to export the auto-parts and tooling products	• Lack tooling manufacturing experience • Lack capable human resources pool	• Planned firm acquisition, future technical assistance and joint venture agreements • Planned poaching of skilled human resource and investment in operational improvements
Firm CPC	• To set up a plastic part manufacturing facility and learn to produce general plastic goods, not auto-parts • Lack of explicit goal related to future learning on auto-parts	• Lack the plastic injection manufacturing experience • Unaware of other technological change	• Informal hiring and random search for foreign experts • Unsystematic trial and error experimentation
Firm CSP	• To become an OEM manufacturer of aluminium die casting parts, to learn to produce auto-parts and electrical appliance parts	• Lack manufacturing experience on aluminium products	• Informal plan, hiring of external experts • Planned collaboration with the customer firms
Firm D Group	• To set up a foreign joint venture to produce OEM brake parts for motorcycle, and later automobiles • To gain successful transition from REM auto-part distributorship to a OEM manufacturing business	• Lack OEM manufacturing experience	• Planned active search for foreign joint venture partner(s) and maintain excellent relationship with prospective Japanese partner(s) • Planned overseas on-the-job training
Firm L	• To set up a manufacturing facility producing alloy wheel for the REM and OEM market	• Lack manufacturing experience on aluminium wheels	• Search for foreign joint venture partner(s) • Plan to purchase new production technology

Source: own elaboration based on the research

Table 6.2 (continued). Summary of Firm Strategies During the Start-Up Phase

FIRM	START-UP PHASE		
	Competitive and Learning Goals	**Capability Gap**	**Gap-Closing Strategy**
Firm S Group	• To set up a manufacturing facility to produce (REM) auto-parts, undercarriage suspension parts • To learn the transition from auto-part trader to a manufacturing firm	• Lack manufacturing experience of the undercarriage parts	• Search for technical assistance provider(s); planned import of machinery from Japan • Informal plan for trial and error experimentation
Firm SOM	• To set up a small manufacturing facility to produce simple auto-parts • Neglecting the long-term learning of and crucial managerial dimensions	• Lack formal manufacturing experience and other resources	• Informal technical assistance from the main customer. Poor awareness with highly passive search strategy.
Firm TKT	• To manufacture simple REM plastic auto-parts	• Lack formal plastic manufacturing experience	• Informal technical assistance from the customer firms and unplanned trial and error experimentation
Firm TS Group	• To gain experience on OEM auto-part manufacturing • To diversify to produce other industrial products	• Lack sufficient experience on mass production of OEM auto-parts	• Planned and executed formal technical assistance and joint venture agreements • Planned active overseas training of key personnel: engineers and technical managers

Source: own elaboration based on the research

With regard to the capability gap, all firms lacked a strong foundation on the manufacturing experience. But some firms were particularly deficient. For example, Firm SOM seemed to be the most deficient. It lacked basic manufacturing experience and also lacked a strategic perspective on learning to prepare itself for future business opportunities. In contrast, Firm AH Group, Firm D Group and Firm TS Group had been highly opportunistic and entrepreneurial, developing learning strategies that incorporated wide local networks (politically and economically). These firms were always on the lookout for new business opportunities and learning. Although these firms lacked OEM manufacturing capability and higher-level technical knowledge, they used their business networks and entrepreneurial skills to search for resources (usually outside the firm) to upgrade their learning strategies and direct a focus on the internal capability gaps. These firms were able to balance the trade-offs between exploitation (i.e. leveraging off current capabilities) and exploration (i.e. formulating plans on capability building for future opportunities) as well as creating synergy between the internal and external sources of knowledge.

6.2 Strategies During the Firm Expansion Phase

6.2.1 Firm AH Group (1989 - pre-1997 crisis)

External Factors Shaping Firm AH Group Strategies

Thai government policy in the late 1980s was to shift its industrialization strategy from import substitution to export-oriented industrialization. Firm AH Group's President made some prudent speculation about Ford establishing its production (export) base in Thailand, and Firm AH exports started well before the onset of the 1997 financial crisis, the President did not wait passively for the export industrial policy; he searched for the export markets while this policy was in its planning stage. In his words,

> "To us, it is becoming apparent that the Japanese have plans to make Thailand an offshore export base for cars, and it makes sense, ... And if one has to withstand the Japanese competition, one has to do the same [i.e. Firm AH has to start its export activity]" (Rainat, 1988).

Consequently, it could be said that Firm AH Group had early plans for becoming an exporter of the auto-parts.

Competitive and Learning Goals

These thoughts led Firm AH to embark on an outward-looking learning strategy and set up a strategic goal, focusing on producing world-class products that are suitable for export. To Firm AH Group's President, producing export-quality auto-parts was a realizable, stretched goal, and similarly, he wanted to engage in the search for capable engineers and technical managers capable of managing the engineering tooling design activities. In addition to incipient export planning, Firm AH also planned to increase its domestic market share, attempting to supply automotive jigs to virtually all the carmakers[193].

Capability Gap and Gap-Closing Strategy

Since its inception in 1986, Firm AH Group had very little experience in producing auto-parts and tooling for export; it lacked the engineering capability to produce export-quality product and similarly it also lacked the human resources and the ability to achieve indigenous tooling design capability. But by the early 1990s, after an extensive international search for capable human resources, Firm AH Group's President formed a capable international team of engineers and technical managers. The Group partially achieved a design capability by moving up from receiving just a detailed technical drawing to a conceptual drawing[194].

In addition, Firm AH Group's President was very outward looking and searched for opportunities to acquire or form a joint venture with other firms that would strengthen his auto-part business group. Firm AH Group had positive attitudes toward forming foreign joint ventures, and considered that such joint venture is an important learning strategy with at least many benefits (Anonymous, 1997b).

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[193] During its start-up, Firm AH supplied automotive tooling (jigs and dies) to only Ford and Mazda. Now it wanted to supply these products to the other carmakers, including the luxury and quality-conscious European carmakers.

[194] Here a conceptual drawing, supplied by the carmakers, does not contain the detailed specifications. Firm AH Group had to fill in these specifications; the Group had achieved this in its low-volume jig design and thus constitutes evidence that the firm had improved its design capability.

6.2.2 Firm CPC (1971 – pre-1997 crisis)

External Factors Shaping Firm CPC Strategies

Throughout the 1970s, the Thai automotive industry had two significant changes: the implementation of the local content requirements (LCR) and the incipient production expansion through increased FDI in automotive assembly plants. Similarly, on the electrical appliance industry, the foreign firms had decided to invest in Thailand and set up more assembly plants[195] (personal interview with Firm CPC President, December 18, 2004). Firm CPC had shifted its learning strategy in response to a business expansion strategy based on related product diversification. The expansion strategy involved two projects: the diversification of Firm CPC product and the establishment of a new joint venture firm, Firm BFC[196].

The product diversification strategy engaged by Firm CPC was the production of plastic parts for electrical appliance (such as electric fans) and Firm BFC focused on the production of a new material, polyurethane foam, which was later used by Firm CPC in the production of auto-parts (motorcycle seat). Even though the strategy was product diversification per se, the learning associated with the production of these simple plastic parts for electrical appliances was proved to be useful preparation for the supply of future more complex motorcycle and auto-parts.

Competitive and Learning Goals

From 1970s to the pre-1997 years, the Thai auto-part industry had grown, with rapid growth during the 1985 to pre-1997 crisis. The goal of Firm CPC was to diversify its product offerings to supply plastic parts for electrical appliances (in the 1970s), for motorcycle parts (in the 1980s) and automobile parts (in the 1990s). The strategic goal was focused solely on product diversification and it was not strictly strategic; it did not plan for other managerial dimensions such as human resources development. The goal incorporated

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[195] The digression here into the electrical appliance and other industrial products was for the purpose of illustrating the path of the learning strategy of Firm CPC. It assists in elaborating on the evolution of Firm CPC and its affiliated firms, how they impact on the learning strategy of Firm CPC.

[196] The firm was owned and operated by a family member associated with Firm CPC President. As far as degree of involvement, Firm CPC President was just a passive shareholder of Firm BFC. There was very little collaboration in terms of technology transfer (personal interview with Firm CPC President, December 18, 2004). It is important to note that Firm CPC and Firm BFC Group existed as independent and separate legal entities.

plans for the purchase of new technology[197], but the firm did not plan for the effective utilization of such technology, since the quality of skilled human resources was deficient.

Capability Gap and Gap-Closing Strategy

During the 1970s, when Firm CPC started the manufacture of plastic parts for electrical appliances, it lacked the ability to design and maintain the plastic injection molds; this constituted one significant technical knowledge gap. The firm learning strategy involved learning by trial and error and much on-the-job experimentation. Firm CPC engineers carried out mold modification and maintenance based on the imported molds.

6.2.3 Firm CSP (2002 – 2004)

External Factors Shaping Firm CSP Strategies

After 2000, the Thai automotive industry was completely liberalized with the full abandonment of local content requirements (LCR). Since start-up and during business expansion, Firm CSP prepared to become a capable OEM auto-part supplier by engaging in systematic work documentation and obtaining quality accreditation such as the ISO 9000, which was achieved in less than one year after initial start-up.

Competitive and Learning Goals

Firm CSP planned to move up the supplier tier structure by gaining more international quality accreditation. It had a competitive goal to meet all the minimum hurdles (good quality, low cost and on-time delivery) to become a competent OEM auto-part supplier and aimed to increase its domestic market share, supplying more OEM auto-parts to virtually all the carmakers. During the expansion phase, Firm CSP did not plan for learning any export activity nor did it plan to learn substantial design activities.

Capability Gap and Gap-Closing Strategy

Due to a lack of systematic work standards, Firm CSP lacked the ability to maintain continuous manufacturing cost reduction, to improve auto-part quality, and to meet the targeted on-time delivery, as requested by the carmakers. To close this capability (knowledge) gap, Firm CSP planned to collaborate actively (and continuously) with several

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[197] About a year prior to the 1997 financial crisis, Firm CPC planned to invest in the modern manufacturing tools such as CAD and CNC machines.

public organizations[198], devising methods to meet the challenge of continuous cost reduction while maintaining product quality and on-time delivery.

6.2.4 Firm D Group (1980 – pre-1997 crisis)

External Factors Shaping Firm D Group Strategies

Due to the continuous phased increase in LCR for both automobiles and motorcycles throughout the latter half of 1970s and the 1980s, most Japanese carmakers decided on the development of a low-cost vehicle capable of using higher local content and had a lower selling price suitable for most Asian markets[199]. In the early 1990s, Honda planned to develop its City model, and Toyota also planned to launch its Soluna model. The awareness of the Japanese carmakers' localization strategy enabled Firm D Group's President to identify a learning opportunity. He actively searched for capable foreign engineers as well as extensively negotiated with these carmakers to allow his engineering team the opportunity to engage in learning simple auto-part design activities.

Competitive and Learning Goals

There were two strategic goals. The competitive goal was the formation of new Japanese joint ventures. Many Japanese small firms wanted to establish a manufacturing base in Thailand, but they were unsure of how to cope with the local bureaucratic issues. In his words, Firm D Group's President described the situation during the late 1980s and early 1990s:

> "I thought to myself that each small-to-medium-sized Japanese firm contained its own accumulated technical know-how. The issue was how can we interest them [the Japanese firms] to come and invest in a joint venture in Thailand since most of them were afraid of excessive overhead costs in dealing with the bureaucratic processes such as the Board of Investment (BOI) applications, employees salary and the search for capable and qualified human resource" (personal interview with Firm D Group's President, May 12, 2004).

The learning goal was the planned engagement in product design activities; Firm D Group's President decided that he wanted to move up the technological ladder, from a mere OEM producer to having its own tooling and product design capability. The formal technical assistance project was formed between the Honda (automobiles) R&D Unit and

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[198] These are public organizations such as NSTDA and TAI.

[199] The Japanese carmakers dubbed the product, the "Asian car" (Panichapat and Kanasawat, 1997: 23).

Firm D Group. The project, the development of a parking hand brake design, was commenced during the early 1990s.

Capability Gap and Gap-Closing Strategy

Since Firm D Group's President wanted to engage in more foreign joint ventures in a systematic way, the firm lacked the administrative system to handle the general management issues. He decided to set up two administrative firms (Firm CKB and Firm MNIH) to oversee the formation of such joint ventures (personal interview with Firm D Group's President, May 12, 2004). In addition, the purpose of forming many new joint ventures was to support the technical knowledge gaps on the design capability. In addition, the President also planned an investment in a new firm, Firm D-tec, to engage in automotive tooling design and manufacturing. Firm D-tec will act as an internal supporting department for the increasing product design activities.

6.2.5 Firm L (1991 – pre-1997 crisis)

External Factors Shaping Firm L Strategies

By the early 1990s, the Thai automotive industry was partially liberalized with high growth prospects. In 1990, Firm L was established as a separate, independent firm from the previously dissolved Japanese-Thai joint venture; the learning orientation shifted from that of a joint venture (dependent) to that of an independent Thai-owned firm. During the first-half of the 1990s, the marketing plan was to supply wheels to the replacement equipment manufacturing (REM) market and implement the new production technology. The supply to the REM market was a good start since it did not require high quality, cost, or on-time delivery as required by the OEMs. Hence the REM market served as a basic learning platform for Firm L to acquire its indigenous production capabilities prior to engaging in the more advanced OEM (or export) production capability. Later in the mid-1990s, Firm L planned to engage in extensive marketing activities overseas to increase its export volume. It also formulated plans to actively upgrade the existing product quality, from a domestic REM level to that of export-quality products (personal interview with Firm L Factory Manager, May 5, 2004).

Competitive and Learning Goals

Equipped with modern production technology, Firm L aimed to become an independent Thai manufacturing firm producing high-quality aluminium alloy wheel for export. Its competitive goal was to achieve a premium brand status. Furthermore, it planned to invest heavily in the state-of-the-art production technology to ensure that such a strategic goal was achieved. But its learning plans included neither sufficient development of the human resources nor its existing suppliers[200]. It was not until recently that the firm started to invest intensively in a formal, human resource training scheme (and a training facility).

Capability Gap and Gap-Closing Strategy

Since its establishment in the 1990, Firm L had been targeting the domestic auto-part market, with very little focus on exports. Consequently to successfully export, Firm L faced two significant challenges: the product quality must be at an internationally acceptable level and the limited overseas marketing activities and narrow distribution network led to deficient awareness of customer needs. In addition, since alloy wheels are considered as fashion automotive accessories, an awareness of current wheel trends is a necessary input to the product design process.

To address the capability gaps, Firm L President engaged in developing a systematic work method and international product testing standards. He undertook an active overseas travel program, to search for new technology and potential export markets. The President started to allocate financial resources for extensive marketing-related travels, both domestic and overseas. These marketing activities assisted Firm L in monitoring the shift in customer needs. This export activity was crucial for survival during the post-1997 crisis years.

6.2.6 Firm S Group (1966 – pre-1997 crisis)

External Factors Shaping Firm S Group Strategies

During the 1970s and the 1980s, there were two main industrial changes that shaped Firm S Group learning strategy. First, when the progressive localization scheme became

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[200] Most of Firm L suppliers lacked the operational discipline; they tended not to strictly follow the delivery schedule and caused much production delay. This was one of the obstacles that Firm L had to overcome in order to be qualified as a capable OEM auto-part supplier (personal interview with Firm L Design Department Chief, December 8, 2004).

effective in the mid-1970s, many Japanese firms decided to comply by investing in more local auto-part manufacturing facilities. As a result, some Japanese auto-part suppliers decided to provide the technical assistance to Firm S Group and encouraged the Group to invest in an expanded, modern manufacturing plant[201].

Secondly, the rapid expansion of the Thai automotive industry (during 1985 to pre-1997 crisis) had led to increase in FDI by multinational carmakers and global auto-part firms. This expansion started since the 1985 Plaza Accord Agreement. Most Japanese carmakers planned to relocate some manufacturing activities to Thailand. Together with the government's progressive localization policy, this had bestowed many local Thai firms with the learning opportunities through forming new foreign joint ventures[202]. Nevertheless the decision of these multinational carmakers to increase their FDI caused Thai auto-part suppliers such as Firm S Group to shift from REM to OEM market. The shift necessitated a transition in the learning strategy; since as an OEM-parts supplier, Firm S Group must comply with a more stringent quality, low cost and on-time delivery (QCD) requirements.

In the 1990s, the Thai automotive industry started to liberalize (with continued increases in LCR) and many Japanese auto-part firms were interested to invest in Thailand. Firm S Group responded by forming new joint ventures. The objective was to acquire production know-how related to auto-parts such as aluminium wheels, intake manifolds, aluminium castings, and brake parts (Anonymous, 1989a). In addition, during the early- to mid-1990s, Firm S Group planned for active engagement in many technical assistance agreements; many of which were a renewal of the existing contracts.

Competitive and Learning Goals

To seize the opportunity available within the growing Thai automotive industry, Firm S Group had competitive and learning strategies of transitioning from a REM auto-part supplier to a first-tier OEM auto-part supplier and learning to produce higher quality products. The Group foresaw future business opportunities in the continued increase in

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[201] As for the US and European carmakers, they did very little to comply with the government's localization scheme and by early 1980s some of them had decided to leave Thai automotive industry altogether.

[202] As for the US carmakers, they did not re-enter the Thai automotive market until the early- to mid-1990s; and their re-entry strategy was hampered by the 1997 financial crisis (see for example, General Motors, Thailand).

FDI and more production expansion by the carmakers; this will lead to more OEM auto-part production and sales.

Knowledge Gap and Gap-Closing Strategy

Having been REM auto-part supplier for nearly two decades, Firm S Group lacked technical know-how on the OEM auto-part production. It planned to upgrade the production process and products to meet the OEM requirements on cost, quality and on-time delivery. Firm S Group realized its lack of advanced quality control system and systematic work procedures; consequently it planned to obtain international quality accreditations. In addition, in the early 1990s Firm S Group planned an investment in a computerized quality control system to ensure that its products will meet the strict quality standards as imposed by the multinational carmakers; "quality is inspected at almost every stage of the production process" (Firm S Group corporate website, accessed March 15, 2006).

6.2.7 Firm SOM (1995 – pre-1997 crisis)

External Factors Shaping Firm SOM Strategies

The Thai automotive industry during early 1995 to pre-1997 crisis continued to grow with much foreign direct investment (FDI) from the multinational carmakers. Contrary to industrial growth, Firm SOM, after its incorporation in late 1994, did not engage in any substantial business expansion. Likewise it did not actively engage in much human resource development program. Its learning strategy was still informal, lacking any explicit ambitious goal. This was due to the poor training and awareness of its management staff; all had technician background with limited formal education. Similar to the start-up phase, Firm SOM lacked professional managers to guide its learning strategy. The firm basically relied on production orders from a few firms that Firm SOM President and his brothers used to work as former employees. Relying on few large production orders exposed Firm SOM to high risk of having such orders cancelled, thus impacting the firm cash inflows.

Competitive and Learning Goals

There was no strategic goal. At best, Firm SOM had mostly conservative goals that directed the firm to meet the minimum production requirements in general continuous improvement activities and lacked specific targets on why such activities should take place. Moreover, the firm did not engage in any explicit goal-stretching learning strategy. The firm was passively producing according to its main customer (Firm SML) orders; this was the firm primary goal. The firm was not aware of the risk exposure due to limited customer base. In other words, if anything happen to the sales order from Firm SML, the firm would be in serious financial trouble.

Capability Gap and Gap-Closing Strategy

Since Firm SOM did not have any ambitious goal, it felt that all the production operations were meeting the pre-specified targets and that there were no significant threats emerging from deficient technical knowledge. The lack of awareness was due to Firm SOM President poor managerial capability, lacking the monitoring of the current competitive situation. This deficiency was partly due to the President limited training in formal education and insufficient external linkages.

With vague understanding of the competitive landscape, Firm SOM did not formulate any gap-closing strategy to address the existing knowledge weaknesses. For instance, Firm SOM did not bother to search for either potential technical assistance or joint venture agreements. It solely relied on a single source of informal technical assistance (its main customer, Firm SML). Consequently the firm had high risk exposure (having only one customer) and was ill-prepared to compete for future business opportunities.

6.2.8 Firm TKT (1991 – pre-1997 crisis)

External Factors Shaping Firm TKT Strategies

The Thai automotive industry started to liberalize in the 1990s with removal of import ban on small cars, lowering of tariffs and the ASEAN Free Trade Area (AFTA) in 1992. The latest liberalization measure imposed by the government was the removal of local content requirements (LCR) in 2000. All these had impacted Firm TKT learning strategy.

In line with the industrial expansion, Firm TKT learning plan involved two significant developments. First was a major manufacturing plant expansion. The new facility commenced construction in 1988 and became operational in 1991. It also registered a new firm, Firm TKT-PI[203], whose operation focused only on export products. To significantly export meant that the new firm will receive the tax incentives from the Board of Investment (BOI) (SET, 2005b). Second was the formation of Japanese-Thai joint venture; the aim was to acquire production know-how in chrome plating process for plastic auto-parts.

Competitive and Learning Goals

Having been an REM auto-part supplier for nearly two decades, Firm TKT lacked technical know-how for OEM auto-part production. It planned to expand production capacity and invested in modern plastic injection machines. Furthermore, it planned to learn to perform mold maintenance in-house. These the competitive and learning goals, aimed at better meeting the requirements enforced by the foreign OEMs. Though wanting to achieve the OEM supplier status, the learning goal did not involve learning from foreign joint ventures or soliciting much formal technical assistance. Firm TKT's interest in foreign joint venture was limited until 2004; when the new Managing Director (MD) and Assistant MD set new competitive and learning goals.

Capability Gap and Gap-Closing Strategy

The firm lacked the ability to undertake systematic OEM auto-part production. Having started as a small family job shop, the firm lacked systematic work standards. To close this knowledge deficiency, it engaged in public training courses to focus on the development of systematic work procedures and international quality system accreditation. In addition, to enable successful penetration into the supplier group of the Japanese carmakers, Firm TKT engaged in a new Japanese-Thai joint venture, aiming to learn from the expert the chrome-plating process for plastic auto-parts. This was the *only* formal joint venture that occurred, and the firm did *not* actively search for any more foreign joint ventures.

[203] In 2002, this firm was liquidated with the rationale that the company had decided to focus mostly on the domestic auto-part market. This was due to the rapid increase in domestic demand of plastic auto-parts caused by establishment of many export production bases of the multinational carmakers (SET, 2005b).

6.2.9 *Firm TS Group (1981 – pre-1997 crisis)*

External Factors Shaping Firm TS Group Strategies

During the latter half of 1980s, many Japanese carmakers decided to increase investment in Thailand as the result of both the 1985 Plaza Accord Agreement as well as the booming Thai economy with staggering increases in domestic vehicle sales. Mitsubishi was no exception, and it envisaged a bright future for the Thai automotive industry. Firm TS Group's opportunity came in the early 1990s when Mitsubishi had announced its plan to set up an export base in the eastern region of Thailand and requested Firm TS Group to follow as their first-tier Thai supplier (Anonymous, 1990)[204]. The Group invested in a new production plant (Firm TSLA) suitable for mass production.

By 1993 the government provided generous incentives (investment and tax) for foreign carmakers to establish an export production base in Thailand. Mitsubishi responded positively with a relocation of its entire one-ton pick-up truck production to Thailand (Terdudomtham, 1997). By mid 1990s, other foreign carmakers (such as Isuzu, Toyota, Nissan, Ford/Mazda and General Motors) followed suit, establishing Thailand as a regional export base of one-ton pick-up trucks. "All (Japanese) manufacturers are now considering expansion in this country [Thailand]" (Anonymous, 1993).

These changes had several impacts on the operations of Firm TS Group. It had to sharply increase the annual production volume and product diversity and improve auto-part quality to match the level required for export. With the entry of the US carmakers[205], Firm TSLA had to obtain the QS 9000 accreditation in order to successfully be accepted as first-tier supplier to the "Big Three" US carmakers[206]. It could be said that these changes impacted Firm TS Group's learning strategy (making it more aggressive) and had shaped the learning path, particularly that of Firm TSLA.

Competitive and Learning Goals

Firm TS Group had a primary, competitive goal, to remain as a first-tier auto-part supplier for all carmakers. It realized that to continue to compete and serve as a first-tier

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[204] Prior to the public announcement, Mr. S (Mr. P older brother) was already preparing for the big business expansion. "[Mr. S] knew that the Japanese automaker [Mitsubishi] planned to relocate its one-ton pick-up truck production base from Japan to Thailand" (Panthong, 2005a).

[205] Prior to their entry, Firm TS Group had dealt with mainly Japanese carmakers, who required only the quality accreditation of ISO 9000. But the quality requirements imposed by the US carmakers were different.

[206] These are "Big Three" US carmakers: General Motors, Ford and DaimlerChrysler.

supplier, it must "follow source" the auto-parts for carmaker Mitsubishi (the case of Firm TSLA). In addition, the Group also realized that as more joint ventures were formed, and production tasks accumulated, it needed to learn to set up a formal corporate structure with clear demarcation among the business groups, ensuring effective internal corporate division of labor; this was its learning goal. The goal underlying the corporate restructuring was twofold: to ensure effective technology transfer (and learning) and to enable effective management at a corporate level. Hence the competitive and learning goals involved more than one focus and involved the long-term ambitious objective in learning the product design.

Capability Gap and Gap-Closing Strategy

Prior to the establishment of Firm TSLA, the Group lacked the ability to undertake a systematic, mass production of OEM auto-parts with strict on-time delivery. To close this knowledge deficiency, Firm TSLA is locating literally "next door" to the carmaker Mitsubishi[207] (researcher's own direct observation, October 25, 2004) and whenever there were any problems regarding the products manufactured, the firm can immediately dispatch its own employees to rectify the situation quickly[208]. During the early expansion phase, Firm TS Group had acquired little transfer of technical knowledge through technical assistance and joint venture agreements.

In terms of planning for more systematic technology transfer, Firm TS Group engaged in new foreign joint ventures and technical assistance agreements. The Group built its own engineering team, capable of incipient design of automotive tooling and simple auto-parts. Through planned technical collaboration, the engineers and technical managers were trained extensively both in-house (on-the-job) and overseas at the carmaker's parent firms (Japan).

6.2.10 Summary of Different Firm Strategies (expansion phase)

During the expansion phase, all firms engaged in active plans to improve their existing manufacturing processes.

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[207] The Mitsubishi carmaker set up its own production cluster, comprising more than 14 companies (including several of Firm TS Group's subsidiaries).
[208] In the Thai automotive business, this policy enacted by both the carmaker and their first-tier supplier is called "door to door" policy (own direct observation during Firm TS Group meeting, December 20, 2004).

Table 6.3 Summary of Firm Strategies During the Expansion Phase

FIRM	EXPANSION PHASE		
	Competitive and Learning Goals	Capability Gap	Gap-Closing Strategy
Firm AH Group	• To learn incipient tooling design activity and export the product • To increase market share by supplying OEM tool for all the carmakers	• Lacking manufacturing ability to manufacture export quality product • Lacking marketing ability to increase the domestic market share	• Planned searching/ hiring/ poaching of highly experienced engineers and technicians • Planned set up of the internal engineering department • Planned searching for foreign partner for joint ventures
Firm CPC	• To diversify to produce plastic parts for electrical appliances and auto-parts • Poor learning due to limited human resources	• Lack the ability to maintain the tooling used in production	• Planned investment in learning by trial and error and experimentation • Planned investment in modern production technology
Firm CSP	• To increase the domestic market share, learning to make OEM auto-parts	• Lack the ability to continuously reduce production cost, while maintaining high quality	• Search unsystematically for public organizations assistance as well as informal assistance from foreign customers
Firm D Group	• To form more foreign joint ventures • To learn simple product design activities	• Lack the administrative firm to handle all the bureaucratic related to foreign joint ventures • Lack the indigenous ability to design auto-parts	• Plan to invest in new firms to oversee joint venture activities • Search for capable foreign engineers and hire them, then negotiate with the carmakers for participation in upstream product design activities
Firm L	• To engage in modern production technology • Learning to export products	• Lack the capable engineers to run the modern technology • Lack the knowledge of the overseas markets	• Planned investment in systematic human resource training facility and programs • Planned travel overseas and active marketing activities

Source: own elaboration based on the research

Table 6.3 (continued). Summary of Firm Strategies During the Expansion Phase

FIRM	EXPANSION PHASE		
	Competitive and Learning Goals	**Capability Gap**	**Gap-Closing Strategy**
Firm S Group	• To transition from REM auto-parts to OEM auto-part manufacturers • To implement a modern production technology	• Lack of experience and technical knowledge on OEM auto-part requirements	• Planned formal technical assistance agreement with foreign auto-part firms • Planned investment in modern production technology
Firm SOM	• Conservative goal of meeting the usual production requirements: cost, quality and on-time delivery • Lack of any stretched, ambitious goal	• Unaware of the existence of several capability gaps	• Unawareness of capability gap led to lack of active planning for gap-closing strategy and poor preparation for future competition
Firm TKT	• To transition from REM parts to manufacture OEM auto-parts and electrical appliance parts	• Lack of technical knowledge and experience on OEM parts • Partially aware of the importance of foreign knowledge sources	• Limited planning on new foreign joint ventures, limited knowledge acquired through formal collaboration with foreign firms • Planned systematic work procedure and quality system
Firm TS Group	• To become first-tier OEM auto-part manufacturer • To set up a formal corporate structure with clear division of labor • To engage in incipient product and tooling design capability	• Lack of formal technical knowledge on mass production of OEM auto-parts • Lack of engineering experience on tooling and product design	• Planned numerous joint ventures and technical assistance agreements • To hire professional managers and develop a capable engineering design team • Planned construction of a production plant located literally next to the carmaker, "follow source"

Source: own elaboration based on the research

Some firms (Firm AH Group, Firm D Group, Firm S Group and Firm TS Group; see Table 6.3) were in a transition from an ordinary supplier (i.e. producing at various positions in the supply chain) to a strategic first-tier supplier position. These first-tier OEM suppliers engaged in quite aggressive learning strategies, incorporating extensive technical collaboration through technical assistance and joint venture agreements. In addition, these suppliers engaged in systematic quality accreditations and extensive, internal on-the-job training of their human resources. Two notable firms engaged in ambitious product export (for e.g. Firm L) and automotive tooling export (for e.g. Firm AH Group) activity. In terms of incipient tooling design activities, there were three firms that engaged in such endeavours: Firm AH Group, Firm D Group, and Firm TS Group. These three firms pursued realizable stretch goals that were not overly ambitious.

Other firms (Firm CPC, Firm CSP, Firm SOM and Firm TKT) were planning (or attempting) to transition themselves from small job shop production toward OEM auto-part manufacturers. The competitive and learning goals of these firms focused on and pursued the acquisition of routine production capability through three primary means: 1) investment in larger, more modern and systematic production facilities, 2) learning by trial-and-error and extensive experimentation and 3) sourcing of external technical experts (mostly domestic and a few foreign) (except Firm SOM, who did not source anyone).

With regard to capability gaps, all firms, to varying degrees, lacked the tooling design capability and the experience of export activity. For instance, Firm SOM seemed to be the most deficient since it not only lacked product design experience; it also lacked the managerial ability to run a viable manufacturing business. On the other hand, other firms (Firm AH Group, Firm D Group and Firm TS Group) were very alert and highly opportunistic always on the lookout for new learning opportunities. For instance, Firm AH Group set an ambitious goal of exporting its indigenous automotive tool since the late 1980s. Though they lacked formal product design capability and higher-level technical knowledge, these firms can utilize their aggressive learning strategy and entrepreneurial ability to extensively search for ways to overcome the capability gaps.

6.3 Strategies During the Adaptation phase

Recall from Chapter 5 that the changes within the Thai automotive industry, during the transition from expansion into adaptation phase, included:

- The removal of import ban and opening up of the industry to competition in the early 1990s
- The severe impact of the Asian financial crisis in 1997
- The establishment of Thailand Automotive Institute (TAI) in 1998
- The removal of local content requirement in 2000, i.e. full liberalization
- The aim to become an international export base of one-ton pick-up trucks

6.3.1 Firm AH Group (post-1997 crisis)

External Factors Shaping Firm AH Group Strategies

Even though the 1997 crisis had some severe impacts on Firm AH Group, they were well ameliorated by the opportunities opened to the firm. The export strategy was "the way out" of the crisis[209]. Since the domestic auto-part demand shrank drastically, Firm AH Group searched for export markets. Soon after the 1997 crisis, the Group exported products worth 150 million Baht, which is about 60 per cent of the production volume (Anonymous, 1997a) and in 1998, it increased its export volume to 70 per cent of the total production (Anonymous, 1997b). By increasing exports soon after the crisis, the Group turned the economic crisis into the business opportunity which leads to increase sales earnings. Deyo and Doner (2000: 138) commented that:

> "[Firm AH Group] was one of a very few local auto firms to *grow* during the crisis. As of summer of 1999, there were no layoffs and the company continued to attract new customers, especially for dies and jigs."
> [italics added]

Firm AH Group's President was fully aware of the increased liberalized competitive environment. He actively searched for external business partners to strengthen the firm's technical knowledge. In addition, the Group searched overseas for potential acquisitions and joint ventures. Firm AH Group planned to export its flagship product, the assembly jigs, through an overseas facility. Furthermore, the Group views the two large Asian markets (i.e. India and China) as major opportunities, and plans to invest in China, through an acquisition (Anonymous, 2004c), and it continues to look for a potential investment in India.

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[209] "[Firm AH] used the crisis of 1997 to actually strengthen its position, invest in capacity, rationalise the market and emerge as a winner (Pandey, 2005).

Competitive and Learning Goals

Firm AH Group plans to transition itself from manufacturer of simple tooling (jigs) to higher-level, automated tooling, and to start supply of auto-parts to the luxury European carmakers. For instance, the firm aims to learn and develop automotive assembly jigs with world-class quality for Mercedes Benz and Volvo. In addition, the Group also aims at internationalizing its manufacturing facility across ASEAN, China, and India. These plans formed the Group's competitive and learning goals in becoming a leading regional auto-part supplier.

Capability Gap and Gap-Closing Strategy

Since in the past the Group had been supplying assembly jigs mainly to US and Japanese carmakers, it lacked the experience regarding producing automotive tooling for the more quality-conscious European carmakers. After an extensive search, the Group planned to acquire a German subsidiary in Malaysia. This German firm had been supplying assembly jigs to Mercedes Benz and through acquisition the Group attempted to acquire technical knowledge on the European automotive jig production. Other gap-closing plans included the investment in an engineering unit in 2004 (Firm AE[210]). In terms of human resources, Firm AH planned to hire and train a large pool of formal engineering graduates to manage the operations of its new firms (both domestic and overseas).

6.3.2 Firm CPC (post-1997 crisis)

External Factors Shaping Firm CPC Strategies

The impact of the financial crisis on Firm CPC was severe, but not lethal. The financial crisis had caused Firm CPC to reallocate its worker by shortening each work shift. Prior to the crisis, the firm organized its workers into two shift periods (each is 12 hours long). After the crisis, the firm retained roughly the same number of workers but dividing the total work hours into three shifts (each is 8 hours long). Hence each worker had reduced work hours (from 12 to 8 hours). In this way the firm saved on the labor costs (personal interview with Firm CPC President, December 18, 2004).

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[210] This firm is devoted exclusively to engineering research and product design activities through computer-aided design, manufacturing and engineering (CAD/CAM/CAE) tools.

As described earlier, Firm CPC produced diversified products, from household goods, electrical appliance parts, motorcycle parts and auto-parts. The auto-parts were the most affected by the crisis, but the impact on other goods was not as severe. The President stated,

> "The impact of the crisis on motorcycle parts was not as severe as the auto-parts. Similarly, the severity of the impact on the orders of electrical appliance parts was (on average) less severe than that of motorcycle parts. Hence we relied on these orders to survive the crisis" (personal interview with Firm CPC President, December 18, 2004).

Firm CPC did not rely on much export as part of survival strategy during the financial crisis.

In the 1990s, the Thai automotive industry had liberalized with the commitment to the ASEAN Free Trade Agreement (AFTA) in 1992, followed by the full abandonment of LCR in year 2000. Moreover, the ban on small car imports as well as the restriction on foreign equity percentage in joint venture firms was lifted. Firm CPC viewed this liberalization as a threat encroaching on its domestic market share. The President stated,

> "[Firm CPC] along with the Thai government have to adjust ourselves to compete at a new level. If we do not have efficient management system (both public and private), the Free Trade Agreement (FTA) became a real threat. On the other hand if we are prepared managerially, then FTA could be our opportunities" (personal interview with Firm CPC President, December 18, 2004).

Hence Firm CPC only viewed the liberalization of Thai automotive industry as the opportunities under the condition that both the public organizations and private firms upgrade themselves managerially and collaborated with each other. Furthermore, it viewed that this adjustment was unlikely to occur, due to the complex bureaucracy plaguing the Thai industrial development system (Ibid.).

Competitive and Learning Goals

The firm did not have any explicit goal stating a particular objective such as it wanted to achieve a first-tier auto-part supplier. Firm CPC President said:

> "In the auto-part business (excluding motorcycle parts), we are not in the first-tier group yet. I think we belong to the third tier group [He was laughing jokingly]" (personal interview with Firm CPC President, December 18, 2004).

Firm CPC merely wanted to increase its domestic share (both auto-parts and electrical appliance parts) and continued with the "general" continuous improvement activities. Hence, Firm CPC's goal lacked any ambitious learning plan to engage in higher value-added design activity.

Capability Gap and Gap-Closing Strategy

Since Firm CPC lacked a definite commitment to become a first-tier auto-part supplier, it did not bother to search extensively for technical assistance, either foreign assistance or joint venture agreements. The firm lacked the learning strategy to address the existing knowledge gap regarding the auto-part production technology. Firm CPC President felt ambivalent about the plan to invest (and commit) in modern plastic injection process software[211]. As a result, the firm was ill-prepared for future competition within the Thai automotive industry.

6.3.3 Firm CSP (2005 to current)

External Factors Shaping Firm CSP Strategies

After 2000, the Thai automotive industry was fully liberalized and competition among the auto-part firms became more intense. To thrive in the new environment, Thai auto-part firms had to ensure that they can meet the minimum performance requirements dictated by the multinational carmakers. This was the rationale for Firm CSP, in 2004, to undergo two major upgrades on quality standards: the upgrade on ISO 9000 (from year 1994 to year 2000 version) and the latest ISO/TS 16949[212] accreditation. Hence it could be said that Firm CSP was well aware of the liberalized regime and planned its learning strategy to acquire an internationally, well-accepted quality standards. Compared with prior phases, the firm was aware that hiring knowledge workers, such as engineering graduates was crucial to the success in upgrading quality standards. The firm planned to invest further to ensure its future competitiveness.

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[211] This software is called Moldflow. It has the capability to model (in real time) the temperature profile and flow profile of plastic melt within the injection mold. Through such analysis, the firm is able to save time and cost on its mold design activities.

[212] This quality standard is the most up-to-date in the auto-parts industry. The Japanese, the US and the European carmakers accept it as the standard that all first-tier auto-parts supplier must possess.

Competitive and Learning Goals

Besides aiming at becoming a first-tier auto-part supplier and to increase the domestic share, Firm CSP also aimed at finding the "right" potential foreign joint venture or technical collaboration partner. Currently the strategic goal also involves the search for potential European OEM customers. Consequently, it could be said that compared with prior to 2004, now Firm CSP is more active in its search for potential technical collaborative partner.

Capability Gap and Gap-Closing Strategy

Having started as a small family-owned firm, Firm CSP quickly grew into a medium-sized firm, but still lacked formal linkages with foreign firms. It acquired most production knowledge from its recent investment in plant expansion and interaction with the foreign OEM customers. It did not acquire higher-level knowledge on automotive tooling and product design. Consequently, the capability gaps existed in these areas, and they impacted Firm CSP's future business opportunities. Carmakers (such as Isuzu) had recommended that Firm CSP participate in the early product development activities. Aiming to close such gaps, the General Manager travelled to overseas conferences in search of a potential technical collaboration partner. But the search plan was passive as the General Manager stated that his firm is not ready to commit to investment to enable future co-design activities:

> "Isuzu wanted my design engineers to join in the auto-part co-design activities in Japan; this means that I have to send my Thai engineers overseas. I have *not* done so yet, as it is too expensive to arrange for such travel" [italics added] (personal interview with Firm CSP General Manager, November 23, 2004).

Hence it is highly likely that Firm CSP will not include much design activity in the near future. For the long term, it remains to be seen how Firm CSP would deal with the auto-part design and development issue.

6.3.4 Firm D Group (post-1997 crisis)

External Factors Shaping Firm D Group Strategies

The 1997 crisis crippled the domestic demand for automobiles as well as motorcycles. The severity of the impact on Firm D Group was due to the fact that the firm had focused a great proportion of its business on auto-part manufacturing. Firm D Group's President described the impact:

> "Out of 2,200 employees, I had retired about 300 and these were temporary employees who stayed with the company for less than 4 months (the probation period). The rest of the employees, particularly the tooling design expert engineers and technicians, were retained" (personal interview with Firm D Group's President, May 12, 2004).

Hence the need to cut the overhead costs such as employee salary was necessary for survival throughout the financial crisis years. But the crisis impact was not lethal as it did not significantly affect the sales volume of the electronic component, as most parts were targeted for export. This was the basis of the survival strategy throughout the post-crisis years. The President described:

> "During 1997, I had about 73 per cent of my production output tied to auto-parts and the remainder supplied to electronics industry. Once the crisis hit, the Thai Baht had devalued. This created business opportunities for the electronics parts since most were targeted for export. Hence my move was to decrease the proportion of auto-part manufacturing and increased the production of electronics parts. The earnings generated from the electronics parts export sales, even though did not generate huge profits (i.e. business growth rate was stagnant), but had enabled me to pay my remaining employees their monthly salary" (personal interview with Firm D Group's President, May 12, 2004).

Hence it could be argued that without proper product diversification implemented prior to the crisis, Firm D could have been significantly affected (financially) by the 1997 crisis.

The growth in FDI meant that Firm D Group, it had to compete head-on with larger, more technically-capable global suppliers. The President elaborated,

> "The opportunities for pure Thai[213] auto-part firms will be smaller and smaller, once global firms like Denso and Toyoda Gosei had decided to enlarge its Thai-based operation (the previous operation was already huge, the upcoming-new operation is even larger). These global firms compete for production orders in aluminium die casting business from Toyota (Thailand); hence they are our domestic competitors. They also exported their finished products to the same overseas markets that we have been exporting our products; hence they are also our international competitors" (personal interview with Firm D Group's President, November 16, 2004).

However great the threat, there were ample business opportunities. Having won the contract to supply auto-parts, the Group was trying to engage in further product

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[213] The Thai government uses the phrase "pure Thai" to denote the auto-part firms that have either 100 per cent Thai ownership or Thai equity majority ownership (Kitaphanich, 2002).

development projects from Toyota. Firm D Group's President expressed his learning strategy with Toyota,

> "Since early 2000, Thai Board of Investment (BOI) announced its newest policy; the Science, Technology and Innovation (STI) elements and for carmakers to qualify for such incentives they must demonstrate that they have engaged in research and product development activities with a Thai firm. Hence, I am negotiating with Toyota; pointing out that it can qualify with this incentive if it engages in a collaborative project with Firm D Group. The aim is to further enhance the Group's product development capability, particularly the development of parking hand brake. I also asked for Toyota's permission to send in 'guest engineers' to participate in the design, either in Thailand or Japan. The Toyota executives had responded positively" (personal interview with Firm D Group's President, November 16, 2004).

Competitive and Learning Goals

Hence from the description above, it could be argued that Firm D Group's strategic goal was not merely a business expansion on hand brake production and sales, but also the leveraging of know-how on improving the current product development activities, to "break into" the once highly centralized research and design (R&D) activities among the conservative *keiretsu* supplier group of Toyota. This was indeed a high stretch goal, focusing on knowledge acquisition to open future business opportunities. In addition, Firm D Group planned to follow the Japanese motorcycle and carmakers, to secure the market share within the ASEAN region (Vietnam, Laos and Cambodia) (personal interview with Firm D Group's President, May 12, 2004). This competitive goal is indeed a challenging one and requires support such as: meticulous planning, negotiation, personal contacts and a strong, experienced engineering design team capable of turnkey (i.e. design, manufacture and test) product and process development activity.

Capability Gap and Gap-Closing Strategy

Throughout the expansion phase, Firm D Group had all operations located domestically. Hence, the Group lacked the ability to "follow source" the foreign OEMs located regionally in Asia. Due to this lack of overseas manufacturing facility, the Group planned to invest in Vietnam, to produce motorcycle parts for Honda[214] (Firm D Group corporate brochure, 2004).

For further developing the flagship product (parking hand brake), the Group lacked the following capabilities:

- Lack of high-level linkage within Toyota to enable participation in value-added design activities;
- Lack of deeper understanding of polymer chemistry, the use of TPOs[215] as a substitute material. The Group's engineers lacked understanding of how this material would perform in its actual use in vehicle.

To address the knowledge gaps, Firm D Group's President attempted to bring in the research and development (R&D) department from its long-time Japanese joint venture partner. Pursuing the ambitious goal, Firm D Group wanted the Japanese partner to set up a local R&D firm based in Thailand[216]. With regards to the limited knowledge in material science, Firm D Group's President planned to solicit assistance from public research organization (such as MTEC and TAI), to assist in the development of the TPOs for hand brake. In addition, other research collaborative projects were planned. For instance, the plan to use computer-aided engineering (CAE) in modelling the process parameters for aluminium die casting process.

6.3.5 Firm L (post-1997 crisis)

External Factors Shaping the Firm L Strategies

The impact of the 1997 crisis on Firm L was severe, but not lethal[217]. The reason was the increase in exports. Soon after the 1997 crisis, Firm L decided to lay off a portion of its employees, those that were still working in the probation period[218]. Finding foreign customers was quite challenging, but nevertheless achievable through significant upgrade in product quality. Hence the learning strategy focused on ensuring that the products

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[214] Since Firm D Group has been a first-tier, strategic supplier for Honda, the motorcycle maker requested the Group to invest in a manufacturing facility in Vietnam. The recently established firm is a joint venture between Honda (Japan), Honda (Thailand) and a Vietnamese local firm (Tran, 2002: 21-22).

[215] Thermoplastic Polyolefins

[216] At the time of this writing, Firm D Group is still pursuing this learning goal.

[217] In fact the crisis impact even had positive effect on Firm L learning strategy. Since to enable successful export, Firm L engaged in multiple plans to upgrade the product quality and attempt to achieve on-time delivery.

[218] The firm had managed to keep the expert mold designer along with the other well-experienced engineering managers.

passed the required international product testing, and on the internal training the employees with systematic work procedures.

The ISO 9000 accreditation project, which had commenced shortly before the crisis, was accelerated during the post crisis years[219] and Firm L received the accreditation in 1998 (corporate website, accessed March 15, 2006). Thus it could be said that Firm L had converted the 1997 crisis into a catalyst for its employees to stretch their production capabilities and to thrive in the export market.

With the Thai government lowering the import tariff on auto-parts, many imported wheels flooded the Thai market, and posed a threat to Firm L.

> "These wheels came mainly from China and Taiwan, since the wheels over there faced stiff competition. Hence these small manufacturers have to develop 'quick copy' strategy to try to capture as best as possible higher market share overseas [i.e. inclusive of Thailand]" (Manager Online, 2005).

To neutralize the threat, Firm L implemented a novel marketing strategy, re-branding and creating customer awareness. In short, the firm tried to create awareness among Thai consumers that its wheel brand is at a premium level, and that the product met all the international safety standards.

Competitive and Learning Goals

Firm L's learning strategy involved a transition into the OEM market, specifically after the firm became more proficient with the REM production. It realized that the domestic consumers do not value the brand highly. Consequently, the firm planned to engage in an active brand awareness campaign to raise brand value perception. In this regard, Firm L attempted to supply its alloy wheel to the British Formula One; this project is currently ongoing (The Nation, 2005).

Capability Gap and Gap-Closing Strategy

A problem facing Firm L during exporting was the poor quality of its products[220]. To address this problem, Firm L created a systematic work procedure and training scheme. Another capability gap was the lack of experience in using computer simulation modelling

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[219] The acceleration of the ISO 9000 project was feasible due to the financial crisis. Production orders were down and this allowed more free time for the employees, who later decided to focus more time on the ISO 9000 project (personal interview with Firm L President, May 4, 2004).

[220] Historically, more than 85 per cent of the total production output was targeted at domestic consumers; the quality level was not able to match that of an export alloy wheel (personal interview with Firm L Factory Manager, May 5, 2004).

for the production process and mold design. In this area, Firm L collaborated intensively with Chulalongkorn University and TAI to acquire such advanced knowledge on design. In addition, Firm L intended to fulfil its learning goal by investing in the most up-to-date production technology, and subjected its engineers to learning such technology.

6.3.6 Firm S Group (post-1997 crisis)

External Factors Shaping Firm S Group Strategies

The impact of the 1997 crisis to Firm S Group was almost lethal. The Group sold its majority equity in most of the Japanese joint ventures and entered into an immediate debt-restructuring program. The 1997 crisis had a significant disruptive impact on the continuity of the implementation of its competitive and learning strategies. Many learning activities were paused until the recovery that took place after year 2000. The Group had insufficient resources[221] to continue the implementation of its ambitious learning strategy set forth through many Japanese joint ventures.

Even though the 1997 crisis had severely impaired its learning strategy, Firm S Group had struggled to plan an expansion of its business and form new joint ventures. The President was confident of the future growth of the OEM auto-part market. The Group still engaged in technical assistance through continuous renewal of its agreements. Since 2000, the Group engaged in a corporate restructuring in order to prepare itself for the transition from a family-owned business to a public firm.

Competitive and Learning Goals

Once the transition into OEM market was completed, Firm S Group aimed at influencing the Thai automotive industry policy. It did this by allowing the Vice President to lead the Thai Auto-part manufacturers Association (TAPMA). This was part of the firm's strategic goal, to shape the industrial environment. In addition, Firm S Group also planned to modernize its production capacity and engage in early product design activity in order to meet the increasing demand of the multinational carmakers, who wanted to establish a global export base in Thailand.

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[221] Insufficient resource means lack of financial resources. As far as other resource such as time, Firm S Group had plenty of free time, especially during the post-1997 crisis years when many carmakers in Thailand had either stopped or scaled-down their production activities.

Capability Gap and Gap-Closing Strategy

Despite its transition from REM to OEM auto-parts, Firm S Group did not engage in any product design activities. At best, the Group focused on advanced tooling design using computer-aided design and manufacturing (CAD/CAM). Consequently, Firm S Group lacked of indigenous product design experience. The plan to acquire the design capability involved investment in a new engineering team, focusing on the development of auto-part design capability. In addition, the firm also invested in a modern manufacturing facility capable of meeting the stringent requirements imposed by the carmakers and to facilitate production of new product designs[222].

6.3.7 Firm SOM (post-1997 crisis)

External Factors Shaping Firm SOM Strategies

The financial crisis had a severe impact on Firm SOM. There was a reduction in sales which led to a requirement for rather large debt financing[223]. It requested the lender to postpone debt repayment for a year after the financial crisis. The 1997 crisis was not lethal because Firm SOM President managed to search for new production orders, producing metal parts for musical instruments. The Engineering Manager stated,

> "The impact of the financial crisis on auto-part industry was very severe, but the impact on the metal parts for musical instruments was less severe" (personal interview with Firm SOM Engineering Manager, November 15, 2004).

Consequently, the production order for musical instrument ameliorated the impact of the financial crisis. However, other serious mismanagement issues severely affected the firm.

Firm SOM indirectly suffered from the liberalized regime, since the customers were freed to source auto-parts from any suppliers who could meet the requirements. Every year Firm SOM was requested by Firm SML (its main customer) to reduce the prices[224]. Firm

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[222] The Group also engaged in relocating some of its production activities to the Eastern Seaboard area, where Thai automotive cluster is located (researcher's own observation, December 17, 2004).

[223] Most of Firm SOM debt since 1994 was from family members, borrowing from several Thai banks and its customer Firm SML; all were domestic lenders. The total amount of debt in 1997 was 1.2 million Baht; this was large compared to firm size (personal interview with Firm SOM President, November, 24, 2004).

[224] Each year Firm SOM must meet the (average) cost reduction of 3 to 5 per cent.

SOM did not strategically plan for such aggressive cost reduction and in 2004, it cannot meet Firm SML's request[225]. The President expressed:

> "Historically, we were able to meet the annual cost reduction requirements. But this year [2004], our firm faced with a sharp rise in raw material and labor cost, and were *unable* to meet the cost reduction. I decided to return more than 100 auto-part items that were accepted earlier. The reason was simple; my firm *cannot* meet the target manufacturing cost. Moreover my equipment and machinery were outdated; even if I could meet the production cost I might not be able to meet the quality requirements" [italics added] (personal interview with Firm SOM President, November 24, 2004).

In addition, Firm SOM also suffered from other problems:

- Old vintage equipment and machinery that lacked the capability to produce high-quality product at low cost
- Financial debt, Firm SOM did not setup adequate depreciation fund to replace these worn-out machines; hence their replacement was impossible (personal interview with Firm SOM President, November 24, 2004)

Although the liberalization measures did not impact Firm SOM directly, the continuous price reduction requests made by Firm SML significantly affected Firm SOM's cash flow, reduced its working capital, and threatened its very survival. Firm SOM President stated his gloomy future:

> "Now I have to find ways to generate revenue in order to pay all the expenses. December [2004] will be the crucial month; if I cannot increase the earnings, my firm will be in serious trouble" (personal interview with Firm SOM President, November 24, 2004).

Competitive and Learning Goals

The firm did not have any focused strategic goals and its learning goal also lacked focus. It simply engaged in planning for "general" continuous improvement activities. Overall the firm faced many operational and managerial problems, and it is unlikely that the business will survive.

Capability Gap and Gap-Closing Strategy

Firm SOM has plenty of capability gaps, but Firm SOM President was unaware of most of these gaps and their implications for firm competitiveness. There were no

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[225] Firm SOM returned the previously accepted production contract comprising over a list of over 100 auto-parts.

measures to monitor or rectify such gaps. Since Firm SOM President was unaware of the existing deficiencies, there was no coherent gap-closing strategy. Firm SOM did not proactively engage in measures to access external technical know-how. Firm SOM currently faces serious problems on many fronts (financial, human resources, technological, operational and managerial) and its learning strategy did not seem to be properly aligned with either the internal resources or the external competitive environment.

6.3.8 Firm TKT (post-1997 crisis)

External Factors Shaping Firm TKT Strategies

The investment expansion continued in 1995 for Nissan, in preparation for new model launch in 1997. However when the 1997 crisis hit, Firm TKT's learning production capacity expansion was paused, and the firm engaged in immediate corporate restructuring (Treerapongpichit, 2004). This prompted the firm to sell its equity in the joint venture to another partner in 1999 (SET, 2005b). During the late 1990s, the firm decided to continue the planned business expansion and to form a new foreign joint venture, but to also implement a damage-control plan in response to the 1997 crisis. Firm TKT survival strategy included the product diversification:

> "The impact of the crisis on the electrical appliance was less severe than that of the auto-parts. ... This was because the selling prices of electrical appliances are cheaper than those of the automobiles. Most Thai people purchase cars using some kinds of debt financing. With the 1997 crisis, the financial institutions went bankrupt and there were no available loans. Consequently, people could not purchase new cars, leading to sales decline and the cut back of auto-part production. This is why the crisis impact was more severe for the auto-part industry" (personal interview with Firm TKT Managing Director, November 5, 2004).

Post 1997 years did not offer only threats; there were business opportunities resulting from the liberalization policy. Since the Thai government (via BOI) provided very liberal investment incentives, many carmakers had set up production bases in Thailand. When Toyota announced that it would relocate all the pick-up truck production from Japan to Thailand[226], Firm TKT stood to receive immense benefits. As a result, Firm TKT production order increased dramatically (Krungthep Turakij, 2006). Consequently, it could be said that not only did the liberalization measures posed as great threat to Firm

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[226] As of 2006, Toyota is establishing Thailand as its *only* pick-up truck production base in the world and to annually produce 280,000 pick-ups by the end of 2006 (Busarawong, 2004b).

TKT, but it also presented the firm with much benefits, under the condition that Firm TKT had sufficient capability to capitalize on such business opportunity.

Competitive and Learning Goals

In line with the expanding Thai automotive industry after the 1997 crisis, Firm TKT planned to become a top-tier plastic auto-part supplier in Thailand (TKT, 2004: 14), and later aimed to become a top producer within ASEAN. The Assistant Managing Director stated:

> "We are confident that within the next 2 to 3 years [i.e. by 2008] we will become a regional player. We view that the ASEAN market is 2-3 times larger than the domestic market, then there is sufficient room in the market for our firm to grow" (Krungthep Turakij, 2006).

This was the current strategic goal of Firm TKT. To achieve such an ambitious aim required the ability to manufacture high-quality plastic auto-parts at competitive prices with assured on-time delivery.

Capability Gap and Gap-Closing Strategy

In achieving its first goal of becoming a leading plastic auto-part supplier, the firm realized its weakness in plastic mold and tooling design capability. This was because historically the firm did not actively plan for any foreign technical collaboration until 2004, when it acquired a Thai mold manufacturing firm[227]. In 2004, Firm TKT was actively searching for a technical collaboration, a prospective foreign partner firm, to engage in automotive mold and tooling design activities (Anonymous, 2004f: 40). Hence it could be said that Firm TKT's learning strategy was still in a transition stage, from passive to active search, and it remains to be seen what the outcome of such transition in the firm learning strategy will be.

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[227] Most of Firm TKT technical assistance agreements (prior to 2004) were of informal type and usually involved sporadic interactions with the Japanese OEMs' expert technicians and engineers. The firm learning strategy involved neither the signing of formal technical assistance nor forming of extensive joint ventures (with the exception of joint venture with Okawa). In all, Firm TKT was on the conservative side in engaging in formal, external technical collaboration, and tended to rely more on the informal, sporadic technical assistance and internally-focused learning strategy.

6.3.9 Firm TS Group (post-1997 crisis)

External Factors Shaping Firm TS Group Strategies

The impact of the crisis was very severe, but not lethal (personal interview with Firm TS Group Vice President, October 19, 2004). The crisis led to a strike by the workers[228] and also caused financial difficulties. Firm TS Group suffered from financial liquidity problem and requested the Japanese carmakers for extended credits and other forms of financial assistance[229]. The impacts affected the learning path of Firm TS Group. However, the impacts were not uniform across the business groups, some subsidiary firms managed to prosper during the post-1997 years. The Engineering Manager stated:

> "... sure, the crisis had severe impact on the auto-part sales, but it had very little impact on motorcycle parts sales and it merely affected the sales of electrical appliances such as simple rice cookers. Regardless of the crisis, the people still feel hungry and have to cook their rice. The electrical appliance group that suffered from 1997 crisis were the luxury items such as the air conditioners" (personal interview with Firm TS Group Engineering Department Manager, October 29, 2004).

One such subsidiary within the TS Group that thrived during the crisis was Firm TSLA; it had managed to turn the financial crisis into a business opportunity. This firm had been one of the strategic, first-tier suppliers for Mitsubishi and it actively learned the production techniques and submitted many auto-part projects. Prior to the crisis, the Japanese carmakers turned down many of the submitted projects; the projects' target costs (and selling prices) could not be met due to high costs of imported materials. Once rejected, Firm TSLA kept many of these projects as part of the corporate archives.

Soon after the 1997 crisis, Firm TSLA pulled out the archived projects and re-submitted them to the Japanese carmakers. The difference was this time the proposed bidding prices had dropped, on average, from 30 to 40 per cent (personal interview with Firm TSLA Plant Manager, October 25, 2004). With severe devaluation of Thai Baht after the 1997 crisis, many cost figures were not as restrictive as the ones prior to the crisis. As a

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228 One of the impacts of 1997 crisis was reflected in an unhappy group of 3,000 employees who decided to take matters into their own hands and formed a strike by blocking the Bangna-Trad road in front of the Firm TS Group head office (Ibid.). The strike aimed at the senior management for cutting their allowances and year-end bonuses (Human Rights Watch, 1998).

229 One form of financial assistances offered to Firm TS Group was allowing the firm to raise the selling price of certain auto-parts to alleviate the financial liquidity problem (personal interview with Firm TS Group Vice President, October 19, 2004).

result the Japanese carmakers gladly seized the opportunity to produce the same auto-parts at much lower costs, and eagerly approved many other projects[230].

The abandonment of local content requirements (LCR) had no significant impact, because of two reasons: the fact that within ASEAN, Thailand had the largest and most developed automotive supplier base (personal interview with Firm TS Group Vice President, October 19, 2004) and the Group had prepared itself for a liberalized environment by investing in overseas manufacturing facilities. This was done as a hedge (risk management) against the shifting of motorcycle and motor vehicle manufacturing activities into other regional countries[231] (Ibid.). The current Vice President continues to craft strategic plans to invest overseas in Asian countries[232] (Ibid.). Consequently, should the carmakers decide to relocate or source its parts regionally via established regional production networks, the Group (either its wholly-owned subsidiary or foreign joint venture) will be able to deliver the parts at a specific geographical location in a timely manner. In this way, Firm TS Group will be able to better satisfy its regional customers (motorcycle and carmakers) and maintain its market share leadership.

One of the important changes was the imminent implementation of the ASEAN Free Trade Agreement (AFTA) initiated in 1992. Almost all carmakers agreed that AFTA should be implemented fully (and quickly) in order to reap the benefits of production economies of scale[233]. Firm TS Group viewed this as both opportunity and threat. As a threat, for instance, the AFTA created a low import tariff scheme resulting in more auto-parts being sourced from Indonesia to Thailand threatening the group's domestic market share. The Group's Vice President stated: "The reason that has pushed us to go to Indonesia by next year [i.e. 2006] is AFTA" (Panthong and Master, 2005: 47). This threat was neutralized by Firm TS Group taking a preemptive step to invest in a joint venture manufacturing plant in Indonesia. Strategically, the cheaper Indonesian-produced auto-parts can then be imported into Thailand through the subsidiary of Firm TS Group, seizing

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[230] Examples of auto-parts that were approved include upper and lower arms, oil filter and air filter (Ibid.). This resulted in increase in annual sales of Firm TSLA. The firm annual revenue had increased from 2 billion Baht in 1997 to 2.4 billion (in 1998) and 2.8 billion (in 1999) (Ibid.).
[231] Since the increasing liberalization after the 1997 crisis, the Thai automotive industry strengthened the local production networks in preparation for the changing trend in global sourcing implemented by the carmakers. Complementary products have been exchanged through the production networks of carmakers under the ASEAN Industrial Cooperation (AICO) Scheme programme (Chiasakul, 2004).
[232] These countries are ASEAN, China and India.
[233] See for example, TAI (2003h) and (Dunne, 2002: 7).

the benefit from AFTA low import tariff rates. Hence in this sense the Group viewed AFTA as a business opportunity.

Competitive and Learning Goals

Aside from aiming to operate regionally by investing in production operations overseas, since the late-1990s, Firm TS Group was requested by the carmakers to participate in the tooling and product design activities. As the firm lacked the capability to engage in advanced automotive tooling design, it decided to invest in a new firm (R&D Unit), specializing in internalizing auto-part design capability. Equipped with such a firm, the Group aimed at becoming a leading auto-part supplier in ASEAN, India and China. In others words, it aimed to become a regional player within the auto-part industry. The future plan is for the R&D Unit to engage in more design activity regionally (see Section 7.3.9 for more details).

Capability Gap and Gap-Closing Strategy

After the 1997 crisis, Firm TS Group competitively aimed to become an own brand manufacturer, but it lacked the technical know-how on advanced product design and also the marketing capability. But having been in the auto-part industry for almost three decades and engaged in more 30 technical assistance and formal joint venture agreements, the Group acquired a great deal of technical knowledge related to routine production capabilities. By the mid-1990s, Firm TS Group planned to set up an R&D Unit, specializing in internalization of auto-part design capability. In addition, this unit was also responsible for designing important automotive tooling using advanced production technology[234]. In the past three years, the R&D Unit collaborated extensively with the public organizations on further improvement in the design activities. Similarly, to accomplish the aim in becoming a leading auto-part supplier in Asian region, the Group planned aggressive investment in overseas manufacturing facilities, either wholly-owned or joint venture with the local firms[235]. This investment assisted the Group in dealing with the existing deficiency regarding the lack of overseas manufacturing facility.

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[234] The technology includes modern manufacturing software packages such as computer-aided design, manufacturing and engineering (CAD/CAM and CAE).

[235] An example of this is the establishment of a recent joint venture, Firm TSN, in India (Than Settakij, 2005).

6.3.10 Summary of Different Firm Strategies (adaptation phase)

During the adaptation phase, all firms (except Firm SOM) engaged in active plans to further improve their existing manufacturing processes and to move up the production value chain. Some firms (Firm AH Group, Firm D Group, and Firm TS Group; see Table 6.4) were attempting a transition from an ordinary first-tier supplier to engage in more complex product and tooling design activities. This transition involved closed collaboration with the carmakers and the dispatching of the firm's engineers to overseas training facilities[236]. For instance, through many years of OEM production experience and a capable team of engineers, Firm TS Group had stretched its competitive goal to become an own brand manufacturer, claiming to be the *first* in Thailand to produce an indigenous electric golf cart. Similarly, Firm D Group moved up from a passive OEM auto-part producer and actively planned to become a supplier that designed and manufactured a parking hand brake for many Japanese carmakers[237]. Likewise, Firm AH Group succeeded in designing the turnkey assembly jigs, and supply virtually to all the carmakers, including exports to ultra-quality conscious Japanese and European carmakers.

Other firms (Firm L and Firm S Group) were planning (or attempting) to transition from a medium-sized auto-part firm to a larger, more design-oriented OEM auto-part manufacturers. Being the only firm that engaged in the aftermarket (REM) auto-parts, Firm L was unique in that it pursued an independent, aggressive marketing strategy, and exported its product (alloy wheel)[238]. Firm L did not have the luxury of the carmakers' assistance, supplying the market research or systematic forecast of market trends; it relied on its own market analysis and distribution network. Although slightly more advanced than Firm L, Firm S Group was facing a similar situation; it produced both REM and OEM auto-parts, with initial focus on the former, but a shift to the latter. Recently, the Group actively planned a new engineering design department, capable of participating in product design activities. It still remains to be seen how Firm S Group's design engineer team will fare.

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[236] The dispatch of Thai engineers for overseas training and participation in the auto-part design activity is called "guest engineer" (Anonymous, 2004a).
[237] Examples of the carmaker that bought parking hand brake from Firm D Group include: Honda, Toyota, Isuzu, and Hino.
[238] Currently the firm exported about 70 per cent of its production output, with USA as its main export market (Krungthep Turakij, 2005).

Table 6.4 Summary of Firm Strategies During the Adaptation phase

FIRM	ADAPTATION PHASE		
	Competitive and Learning Goals	**Capability Gap**	**Gap-Closing Strategy**
Firm AH Group	• To supply complex automotive jigs to the European carmakers • To internationalize with the aim of supplying auto-parts to the Asian regional markets	• Lacking the manufacturing experience with European carmakers • Lacking the overseas manufacturing facility	• Planned acquisition of foreign firms and form overseas joint ventures • Planned hiring of engineers to assist in assimilating the technology of the acquired firm
Firm CPC	• To be supply a variety of auto-parts and electrical appliance parts • Lack of explicit goal committed to become first-tier auto-part supplier	• Partially aware of the existing production capability gap within Thai automotive industry	• Passively planned for improvement in production technology • Lack of commitment to serious product upgrading
Firm CSP	• To increase the domestic market share of auto-part supply • Incipient search plan for foreign technical collaboration partner	• Lacking the knowledge on design of simple auto-parts • Lack of explicit commitment to improve product design	• Investment in plant expansion • Passively planned for involvement in the auto-part design activity
Firm D Group	• To engage in higher-level product development and design activities • To engage in sending in "guest engineers" to the carmaker office overseas	• Lack of higher-level product design capability • Lack of sufficient research and development activities	• Planned linked up with foreign carmakers, negotiate for technology access through "guest engineers" • Planned to form new joint ventures with suppliers in the carmaker corporate groups

Source: own elaboration based on the research

Table 6.4 (continued). Summary of Firm Strategies During the Adaptation phase

FIRM	ADAPTATION PHASE		
	Competitive and Learning Goals	**Capability Gap**	**Gap-Closing Strategy**
Firm L	• To become a world-class premium brand • To engage in a world-class production technology and become an OEM supplier	• Lack of customer awareness of brand value • Lack of sufficient human resource training	• Planned marketing campaign to establish customer awareness • Planned systematic human resource training
Firm S Group	• To meet higher requirement imposed by the carmakers on product quality, cost and delivery • To engage in incipient product design	• Lack of sufficient modern manufacturing and product design capability	• Planned set up of new engineering team, trained to co-design the auto-parts with the carmakers
Firm SOM	• To supply the auto-part first-tier suppliers • Lack of any explicit, clear goal for organizational improvement	• Lack of financial capability, poor production planning, poor upgrade of technology and human resource	• Ineffective planning of simple continuous improvement activities that do not target the improvement of overall firm efficiency • No significant gap-closing plan
Firm TKT	• To become a top-tier auto-part producer in Thailand, then in ASEAN region	• Lack of formal tool design and manufacturing facility	• Planned acquisition of a Thai firm and search of foreign firm (joint venture), specializes in tool design and manufacturing
Firm TS Group	• To engage in advanced tooling design and to design and manufacture own brand product • To become a leading auto-part supplier in the regional market	• Lack of sufficient indigenous capability to build own product • Lack of overseas business facility to engage in regional business	• Planned overseas acquisition and foreign joint ventures • Planned extensive collaboration with public organizations on indigenous product development, own brand manufacturing

Source: own elaboration based on the research

The remaining firms (Firm CPC, Firm CSP, Firm SOM and Firm TKT) were still in a decision stage, and with unfocused product diversification, they lacked the solid commitment to auto-part design activities. As in the expansion phase, Firm SOM was still the worst performer. Not only did it lack the commitment to higher-level innovative activities, but it also lacked the managerial capability to ensure a viable, manufacturing business. Among the four, Firm CSP and Firm TKT were considered to be the better performers in terms of the awareness as well as the formulation of strategies for upgrading and learning. These two firms actively engaged in investment in new production technology, and continuously sought to improve their production operations through extensive collaboration[239]. Lastly, Firm CPC's strategies were slightly more aggressive than Firm SOM; it engaged in general continuous improvement activities, but still lacked a focus on the upgrading of the auto-part production process. Although slightly different in their strategic stance, both Firm CPC and SOM were largely uncommitted, and somewhat unaware of the need to advance into the auto-part design activities.

6.4 Summary of Different Patterns of Firms' Strategies

Having described firm-level strategies for each common phase, it is useful to combine the key competitive and learning strategy characteristics across all phases, for each firm. The objective is to derive a dynamic, firm strategy pattern (or patterns) across the firms. From Table 6.5, there are **three** distinct evolutionary patterns of firm strategies.

First are the patterns of what could be termed the **"strong learners"** (Firm AH Group, Firm D Group, and Firm TS Group). They have several common characteristics. Each firm had successfully migrated from a conservative strategy to engage in an ambitious (well-defined and aggressive) strategy, incorporating much planning for extensive technical collaboration through technical assistance and joint venture agreements. Their competitive and learning goals shifted from conservative to ones that are semi- to highly stretched, yet realizable. Similarly, the awareness of the firms' resources and capabilities were well grounded. These firms had transitioned from ordinary awareness to high-level alertness, eager to search for sources of internal and external knowledge to strengthen their existing resources and capabilities.

[239] The technical and managerial assistance were mainly provided by both the foreign customers and the assistance programs prepared by the public organizations (for e.g. the Thailand Automotive Institute).

Table 6.5 Summary of Firm Strategies Across All Phases

FIRM	Start-Up Phase		EXPANSION PHASE		ADAPTATION PHASE		Firm Strategy Stance
	Competitive and Learning Goals	Capability Gap	Competitive and Learning Goals	Capability Gap	Competitive and Learning Goals	Capability Gap	
Firm AH Group	Conservative	Aware	Stretched	Aware	Highly Stretch	Highly Aware	Balanced Aggressive
Firm CPC	Conservative	Unaware	Conservative	Partially Aware	Conservative	Partially Aware	Conservative
Firm CSP	Conservative	Unaware	Conservative	Partially Aware	Conservative	Partially Aware	Conservative
Firm D Group	Conservative	Aware	Semi-Stretched	Aware	Highly Stretch	Highly Aware	Balanced Aggressive
Firm L	Conservative	Aware	Semi-Stretched	Aware	Semi-Stretch	Aware	Moderately Aggressive
Firm S Group	Conservative	Aware	Semi-Stretched	Aware	Stretched	Aware	Moderately Aggressive
Firm SOM	Conservative	Unaware	Conservative	Partially Aware	Conservative	Partially Aware	Highly Conservative
Firm TKT	Conservative	Unaware	Conservative	Partially Aware	Conservative	Partially Aware	Conservative
Firm TS Group	Conservative	Aware	Stretched	Aware	Highly Stretch	Highly Aware	Balanced Aggressive

Source: own elaboration based on the research

In other words, these progressive learning firms ensured that their pre-specified strategic goals were within reach, given their existing resources and capability. At the same time, these firms ensured that goals served the purpose of further building on such resources and capabilities. Prior to goal setting, the "strong learner" firms were realistically assessing themselves and did not aim at unrealistic goals. These firms were the ones who started out with a conservative goal, then later successfully transitioned into ambitious, stretch goals. They also engaged in planning activities that assisted in increasing the level of awareness of their own knowledge deficiencies. With increased awareness their strategies directed the learning activities which enabled them to remedy the existing firm weaknesses.

In contrast, the **second** set of firms could be termed the **"weak learners"** (Firm CPC, Firm CSP, Firm SOM and Firm TKT). These firms did not complete the transition from conservative goals to ambitious ones (see Table 6.5). They engaged in ineffective search activities that ensured only minimum awareness of the changes in their competitive environment. As a result, these firms lacked sufficient ability to assess external opportunities and challenges. For instance, Firm SOM had *highly* conservative competitive and learning strategies, basically unaware of most of the assistance programs that were available from the public organizations; the firm passively received sources of information through *only* one main customer. Likewise, both Firm CPC and Firm CSP, historically, did not plan for extensive search for external sources of knowledge through foreign technical collaboration. It was not until recently (i.e. in 2005) that such competitive and learning strategies were implemented at Firm CSP. Similarly, historically Firm TKT did not plan to form joint ventures or engage in much foreign technical collaboration, and it was only in 2004 that it began to look for a foreign partner to assist with automotive tooling design. Consequently, as a result of such a static strategy[240], these firms did not plan for active capability (knowledge) gap-closing activities; and their knowledge deficiency largely remained unattended. Overall, when compared with the "strong learner" firms, the effect of passive and conservative learning strategy of "weak learner" firms had crippled them from seizing future challenging business opportunities; hence they tended to view the liberalized automotive regime as threats rather than opportunities.

[240] Static here means that the competitive and learning goals remained as "conservative" throughout the three phases for these four firms. Likewise, their awareness of technological and managerial deficiencies remained at "unaware" to "partially aware" throughout the three phases, see Table 6.5.

The **third** group of firms could be termed the **"average learner"** firms (Firm L and Firm S Group)[241]. The firms are located in between the strong and the weak learner firms. Both firms have moderately ambitious competitive and learning goals. For instance, Firm L wanted to be able to produce the best alloy wheel within the Asian region and Firm S Group wanted to become a world-class OEM producer of axle shafts. However, the awareness of their capability gap was not fulfilled by the synergistic implementation of firm learning strategies. For instance, Firm L aimed at becoming an OEM auto-part supplier, but did not want to form any future joint venture with foreign firms (especially the Japanese)[242]. Moreover, the firm had upgraded itself with the most sophisticated equipment, but was a bit behind in upgrading the most important resource – personnel skills. Similarly, Firm S Group also aimed at becoming a world-class supplier, but was faced with the inability to timely implement plant and equipment upgrade. Even though the firm age is more than half a century, the upgrade of plant equipment into a world-class modern production facility did not occur until the latter half of the 1990s, despite its competitor upgrading in the late 1980s.

Inter-firm differences in competitive and learning strategies are analyzed further in Chapter 8 (Section 8.1), where the focus of the analysis will be on differences in firm competitive goals, learning goals, and how these differences influence the firms' divergent competitive and learning positions.

241 These firms are basically the firms that have sufficient capability to compete with other auto-part firms in the domestic OEM market (Firm S Group) and export REM market (Firm L). The "strong learner" firms are slightly more competitive than the "average learner" firms, in terms of their well-defined aggressive competitive and learning goals and superb awareness when assessing their existing weaknesses and strengths related to their capabilities.

242 Firm L managing director claimed that the Japanese business partners are excessively opportunistic (personal interview with Firm L President, May 4, 2004).

Chapter 7 – Firm Learning Activities and Mechanisms

The objective of this chapter is to describe the firm-level learning activities and mechanisms carried out by the nine case study companies over their lifetime. Since the start dates and ages of the case study companies are different, the common phases were defined to assist in the organization of the empirical findings. In order to facilitate the findings and analysis, the three common phases were similar to the ones defined earlier in Table 6.1 (see also p. 146 of this thesis). This chapter concludes with a summary on the emerging patterns of firm-level learning activities, aiming to discern the differences in the learning activity patterns between the "strong learner" firm from and the others.

7.1 Learning Activities During the Start-up Phase

7.1.1 Firm AH Group (1979 – 1988)

Learning the Investment Activities

Firm AH Group founder is originally from a small town in Malaysia[243]. In 1985, he migrated to Thailand set up two businesses: a Ford dealership and a manufacturing business (through acquisition). The sources of **investment funding** were derived from the business partners and relatives. The manufacturing business was a small operation.

> "... [In 1986, Firm AH production plant] was a tiny operation in a rented factory ... the [production] volume was very low but we built our reputation slowly. I bought junked machinery from disused tin mines in Perak. The machines costed about RM[244] 3,000. We repaired them cheaply and used them in our plant" (Pandiyan, 2003: 5).

In 1988, Firm AH President emulated the Japanese carmakers by laying down the export strategy for the Thai-made jigs[245]; he conducted a **feasibility** study on such undertaking[246].

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[243] Firm AH founder received his undergraduate education in Industrial Management and Engineering from a New Zealand university in 1974. After graduation he worked for a truck company for a couple of years. In 1979 he set up a Mitsubishi and Proton dealership in Malaysia. It was not until early 1986 that he had transitioned his firm from an automotive dealership into a manufacturing firm.

[244] Malaysian Ringgit.

[245] A jig is an apparatus that holds the vehicle body parts in their correct position while they are being welded together. Hence it has the important function of ensuring the accuracy of each position relative to those of other body parts. "No other piece of equipment is as crucial to assembling car bodies as the jig. Making jigs, which sell for up to 400,000 US$ isn't easy. It requires a deep knowledge of car-building techniques and extreme precision in manufacturing. If the jig is misaligned, the car will be too (Fairclough, 1994)." The low-volume jig is one of Firm AH's flagship products.

He realized that this task was not an act which could be accomplished overnight. He planned to **invest** in the resources that would ensure the quality and manufacturing cost of his products was at least as competitive as his competitors. In addition, he **invested** in an international search and **recruitment** of a talented team of human resources to accomplish the export task.

Learning the Production and Product Activities (Process, Product and Industrial Engineering[247] & Human Resource Development[248])

In 1986, the firm continued with the production of jigs, dies and original equipment manufacturing (OEM) pressed auto-parts. Firm AH Group's production process was simple and did not involve much high-level technology and most of the **routine production** improvement activities were focused on craft-like skills; hence, the common form of learning mechanism was by doing the production activities with much trial and error. In addition to learning-by-doing, the President understands the concept of continuous **quality improvement**, "We're disciplined... if you think 95% [quality level] is enough, you're in trouble" (Shari, 2003).

In the late 1980s, the problem facing the automotive industry was the low production volume and hence the challenge to reach the minimum economies of scale[249]. Coping with this challenge, the Group decided to design the **low-volume jigs**, a niche product with few competitors. The need for low-volume jigs arose from the ineffective rationalization policy which allowed many carmakers to enter the Thai market and led to overcapacity. For each car model, there was low volume production and thus the need for low-volume jigs[250]. Firm AH's low-volume jig was unique and could manage to simultaneously keep the cost low as well as operating at low production rate, without sacrificing the product quality. At the time there were few Asian firms who could produce this low-volume jigs[251] and the decision to produce jigs was a good one since it brought in

[246] It was informal study since Firm AH President relied on many personal (yet international) contacts, and through these informal connections, he received updating news on the changes within the Thai automotive industry.
[247] Represented as "IE" from here onwards.
[248] Represented as "HRD" from here onwards.
[249] Janssen (1987) reported that in the late 1980s Thai automotive industry had a small market size with 100,000 vehicles sold annually. This leads to the problem of economies of scale.
[250] Here low volume means at a production rate of about 10 cars an hour (which is typical of any assembly plants in most Southeast Asian countries). This is in contrast to high volume production in Japan and USA where production rate is at about 50 to 60 cars per hour (Fairclough, 1995).
[251] In Thailand there are very few competitors in jigs manufacturing, one of the known firms are Auto CS, a large jigs manufacturer from Toyota Motor (Thailand) (AH Group, 2003).

businesses from local carmakers which needed lower-cost advantages and enabled Firm AH to learn and keep abreast with progressive process and product technologies (Pandiyan, 2003).

Learning the Technology Linkage Activities

During its early days, Firm AH Group linkage consisted of mostly informal and personal linkages. For instance, Firm AH President met with the Ford Regional Director in 1985 when the firm applied for and won a contract to become a Ford distributor in Thailand. During the time, the Regional Director also assisted Firm AH President in naming the new dealership (Changsorn, 2002). Other linkages were personal friends of the President that were located in Malaysia, Singapore, and New Zealand. Consequently, these linkages did not provided the direct technology sources for Firm AH; however, it did provided sources of information on the direction for further business expansion. An example was the information regarding the acquisition of a Thai firm, producing jigs and dies for Ford and Mazda.

Learning the Marketing Activities

Initially, all of Firm AH Group products were targeted at the **domestic** markets and there were no formal **market research**. However, Firm AH President had in mind plans for **export**[252].

7.1.2 Firm CPC (1965 – 1970)

Learning the Investment Activities

The firm was established in 1965 as a small business with less than 100 employees. The founder did not have any formal education; he was a hands-on technician who learned by doing simple experiments. The **investment** in manufacturing processes was not significant and there were neither formal **feasibility study** nor the plan to produce any OEM auto-parts.

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[252] He stated, "To us, it is becoming apparent that the Japanese have plans to make Thailand an offshore export base for cars, and it makes sense, ... And if one has to withstand the Japanese competition, one has to do the same [i.e. Firm AH has to start to export]" (Rainat, 1988).

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** important learning activities. **First** was the plastic production process improvement. Engaging in manual plastic injection process during its start-up, Firm CPC underwent learning by trial and error and extensive in-house experimentation. There were no formal schools for technicians.

> "In those days there were neither university courses nor formal curricula on the plastic production process. My father did not receive much formal education; therefore, he and his technicians had to learn by trial and error" (personal interview with Firm CPC President, December 18, 2004).

In addition, Firm CPC's plastic injection machines were manually operated; they required the technicians to manually pull the handle. Due to skills inconsistency, the firm faced the challenge of poor operational performance. The defect rates were high and most technicians lacked the practical experience. They did not fully understand the principles underlying machine operations. Therefore, Firm CPC struggled to find foreign expert(s) (from Hong Kong and China) who could assist with the production activities (personal interview with Firm CPC President, December 18, 2004). Hence, it could be said that most early production process improvements were mostly absent and the improvement activities were at best ad hoc. This was due to the lack of formal human resource training.

Second was the improvement in the tooling used in the production process. Firm CPC concentrated on producing simple household goods with almost no production of the auto-parts[253]. This was because the Thai automotive industry did not begin until the early 1960s and the plastic auto-parts industry was virtually absent. Then in the 1970s, the firm moved on to produce electrical appliance plastic parts such electric fan casing and cover for an electric kettles (Firm CPC corporate website, accessed December 15, 2004). In terms of tooling, Firm CPC imported all the molds from Japan and none were produced in-house (personal interview with Firm CPC President, December 18, 2004).

In addition, Firm CPC did not have any formal **human resource development** programs, since it was a small family business. At best, the training courses were on-the-job trial and error sessions. With deficient human resources, the firm did not engage in any long-term continuous improvement activities.

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[253] Examples of household parts included plastic basket, bowls and other tableware.

Learning the Technology Linkage Activities

Firm CPC did not **learn** much about linking with other firms or organizations. For instance, the active public support and training activities were unavailable during mid-1960s and did not occur until after the establishment of the Thailand Automotive Institute (TAI) in 1998. Since its establishment, Firm CPC engaged in neither foreign joint venture agreement nor formal technological assistance. Consequently, it could be said that the Firm CPC **learning** with regard to **linkage activities** were limited and at best, the **linkages** involved only the foreign equipment vendors.

Learning the Marketing Activities

Firm CPC did not develop any marketing capability. There was neither market research nor advertising activities. The firm's products were basic commodities and targeted at the local consumer markets.

7.1.3 Firm CSP (1995 to 2001)

Learning the Investment Activities

The **investment** in the new production facility was minor. The firm had about 40 employees and the business was set up as a partnership among relatives.

> "All of us had prior experience in aluminium die casting, working as employees in an aluminium die casting firm. We viewed that aluminium is a good substitute material for iron and other steel-related material; hence an opportunity for our team to invest in Firm CSP in 2000" (personal interview with Firm CSP General Manager, December 15, 2004).

Hence it could be said that the **investment plan** was analyzed through a group of engineers and personnel who were well acquainted with the supporting industry such as aluminium die casting process.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** types of learning activities: process improvement, tooling improvement (including product diversification, but no product design) and work standard improvement.

First were the production process improvement activities. The President of Firm CSP owned a small family business (Firm SRI) that manufactured rubber seal, rubber engine mount, and oil seal. During that time, the soon-to-be General Manager of Firm CSP had been working in another die casting firm and accumulating much production experience. Soon he retired from that firm and joined Firm CSP as a General Manager. Much of the firm's production process set up was from General Manager's prior experience.

Second were the product diversification and tooling improvement activities. Firm CSP supplied much of electronics as well as electrical appliance parts. It did not focus much effort on the auto-parts and the firm engaged in much **product diversification.**

> "During Firm CSP start-up, we cared a lot about achieving a short [financial] payback period. We accepted virtually any production orders that we could find and also had the capability to produce. Our firm was not selectively picking sale orders; we simply produced as much as we could and tried to fully utilize our invested production capacity" (personal interview with Firm CSP General Manager, December 15, 2004).

Consequently it could be said that Firm CSP had already engaged in product diversification, producing for electronics and electrical appliance as well as the auto-part industry. It also positioned itself at various points along the supply chain, ranging from third tier to first-tier auto-part suppliers (Ibid.). Additionally, Firm CSP did not learn any product design activity.

Last was the improvement in the work procedure. Firm CSP invested its effort into the quality management system, ISO 9000, and gained this quality accreditation in only a year after establishment (from www.tisi.go.th[254], accessed February 15, 2006). In addition, the firm management was highly committed to continuously upgrade the quality management systems.

Learning the Technology Linkage Activities

There are **two** types of linkage: **domestic** and foreign. Firm CSP engaged much in the former rather than the latter. For instance, Firm CSP had received much assistance from public organizations to continuously improve the production process. Such assistance enabled the firms to provide training courses that were more systematic. With regard to the **foreign linkage**, Firm CSP started out as a 100 per cent Thai-owned firm and did not receive much foreign technical assistance.

[254] TISI = Thailand Standards Industrial Institute

Learning the Marketing Activities

The marketing activities of Firm CSP were inward-focused on only the **domestic** market. Very little focus was on **export**, since the General Manager stated that the firm would like to secure the domestic market first prior to the expansion of its products overseas (personal interview with Firm CSP General Manager, December 15, 2004).

7.1.4 Firm D Group (1966 – 1979)

Learning the Investment Activities

Three significant **investments** in new firms occurred: Firm M, Firm MNI, and Firm D Group. The origin of Firm D Group started with the **investment** of a trading firm in 1966, **Firm M** (corporate website, accessed February 15, 2006). Throughout the first decade, Firm M's only focus was on REM auto-parts, with virtually no manufacturing activities and no joint venture with foreign firms[255]. After linking and leveraging on the business relationship with a prospective Japanese partner, Firm M was ready to transition into the auto-part manufacturing business.

In 1977, the **investment** in **Firm MNI** was initiated as a manufacturing plant specializing in producing OEM brake parts. It was a joint venture with a Japanese brake producer. Two years later, the **investment** in **Firm D** Group was also a foreign joint venture. Firm D President succinctly expressed his early working style as:

> "During the late 1970s, I worked and lodged within the factory premises, along with a group of 5-6 employees. We live together as a family unit" (personal interview with Firm D President, May 12, 2004).

Firm D President frequently travelled to Japan to receive advice on proper tooling design.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** learning activities: learning the production process improvement, learning the product and tooling improvement, and learning to develop the human resources.

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[255] From 1966 until mid-1970s, most of the businesses conducted by Firm D group were in dealership activities. The auto-parts were targeted at the replacement equipment (REM) market, and most auto-parts were simple and required little sophisticated technology. Examples of the auto-parts were wiper blades, automotive belts, automotive lamps and bulbs, shock absorbers and hubs and bolts (Firm M corporate website, accessed January 15, 2006). These were mostly stand-alone and non-critical auto-parts, and most carmakers did not require the same level of quality and cost as required by those of the OEM auto-parts.

First were the production improvement activities. Initially, the Group's production activities were virtually non-existent since it was an aftermarket auto-part distributor and not a manufacturer. Later, the foreign joint ventures assisted Firm D Group with continuous technical assistance and the issues regarding product quality, low cost and delivery punctuality. Consequently, most production process improvement activities started to shift from trial and error experimentation to a more systematic work procedure to enhance the consistency of the production process. Again, through foreign joint ventures, Firm D Group managed to successfully transition from a REM part distributor to an OEM manufacturer.

The **second** learning activity was related to the product and tooling improvement. Firm MNI and Firm D Group were capable of producing motorcycle and automobile products. Firm MNI was responsible for producing motorcycle brake parts and supplied them to Suzuki motorcycles, while Firm D was producing automotive braking system and aluminium die casting auto-parts (personal interview with Firm D President, May 12, 2004).

The acquaintance with the simple REM auto-parts (from 1966 to 1977) served as an appropriate training ground for accumulating technical knowledge that was useful later during the transition into the OEM manufacturing activities. Consequently, it could be said that the starting point of REM distributorship had served **two** learning purposes for Firm D group: 1) the long-term development of business ties (with a Japanese firm) that eventually lead to future joint ventures, and 2) the experience with REM auto-parts served as a basic learning platform that facilitated Firm D transition into OEM auto-part business.

The **third** learning activity involved the human resource development which started with on-the-job training of Firm D President. His two-year home-stay with a Japanese manufacturer had taught him many things.

> "I learned how to speak and listen in Japanese; as well as understanding the Japanese culture since I stayed at his home and also worked as an employee. His home was a typical conservative Japanese family with many strict rules. I had absorbed the Japanese tacit 'ways of doing things'. Some of these occurred automatically, as I was not always aware. Today, when I converse with a Japanese, that person perceives me as a native Japanese" (personal interview with Firm D President, May 12, 2004).

Hence it could be said that the production experience of the President was formed during his visit to Japan. The experience had enabled him to solicit much informal assistance and formed many successful Japanese joint ventures. Having lived and worked in Japan, the President understood quite well the Japanese philosophy of continuous improvement (Ibid.).

Even though trained in Japan, the President described his manufacturing experience as quite deficient.

> "Due to our prior business activities concentrated on REM auto-parts, we never had any experience running an OEM business. Sometimes we hired an outside contractor to build a mold; we did not know how to measure the quality of the product. At times, we even got rip-off by some unscrupulous contractors. Often times, we relied on the learning by trial-and-error" (personal interview with Firm D President, May 12, 2004).

To make the process of learning by trial-and-error more productive, Firm D President decided to form more foreign joint ventures and travelled to Japan (again) for another three-month on-the-job training.

Learning the Technology Linkage Activities

Firm D had a well-balanced "link and learn" capability; and the linkages were of two types: domestic and foreign[256]. The firm had well-grounded **domestic** knowledge of Thai auto-part industry. Furthermore, with investment in foreign joint ventures (Firm MNI and Firm D) the firm obtained significant linkages with foreign technology sources. These **foreign linkages** enabled Firm D Group to develop the production capability necessary for the auto-part manufacturing business.

For instance, the foreign technical assistance agreement signed by Firm D in 1979 was with Firm ASK (Japan). Firm D Group had set as an objective to produce the brake shoes and pads, but it lacked the know-how on both the production process and product. Firm ASK provided the know-how on the production of brake pads for Suzuki motorcycles. Besides this formal technical assistance, Firm D President often relied on his personal connection with the Japanese businessmen as well as the technicians. In addition, the **foreign linkages** afforded Firm D Group to frequently send both the President and his engineers overseas to absorb the foreign knowledge first-hand.

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[256] The domestic linkages were mostly dealing with the local automotive repair shops, whereas the foreign linkages were with the suppliers of imported auto-parts.

Learning the Marketing Activities

Firm D marketing activities were focused on the **domestic** market, since very little auto-parts were exported. In addition, with the assistance of Japanese OEM supplier Firm D Group did not invest much time into activities such as market research or forecasting.

7.1.5 Firm L (1972 – 1990)

Learning the Investment Activities

From 1972 to 1987, Firm L was a small auto-part trader. It was not until 1987 that Firm L decided to **invest** in a foreign joint venture, a manufacturing business[257]. This joint venture had **plans** to **invest** in increased production capacity and to diversify into producing engine parts (from www.enkeithai.co.th, accessed January 15, 2005). Unfortunately, this joint venture was dissolved in 1990, due to disagreements. Firm L had transitioned to become an independent Thai firm. The **initial investments** included: the investment in the low pressure aluminium die casting machines and the hiring of about 70 to 80 employees, inclusive of a couple of engineers with many technicians (personal interview with Firm L President, May 4, 2004). There was no major investment in production capacity in this period.

Learning the Production and Product Activities (Process, Product and IE & HRD)

Firm L main products had always been the production of aluminium alloy wheels; there was no product diversification. There was not much activity related to the continuous improvement. The firm engaged in **two** important **learning activities**: learning to transition from auto-part trader to become a manufacturer and learning to transition out of the foreign joint venture and became independent.

First was the **learning** that involved the transition from an auto-part trader to a manufacturer. Since Firm L was an aftermarket trader, it did not engage in any manufacturing activities (Manager Online, 1994). Consequently, there was no improvement to the production process. From 1987 onwards, the foreign joint venture provided Firm L with foreign technical knowledge on the production process; specifically

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[257] The roots of Firm L started with a small trading firm (Firm L & S) in 1972 and then in 1977 when the sons and daughters of Firm L & S owner started their own business expansion, following in the footsteps of their father (Manager Online, 1994). The expanded firms include two business groups: the alloy wheel and tires business and the chemical industry business.

the firm learned the aluminium die casting process[258]. Through this joint venture, Firm L started to produce alloy wheels for the carmakers. The joint venture also provided Firm L with the opportunity to learn OEM production technology. It was not until 1990 that the joint venture was dissolved, and Firm L was an independent Thai firm. Throughout this period, Firm L did not engage in any product design activities.

The **second** learning activity occurred in 1990, after the joint venture was dissolved. Much codified technical knowledge was accumulated into Firm L by its President, who read self-taught books on the theory of aluminium die-casting[259]. In addition during the joint venture, the President had the opportunity to train closely with the Japanese engineers and absorbed the technical knowledge. In 1990, the firm was on its own and relied quite heavily on independent learning by trial-and-error as the means to **develop** its own **human resources**, and at times it had to search for external technical assistance. Thus it could be said that Firm L President working style was quite adaptive, continuously searching for new knowledge to supplement his own knowledge gaps and always on the lookout to purchase the newer equipment as long as the long-term benefits justify the costs (personal interview with Factory Manager, May 5, 2004).

Learning the Technology Linkage Activities

For Firm L, the shift between domestic and foreign linkages was a dynamic one. Prior to 1987, all the linkages were **domestic** (except the links with foreign suppliers for the imported auto-parts), and furthermore, the linkages were largely related to the domestic trading network. The **foreign linkage** was evident in 1987 when the firm formed a Japanese joint venture. This foreign link allowed Firm L to learn the aluminium die casting production technology. Later, when the joint venture was dissolved, Firm L reverted back to relying mainly on the **domestic linkages** for production knowledge.

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[258] In addition, Firm L founder received an engineering education from overseas (USA); hence he was able to conduct an independent assessment of the alternative aluminium die casting manufacturing processes. He searched for more technical information and analyzed the pros and cons of the gravity die casting production process, when compared with the low-pressure aluminium die casting (personal interview with Firm L President, May 4, 2004).

[259] Having earned an engineering degree, Firm L President understood full well the principles of aluminium die-casting. He was equipped with the ability to self-teach himself with new die casting techniques by reading books and consulting with his friends who were in the alloy wheel business.

Learning the Marketing Activities

Prior to 1990, most of the firm's production volume focused on meeting the growing **domestic** demand and not much was focused on the **export** activity since the domestic demand growth was more than sufficient fuel business growth. Consequently, the firm did not engage in much detailed market research or the search for export. The linkage with foreign firm enabled Firm L to enhance its **domestic distribution network.** The joint venture allowed Firm L to achieve two **domestic marketing capabilities**: to learn to supply alloy wheels to the Japanese carmakers and to learn to manage a large distribution network (more than 400 shops) (Manager Online, 1994). Without the joint venture in 1990, Firm L reverted to the smaller **domestic REM** auto-part market.

7.1.6 Firm S Group (1941 – 1965)

Learning the Investment Activities

Having been an auto-part trader for two decades[260], Firm S Group decided to **invest** in its first manufacturing facility in 1962[261]. It imported a machine from Japan and **learned** to produce undercarriage suspension auto-parts[262]. Three years later, the firm **invested** in additional production lines to **learn** to produce brake and clutch linings. Besides this, there were no other **major investments** in manufacturing facility. Other **minor investment** included the programs to have the workers trained on-the-job; these were unsystematic and relied only on trial-and-error.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** main learning activities related to Firm S development of production capability: learning to operate the REM auto-part trader and learning the transition from a trader into a manufacturer.

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[260] In 1941, Firm S Group founder and his partners established a partnership (Firm Y) to sell after-market auto-parts. "[The establishment of Firm Y] marks the beginning of the [Firm S] group (Firm S Group corporate website, accessed December 20, 2004). This partnership was only a trader and distributor of auto-parts and there were no manufacturing activities.

[261] In 1962 this firm was a limited liability partnership under a different name. Firm BSK was the new name given to the facility after the production capacity expansion in 1976. The firm registered capital investment was 30 million Baht and during its first year of operation it had about 100 employees.

[262] During the early days of Thai automotive industry, Firm S Group manufacturing plant claimed to be the first and arguably the only one in Thailand to produce leaf spring (corporate website, accessed January 10, 2006).

First was the learning related to the operation of an auto-part trader. Since most trader activities concentrated on only few products; it was relatively easy for Firm S Group to manage close contact with the foreign suppliers. The Group learned to collaborate with these suppliers. It could be said that starting out as a trader was advantageous, as the Group's initial learning activities were related to getting acquainted with the auto-parts prior to engaging in the manufacturing activities. **Second** was **learning** that involved a **transition** from a trader to a manufacturer. After importing the Japanese equipment, the manufacturing plant experimented extensively with "reverse engineering" the imported auto-parts. The early products were the leaf and coil springs. Most products prior to the 1980s were concentrated only on the REM auto-parts, and there were no OEM production. In 1965, Firm S Group started to learn how to produce brake and clutch linings using the same facility (through additional production lines). All of the tooling was imported, and there were no indigenous tooling design facility.

Learning the Technology Linkage Activities

The **domestic linkages** were mostly with the local automotive repair shops, to sell the REM auto-parts. The **foreign linkages** were with the suppliers of imported auto-parts. Consequently, neither of these two linkages contributed significantly to the Group's production activities. The exception was when the auto-part manufacturing had started, and this provided the link with **foreign equipment vendors**. Here the Group learned how to operate the production equipment to produce simple REM auto-parts.

Learning the Marketing Activities

All of the learning activities related to marketing were **domestically** oriented, i.e. to supply the local market. Firm S Group did not pursue any **export** activities. Consequently, there was no need for systematic market research or any forecasting activities.

7.1.7 Firm SOM (1990 – 1995)

Learning the Investment Activities

Initially, Firm SOM **invested** in a residential home to accommodate 4 to 5 technicians[263]. Later, the business grew bigger, and it had to relocate (personal interview

[263] Several years prior to its establishment, the firm founder had been working as a technician at two Thai manufacturing firms: 1) PVC pipe manufacturer and 2) a heat exchanger (a device used for cooling/heating

with Firm SOM President, November 24, 2004). Lacking the **financial capital** for relocation, Firm SOM relied on its customer for **financial** assistance. It appeared that Firm SOM was passive in searching for other sources of assistance, and had only a very basic level of investment capability.

Learning the Production and Product Activities (Process, Product and IE & HRD)

The early **learning** was craft-like work with much trial and error activities to produce simple auto-parts. The condition was akin to a repair shop, rather than a manufacturing firm (personal interview with Firm SOM President, November 24, 2004). In addition, Firm SOM was a third-tier auto-part supplier[264]. The assistance that the firm received was very **basic production capabilities.** At best, Firm SOM produced according the customer-provided specifications, and the firm relied only on its main customer for technical assistance.

> "Firm SOM was lucky to receive the assistance from Firm SML, which had provided us with production orders as well as technical assistance on setting up the production processes. We were satisfied with the received production orders, since it saved our firm the time to search for customers" (personal interview with Firm SOM President, November 24, 2004).

Hence it could be said that Firm SOM had a passive stance on improving its **production capability**, in particular it relied on a *single* customer for many assistances (financial and technological). In addition, all the firm's personnel were technicians, and there were no professional managers.

Learning the Technology Linkage Activities

Even the **domestic linkages** were limited for Firm SOM. Firm SOM basically relied on a single **domestic linkage**, i.e. its main customer (personal interview with Firm SOM President, November 24, 2004). Besides this, there were no other links. The firm did not have any organization development programs, nor did it engage in any **search** for sources of new knowledge. Additionally, Firm SOM did not aim at **learning** through any **foreign** joint venture or technical assistance agreements (Ibid.).

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fluid) manufacturer. Firm SOM President has very limited formal education; he foresaw very little future in working as an employee. After gaining sufficient production experience in mold and tool making, he decided to team up with his younger brother and opened his own small job shop in 1994 (personal interview Firm SOM President, November 24, 2004).

[264] Firm SOM was essentially a subcontractor for Firm SML, who was producing auto-parts for a first-tier supplier such as Firm TS Group (personal interview with Firm SOM President, November 24, 2004).

Learning the Marketing Activities

Firm SOM's **domestic market** share was limited, and the firm was highly exposed to the risk of losing its main customer. The firm did not even bother to plan (or think about) the **export activity**.

7.1.8 Firm TKT (1973 – 1990)

Learning the Investment Activities

The early learning was concerned with simple electro-plating process for plastic parts. In 1973, the business was a small job shop. Later in 1980, Firm TKT was incorporated with the registered capital **investment** of 5 million Baht[265] (SET, 2005b). It was not until the plant expansion in 1990, when **investment** in the production process became more systematic.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** learning activities: learning to operate the imported equipment, learning to produce simple plastic parts, and limited learning in the development of human resources.

First was the **learning activity** related to the simple production process. Since the firm was small, the production activities were conducted internally (involved neither formal technical assistance nor foreign joint venture agreements). Consequently, the learning activities involved much doing by **trial and error**. The workers would design the process themselves and performed trial runs, and the problems that occurred were solved through successive data gathering and iterative problem-solving sessions (personal interview Firm TKT Managing Director, November 5, 2004). **Second** was the **learning activity** related to the production of simple products. Firm TKT early products were simple plastic parts[266]. There was very little focus on the plastic auto-parts. Most tooling and mold were imported, with insignificant emphasis on the indigenous design of such tools (Ibid.). **Third** was the learning activity related to **human resources development**. Initially, the qualifications of Firm TKT personnel comprised only technicians who had graduated with at most high

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[265] The shareholders were the majority Thai and minority foreign (Hong Kong) shareholders (Lauridsen, 2000: 41).
[266] Examples were household plastic goods and simple chromium-plating of plastic parts for electrical appliance.

school diplomas. The firm seldom hired formal engineering graduates. It was not until after the move to the new factory in 1990 that the firm started to hire engineers (Ibid.).

Learning the Technology Linkage Activities

Most learning activities were developed through **domestic linkages**. It learned to network with the local repair shops and distributors. Additionally, there were few **foreign linkages**. Firm TKT involved in neither formal technical assistance nor foreign joint ventures.

Learning the Marketing Activities

Firm TKT supplied the domestic markets with simple plastic parts. Since all products were targeting the **domestic market**, Firm TKT did not engage in any **export.**

7.1.9 Firm TS Group (1960 – 1980)

Learning the Investment Activities

There were **two** significant **investment projects**: a small repair shop and two formal manufacturing firms (related to set up of Firm TS Group).

The **first** project started with an **investment** in **1960**; it was a job-shop[267] with several repairmen working on motorcycle seats. The business orders came from the owners of the imported vehicles who needed the simple repair work[268]. By 1964, this shop expanded to produce the OEM motorcycle seats (Somsak, 1983). The **second** major **investment** was related to the **two** formal manufacturing firms. **One** was the set up of Firm SAS[269] to produce automotive and motorcycle seats. Another **major investment** was made as a spin-off from Firm SAS; it was Firm TS Group[270].

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[267] The total investment amount in the job-shop was only 40,000 Baht (Anonymous, 1983b). The investment did not involve any mass-producing equipment or modern machinery, and the production tasks were highly labor-intensive.

[268] Some of the firm orders came from the domestic taxi cooperatives that needed to have their seats cover with plastics (Anonymous, 1983c). Another large job was the production of metal roof for Fiat automobiles, which were assembled by Karnasutra Assembly plant (Ibid.).

[269] In 1972, Firm SAS had registered capital of 30 million Baht with 400 employees (Anonymous, 1983b). The firm engaged in a technical licensing agreement with Namba Press Works (Japan) to learn seat production technology. Various training courses were conducted for employees and Japanese experts were frequently dispatched to assist with production technology (personal interview with Firm SAS Chief Operating Officer, November 6, 2004).

[270] The rationale was Firm SAS wanted to separate the motorcycle parts division as a separate unit in order to achieve effective learning and technology transfer from the Japanese partner firms. Firm TS Group had a

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** main **learning activities**: learning to produce OEM products and learning to develop the human resources.

The **first** learning activity had to do with production activity and reverse engineering. Firm TS Group focused on the OEM motorcycle parts[271], with negligible amount in REM parts[272]. The Group would "take apart" the imported parts to reverse engineer its components. This was done through **learning by trial and error**. The Group utilized the "copy and develop" approach to **learning** (Panthong, 2005a: 44). Hence the imported automotive parts were taken apart to see if there were any components that could be reproduced in-house and then supplied to the domestic carmakers. The copy and develop model was utilized within each subsidiary that was responsible for production of a single auto-part that utilized the same technology (Panthong, 2005a: 44).

The **second** learning activity was the early development of human resources. The Group's President actively **searched** for his employees from many sources[273] (Anonymous, 1983b). Additionally, the President always views the **continuous learning** as paramount.

> "I always think about how to create a Thai society where production workers are more capable. I looked to the Japanese; they were able to upgrade their human resources. They were able to manufacture their own products and exported them globally. I wanted to develop the human resource pool for Thailand" (Anonymous, 1983b).

The President also believes in the philosophy of hard work and commitment to the **continuous learning**[274]. Hence it could be said that Firm TS Group highly emphasized the development of human resources.

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registered capital of 20 million Baht and mostly supplied motorcycle parts and later various other engine parts (personal interview with Firm TS Group Senior Engineering Manager, October 29, 2004).

[271] During the late 1970s, Firm TS Group main products focused on mainly motorcycle seats with very little variety of other auto-parts. In 1978, the Group received an order from two Japanese motorcycle manufacturers to produce seats. There were negligible amount of automobile (4-wheel) parts.

[272] This was in accordance with Firm TS Group learning strategy, which was to engage in supplying the major domestic motorcycle makers and carmakers in Thailand with OEM automobile and motorcycle parts.

[273] The technicians were from small family-owned shops. The administration staffs were from the normal hiring process. The freshly graduated engineers were from university and they were provided with sufficient training. The management personnel consisted entirely of family relatives.

[274] "Even though I had very little formal education, I learned from more experienced businessmen who had knowledge on the business ventures. I used this as a way to enhance my own knowledge and learned how to successfully run my businesses. This knowledge assisted me during the transition from a mere repair shop to become an OEM auto-part manufacturer" (Anonymous, 1983a).

Learning the Technology Linkage Activities

Firm TS Group had a well-balanced "link and learn" capability, utilizing both **domestic** and **foreign** linkages. The Group **networked widely** with the local repair shops and supplied them with simple products. In addition, the Group also supplied auto-parts to the **domestic** carmakers. These **linkages** enabled the Group to **learn** the simple production activities, and it served as a platform to progress into more complex production. For **foreign links**, in **1977** the first joint venture was formed with Honda (motorcycles) to produce various motorcycle parts. This **linkage** was part of the Group's **learning strategy** to efficiently transform itself from a repair shop into a manufacturer. The foreign joint venture also enhanced the Group credibility as first-tier auto-part supplier.

Learning the Marketing Activities

Most of the Group's marketing activities were focused on the **domestic** market; very little auto-parts were **exported**. Since the foreign partner was assisting the Group with the **marketing activity**, it did not invest much time into systematic market research or sales forecasting.

7.1.10 Summary of Different Firm Learning Activities and Mechanisms: Start-up Phase

The pattern of learning activities and mechanisms of the nine case study firms during the start-up phase is summarized in Table 7.1. All firms started out as small businesses, either as a repair job shop or an auto-part trader, with moderate **investment** activities. Most firms (Firm CPC, Firm CSP, Firm SOM, and Firm TKT) did not engage in any plans to invest in complex set of learning activities. At best, some of the firms (Firm AH Group, Firm D Group, Firm L, Firm S Group, and Firm TS Group) were in a transition process from a small auto-part trader to an REM or OEM auto-part manufacturing firm.

In addition, all firms were initially involved in using the passive learning-by-doing **production** activities. Not all firms were engaged in the purposive learning mechanisms. Only some firms implemented the more active learning by searching for foreign partners as well as importing the foreign technology (for example, Firm D Group, Firm L, Firm S Group, Firm TS Group). Other firms accumulated their production capability by implementing learning by hiring and training engineering graduates (for example, Firm AH Group, Firm CSP, Firm D Group, and Firm TS Group).

Table 7.1 Summary of Firm Learning Activities and Mechanisms - the Start-Up Phase

FIRM	START-UP PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm AH Group	• Investment activities; transition into manufacturing business • Production process activities • Product activities • Linkage activities (incipient)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching and acquiring firm • By hiring capable foreign engineers • By training employees • By planning to export
Firm CPC	• Investment activities • Production process activities • Product activities (household goods, no auto-parts)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By hiring foreign consultants (not continuous)
Firm CSP	• Investment activities • Production process activities • Product activities (diversification; no design)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By hiring capable engineers
Firm D Group	• Investment activities; Transition into OEM market • Production process activities • Product activities (diversification; no design) • Linkage activities (domestic, incipient foreign)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By visiting Japan frequently • By searching to form foreign joint ventures • By hiring and training employees (on-the-job)
Firm L	• Investment activities; Transition into manufacturing business • Production process activities • Product activities (no design) • Linkage activities (incipient)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching and form a foreign joint venture • By hiring capable technicians

Source: own elaboration based on the research

Table 7.1 (continued). Summary of Firm Learning Activities and Mechanisms - the Start-Up Phase

FIRM	START-UP PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm S Group	• Investment activities; transition into REM market • Production process activities • Product activities (REM parts) • Linkage activities (domestic)	**Passive and Semi-Automatic**: • By doing production activities (trial and error) **Active and Purposive**: • By searching and importing foreign technology • By hiring capable technicians
Firm SOM	• Investment activities • Production process activities	**Passive and Semi-Automatic**: • By doing production activities (trial and error) **Active and Purposive**: • By training employees (on-the-job)
Firm TKT	• Investment activities; REM then transition into OEM market • Production process activities • Product activities (diversification; no design)	**Passive and Semi-Automatic**: • By doing production activities (trial and error) **Active and Purposive**: • By searching for foreign investors (no formal joint ventures or technical assistance) • By hiring capable technicians • By training employees (on-the-job)
Firm TS Group	• Investment activities; REM then transition into OEM market • Production process activities • Product activities (OEM motorcycle parts) • Linkage activities (domestic and foreign)	**Passive and Semi-Automatic**: • By doing production activities (trial and error) **Active and Purposive**: • By visiting Japan frequently • By searching to form foreign joint ventures • By hiring and training employees (on- and off-the-job)

Source: own elaboration based on the research

The **products** produced by all the firms were simple. For instance, Firm AH Group produced simple automotive tooling; Firm CPC produced simple household plastic parts; and Firm CSP produced simple aluminium die casting parts. Moreover, most firms used the production of the simple parts as a training ground to enable transition into more complex auto-parts (for example, Firm S Group, Firm TS Group). Although producing more complex auto-parts, none of the firms were engaged in the design activities.

In addition, firms managed their **linkage activities** differently. Some firms used their auto-part trading businesses as a leveraging platform to solidify their ties with the foreign suppliers, leading to joint venture firms (for example, Firm D Group and Firm L). Other firms leveraged on their personal relationships with the vehicle makers to form joint venture (Firm TS Group) or acquire other firms (Firm AH Group). These firms were more active in using learning by searching and forming linkages with foreign technology (knowledge) sources. In contrast, other firms did not attempt to search for such linkages with foreign firms at all, and were lacking the access to foreign technology sources (for example, Firm CPC, Firm CSP, Firm SOM, and Firm TKT). Only Firm AH Group made explicit plan, aiming at export, the other firms focused solely on the domestic market.

7.2 Learning Activities During Firm Expansion Phase

7.2.1 Firm AH Group (1989 – pre-1997 crisis)

Learning the Investment Activities

There were two significant **investment projects**: production expansion in the **1990** and another subsequent expansion in **1996**. In **1990**, the Group expanded its production capacity by purchasing machineries and invested in a factory. From late 1980s until 1997 (pre-crisis) the Thai automotive market had expanded rapidly and the carmakers' requirement for tooling (jigs and dies) had become much more demanding. To keep up with these changes, in **1996** Firm AH Group invested in a new production plant[275]. The new site had four times the space of the old one, thus providing more area for a complete turnkey production of jigs. In other words, Firm AH Group planned to use this site to produce modern auto-part tooling.

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[275] Firm AH bought 24,000 square meters (about 10 acre) of land in Ayuthaya to build a new world-class factory (AH Group, 2003). The total investment was about 1 billion Baht, of which 300 million was the land cost.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** significant learning activities: an upgrade to modern production technology, systematic productivity improvement activities, and involvement in the turnkey low-volume jig production.

First was the upgrade of production technology. In 1991, Firm AH Group introduced computer-aided design and manufacturing (CAD/CAM) and computer numerical control (CNC) machines[276]. This investment was necessary since the Group received design data on CAD drawings, and it needed the ability to open the received CAD file and translated the information into design requirements (Deyo and Doner, 2000: 131). In addition, Firm AH President stated:

> "We learned early that if you want to compete, you must be able to interface technically with the big manufacturers. ... If you don't change with the times [or] if you don't follow the trend, after a while you can't even talk to them" (Crispin, 2002).

Second was the systematic improvement in productivity, including human resources development. Prior to 1995, the work monitoring and documentation were quite loose[277]. Firm AH realized its existing work practice lacked a standard. Furthermore, to achieve the ISO9000 and QS9000 accreditations, systematic work documentation was necessary. The work documentation started with Firm AH Tooling Director[278], whose responsibility was to oversee the start and finish dates for each tool development[279]. The established work standard enabled the Group to consistently deliver high quality product in a timely manner[280].

Firm AH Group also engaged in active **human resource development.** As mentioned above, the Group relied on two mechanisms to develop and retain its bright

[276] "In 1991, [the firm] became the *first* among its peers to introduce CAD/CAM technology and CNC machines" [italics added] (De Meyer and Garg, 2005: 88).
[277] This is not surprising since the early development of low-volume jigs or small volume production of pressed auto-parts required neither formal work monitoring nor systematic documentation. Moreover Firm AH Group did not achieve quality standards (such as ISO9000 and QS9000) until 1999.
[278] After searching for some time during the late 1980s, the firm hired an Australian Tooling Director whose direct responsibility was the design, manufacture and test of low-volume jigs and other automotive stamping dies. This expert on jigs and automotive tooling came directly from Ford Australia, where he had worked for nearly 30 years.
[279] The time duration between the dates were conveyed to the foreman of the jig shop who would break down the projects into a sequence of simpler tasks such as "tooling design, base fabrication, base machining, unit fabrication, unit machining, unit assembly, installation, inspection, piping, try-out and buy-off" (Deyo and Doner, 2000: 130-131).
[280] Within the automotive industry, this is popular phrased as QCD – Quality, Cost and (on-time) Delivery.

talent: extensive in-house training as well as overseas plant visits[281] and measures to improve workers' morale. The President expressed:

> "I also take great care of my staff since money can buy factories, machines, but *not* people. Human resources are the *most* important decisive factor toward company work and productivity improvement" [italics added] (Chaiwat, 2003).

Moreover, the Group also retained its workers; the President said, "Once we get them [the capable employees] we don't let them go" (Fairclough, 1995).

Last learning activity was the turnkey design of low-volume jigs. In the late 1980s, Firm AH produced the manual low-volume jigs that used simple technology and tools. For instance, the simple tools used by these jigs were caster wheels and thus they were easy to maneuver around (Deyo and Doner, 2000: 129) making them suitable of low-volume, flexible job shop production. Through such developments, Firm AH was able to cut costs[282], but maintain the same level of quality. It won a contract to supply this low-cost, low-volume jig to Honda Automobiles in the late 1980s. Prior to the early 1990s, Firm AH Group did not produce its own jig design, that is the detailed specification drawings were provided by the carmakers and the firm just responded by producing the jig according to the supplied drawings. This situation however was different in the early 1990s.

By 1990s, there was evidence that Firm AH was capable of turnkey jig projects[283]. Firm AH Group was equipped with CAD/CAM technology, had a trained set of international technical and engineering staff and enjoyed a growing automotive market due to booming foreign direct investment. New learning opportunities arose when it won contract to design vehicle assembly jigs for other carmakers[284]. This learning activity was different from the previous manual jig design; it incorporated the use of newer equipment

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[281] On the issue of overseas training Prof. Arnoud DeMeyer from INSEAD (France) remarked: "[Firm AH] is a true knowledge management company, ... it had a policy to send its employees to various parts of the world to gain new skills and then teach other staff members at the home office" (Pandey, 2005).

[282] Firm AH was capable of producing a jig for 100,000 to 200,000 US dollars; this is significantly less than the cost that most Japanese carmakers could make them. Hence it is logical for these carmakers to outsource the jig production and other tooling tasks to Firm AH in order to save money as well as plant size (Deyo and Doner, 2000: 129).

[283] i.e. designing, manufacturing and testing its low-volume jigs

[284] In 1993, Firm AH designed jigs for the Jeep Cherokee, Honda Civic and Ford Ranger (Mazda) pickup truck.

and the ability of the engineering team to design, produce the prototype jigs, and subject these jigs to rigorous testing[285].

Learning the Technology Linkage Activities

There were several foreign joint ventures and formal technical assistance agreements. In **1990**, the Group formed two joint ventures with Sanoh Industries (Japan) and Nissho Iwai (Japan) to produce brake tubing. Later in **1995**, the Group signed a technical assistance agreement with Kurata Corporation[286] (Japan) who had expertise in fuel tank manufacturing (AH Group, 2003: 5). The agreement was to assist Firm AH with the production of fuel tanks for the Ford/Mazda pick-up truck[287]. In the **same year**, Firm AH signed a distributorship and service agreement to supply Kawasaki robots in Thailand. Then in **1996**, the Group formed another joint venture with a US-based firm, Arvin Industries[288]. The purposes of these joint ventures and assistance agreements were: to equip the Group with sufficient breadth of OEM auto-part product portfolio[289] (risk management) and to provide the technical assistance for the production of auto-parts.

Learning the Marketing Activities

In terms of marketing activity, Firm AH President aimed at exporting his Thai-made jigs. He went directly to the Japanese and told them there was no point in making master jigs for only each individual Asian country's small (and fragmented) domestic market, when it was possible to mass produce them at Firm AH and lower the cost at the same time. The result was that Japanese brought the participants from various countries including Taiwan, Australia, Malaysia, Indonesia, and Japan, and Firm AH Group had the opportunity to demonstrate the master, low-volume jigs to them. The marketing efforts paid off and orders have been coming in ever since[290] (Rainat, 1988).

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[285] The Tooling Director stated, "We used to get drawings from our customers ... and make the jigs to their specifications, ... Now we do the design work ourselves" (Fairclough, 1994).

[286] Later this firm changed its name to Keylex Corporation.

[287] At this stage, Firm AH was able to produce the fuel tank per se, excluding other parts such as the 'tank sender' (i.e. the instrumentation that is attached to the tank to measure the level of remaining fuel). This knowledge regarding tank sender will be acquired by Firm AH in its subsequent technical assistance.

[288] Unfortunately this venture was short-lived due to the impact of the 1997 financial crisis.

[289] By 1996, Firm AH had three related product areas: 1) the design, manufacture and assembly of automotive body jigs, 2) the design and manufacture of dies and 3) the production of pressed parts such as fuel tanks, body panels, exhaust systems, and brackets (Deyo and Doner, 2000: 128).

[290] Assembly jigs on the new Ford Falcon have been ordered from New Zealand, the President was sure that, Firm AH will also be making (assembly) jigs for Malaysia's new BMW 5 series" (Rainat, 1988).

7.2.2 Firm CPC (1971 – pre-1997 crisis)

Learning the Investment Activities

There were no significant **investment projects**. At best, the investment involved a gradual expansion of **production capacity**. Most **learning** on selection of new equipment was from foreign and domestic vendors. In the **1980**, the firm **invested** in equipment and tooling to supply the plastic motorcycle parts[291]. Then during the **early 1990s**, Firm CPC increased its **investment** in production capacity, **installing** more new plastic injection machines to produce auto-parts[292]. In **1996,** the firm also **invested** in modern **equipment** such as computer-numerical control (CNC) machines and computer aid design (CAD) tools.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** important learning activities: the improvement in the production activities, improvement in tooling and production technology, and improvement in human resources.

First was the improvement in production activities through product diversification. Firm CPC had been producing simple plastic commodity products since **1965**. In mid-**1970s**, the firm underwent production expansion and **learned** to produce plastic parts for electrical appliances. This learning was a useful preparation for future production of plastic motorcycle and auto-parts. In addition, the firm also learned to perform simple mold maintenance. Later, Firm CPC **learned** to produce the OEM motorcycle parts[293], and it was different from small lot-size production of household goods. Firm CPC must meet the strict requirements of high quality, low cost and on-time delivery. Finally in the **1990s,** Firm CPC learned to supply automotive plastic parts[294].

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[291] Examples of motorcycle parts were fenders, plate bottom seat, leg shields and rear rail grab.
[292] This investment followed the firm's competitive strategy, to further diversify to increase the supply to both the automotive as well as the motorcycle makers, since during the early 1990s, the Thai auto-part industry was under rapid expansion (until the 1997 crisis) along with the increased localization.
[293] The motorcycle parts produced were plastic cover for engines, front fenders, but not motorcycle seats. This was because most seats were still using metal frame rather than plastic ones (personal interview with Firm CPC President, December 18, 2004). Other motorcycle parts produced by firm included the rear rail grab and seat foam. The foam was made of polyurethane and supplied by the sibling joint venture company, Firm BFC. These motorcycle parts were supplied directly to the Japanese OEMs such as Suzuki and Honda. Consequently, Firm CPC has been a first-tier motorcycle parts supplier (Ibid.).
[294] Examples included the plastic casing for automotive air conditioner blower, plastic center console (interior trimming parts) and the plastic battery cover for trucks (Firm CPC Corporate Website, accessed February 15, 2006). Initially, the firm started with the production of simple parts such as the battery cover for trucks and the interior console of a car. Later it produced a blower casing for automotive air conditioner; this part was

Second was the improvement in tooling and production technology. Initially, Firm CPC imported the molds from Japan, and it had the opportunity to learn to become an OEM supplier.

> "Once we started to import the molds; we had the opportunity to learn. We observed via the Japanese experts their production techniques and their problem-solving decisions on the shop floor. Our firm then tried to emulate and transferred this know-how to finally try to maintain our own molds" (personal interview Firm CPC President, December 18, 2004).

In addition, in **1995** there were investments in computer-aided design (CAD) and computer numerically controlled (CNC) machines. This was necessary because the OEM customers required the firm to achieve higher precision.

Third was the limited human resources development. Normally, Firm CPC relied on the expertise of its Japanese customers to assist its workers with the training in work procedures. Often times, Firm CPC own technicians had to fumble around to learn the improved production technique.

> "I think that the technicians back in the 1970s had more experimental skills that today's technicians. There were no formal university or college courses to attend. All that they did were to sharpen their technical skills via practical training, learning from the foreign experts. Often times, they had to learn by trial and error and achieved improvement in production technique" (personal interview with Firm CPC President, December 18, 2004).

Firm CPC lacked the explicit **learning activities** that focus on systematic human resource training. Moreover, Firm CPC did not have any formal training programs since the firm was operated as a small family-owned business. At best, the training courses consisted of sending the workers to attend the Thai government supplied courses[295].

Learning the Technology Linkage Activities

Firm CPC tended to focus more on the domestic linkages, neglecting the foreign ones. For instance, Firm CPC is a member of the Federation of Thai Industry (FTI), Plastic group, of which Firm CPC President commented that the organization was too heterogenous and did not sufficiently focus on the plastic producers (Lauridsen, 2000: 40). Overall Firm CPC participation with the organizations and the search for outside expert

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supplied to another first-tier auto-part firm, who in turn supplied to Mitsubishi to be assembled into a pick-up truck (personal interview with Firm CPC President, December 18, 2004).

[295] This type of training was insufficient because the *active* public support in on-the-job training did not occur until after the establishment of the Thailand Automotive Institute (TAI) in 1998 (personal conversation with a Managing Director of an auto-part firm, March 22, 2004).

assistance was passive and lacking continuity. In addition, there were no foreign joint ventures or technical assistance agreements.

Learning the Marketing Activities

All of Firm CPC marketing activities were focused on capturing only the domestic market share. There was an insignificant focus on export; hence there were neither gathering of foreign market intelligence nor overseas customer search.

7.2.3 Firm CSP (2002 – 2004)

Learning the Investment Activities

There was a major **investment** in plant expansion. In early **2004**, Firm CSP had expanded and **invested in land** and modern **equipment** such as computer aided design and manufacturing (CAD/CAM) and computer numerical control (CNC) machines. The **investment** also included the recruitment of more engineers[296]. Other investments concentrated on the improvement of production processes and in creation of work standards[297].

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** learning activities: learning to produce OEM auto-parts, learning about simple mold design and maintenance, and learning to develop human resources.

First was the learning activities related to the production of OEM auto-parts. Firm CSP began to produce the OEM auto-parts, and the important criteria are: high quality, on-time delivery and competitive price. The Japanese OEMs always put pressure on Firm CSP to reduce the prices, almost every year.

> "To be able to produce for Japanese OEMs, we have to continuously improve our operations. Without such commitment, our firm would not be able to meet the required cost reduction, and we will surely lose our OEM customers" (personal interview Firm CSP General Manager, December 15, 2004).

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[296] In 2003, the firm had about 200 employees, of which 14 were engineers; this was considered a major increase from the 40 workers and a couple engineers (in 2000).

[297] For instance, Firm CSP was committed to the **investment** in time and effort to obtain the most up-to-date quality accreditation, ISO/TS 16949 in 2004. This was because part of the firm's competitive goal was to become a first-tier auto-part supplier.

Since 2001, the firm focused mainly on the OEM auto-parts, with very little REM auto-part production volume[298].

Second was the investment in modern production technology. The purpose was to design and produce **the mold**. Back in 2000, the firm started off with simple mold design for the electrical appliance parts, and then followed by auto-part mold design (personal plant visit, November 12, 2004). Hence the firm progressed gradually from simple mold design to more complex ones. The **third** learning activity was the human resources development. Firm CSP engaged in a **two** types of training schemes. **First** were the training offers that were available from new equipment vendors. **Secondly**, the employees spent most of their time learning on-the-job. They usually experimented with mold design, maintenance, and production; they were learning by trial-and-error.

Learning the Technology Linkage Activities

There are **two** types of linkage: **domestic** and **foreign**. Firm CSP relied mostly on the former and not very much on the latter. For instance, the **domestic** linkages with the public organizations comprised **two** collaborative projects with TAI. The **first** project was Invigorating Thai Business (ITB)[299]. Firm CSP engaged in collaborative problem solving with the ITB consultant who provided solutions to the firm operational problems[300]. The **second** collaboration with TAI occurred under the Automotive Experts Dispatching Program (AEDP), which started from 2003. Firm CSP learned significantly on **two** main operational issues: 1) the production techniques related to aluminium die casting (personal

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[298] "Since inception, Firm CSP had focused on the OEM auto-parts. We focused very little on REM production because we thought that competition within the REM market is more cutthroat and based solely on price alone. Our firm had the capability to produce high quality auto-parts at a competitive price and this qualified us into the OEM auto-part market. Within the REM market the quality did not matter much, it was fierce price war among the manufacturers" (personal interview with Firm CSP General Manager, December 15, 2004).

[299] The project duration was from May 2003 to September 2004 (from www.thaiauto.or.th, accessed March 25, 2006).

[300] One of the problems was the issue of poor inventory control and management. Since Firm CSP did not purchase any state-of-the-art software for such matter, it had to make do with a modified spreadsheet (Microsoft Excel) program. The ITB consultant had provided the firm with an inventory management program, designed in general for the Thai small and medium enterprises (SMEs). The firm learned about the use of such program and found that the generalized version of the program was deemed to be unsuitable to Firm CSP inventory management system. It had to adapt the given program, essentially learning by trial and error in the adaptation process. Consequently the firm learning activities conducted under the ITB program was not highly successful.

plant visit, November 11 and 12, 2004) and 2) the plant management technique that would ensure high productivity (Ibid.)[301].

Learning the Marketing Activities

The marketing activities of Firm CSP are still inward-focused on only the **domestic** market, with very little focus on **export**. Firm CSP's competitive goal was to secure the domestic market share first prior to expansion into export (personal interview with Firm CSP General Manager, December 15, 2004).

7.2.4 Firm D Group (1980 – pre-1997 crisis)

Learning the Investment Activities

Realizing the increasing foreign direct investment (FDI) trend, in **1990** Firm D Group decided to **invest** in two more firms: Firm CKB and Firm MNIH to oversee the formation of foreign joint ventures. Most Japanese firms wanted to invest in Thailand, but were unsure of how to cope with other bureaucratic issues. These two firms would assist in such matters. Many other investment in foreign joint ventures occurred during this period (see Table 7.2). Another important strategic **investment** was Firm D-tec[302].

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** main **learning activities**: incipient product design and tooling improvement activities. In both activities, human resources development was crucial. The **third** learning activity involved the product diversification.

The **first** learning activity was related to product design. Throughout the **1980s**, the Group had been supplying the brake parts and the aluminium parts to all the major motorcycle makers. Often times, the Group received the detailed specification drawing from the OEMs and produced strictly according to such drawing. It did not outline or

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[301] The problems facing the firms were: high defect rates, uneven temperature distribution during the cooling stage and trapped air bubbles inside the mold, causing porosity. The Japanese expert, along with the Thai engineer, guided Firm CSP to collect relevant operational data to determine the root cause of the above problems. First were the learning activities on solving problems related to the aluminum die casting production techniques. Then after the rectification measures were implemented, the firm was able to reduce the defect rates, at the first instance, from over 3 per cent to less than 0.3 per cent (from www.thaiauto.or.th, accessed on March 25, 2006). On the plant management issue, Firm CSP learned to solve the problems related to low productivity, inventory management, and general plant management issues (Potisarangkul et al., 2005: 13-15).

[302] This is the Group's engineering design unit, which was instrumental in enhancing the Group's product design capability.

engage interactively in arriving at these detailed specifications. The President wanted his engineers to actively participate in outlining the product specifications[303]. This vision materialized in the early **1990s** when Honda carmaker decided to invest locally[304]. Within

Table 7.2 Foreign Joint Ventures for Firm D Group During Its Expansion Phase (1980 – pre-1997 Crisis)

Year	Partner Firm (country)	Expertise / Knowledge
1986	Koito Manufacturing (Japan) Bangkok Diecasting and Injection (Thailand)	Production of automotive lamps (both cars and motorcycles), plastic injection molding process and aluminium die casting mold and parts
1987	Mitsuboshi Belting (Japan)	Production technology of various types of automotive belts: timing belts, V-belts, etc.
1989	Keihin Group (Japan) Keihin Metal (Japan)	Carburetor production process technology (both cars and motorcycles) and the production process of springs (both cars and motorcycles)
1994	Toyo Roki (Japan)	Design and production of automotive filtration equipment air cleaner, canister, power steering oil tank
1994	Nanyo (Japan) Sugiyama (Japan) FCC (Thailand)	Production technology of compressor parts for automobiles
1994	Nichirin (Japan)	Production of hydraulic brake hose for motorcycles
1994	Atsumitec (Japan) H.P.D.	Production technology of engine parts via special plating system and heat treatment
1995	Ota Seimitsu Kanagata (Japan)	Tooling (jigs and fixtures, mold) design and production
1995	Asakawa Seikakusho (Japan)	Research and production of high-tensile bolts and fasteners for cars and trucks
1996	Tanaka Precision (Japan)	Production of clutch parts, piston pins and ball race for motorcycles
1996	Firm TFS	Production of sintering products, utilizing the knowledge of powder metallurgy processing

Source: corporate document and personal interviews with the President in 2004

the Asian region, Honda planned to produce the "Asian car", Honda *City* (Panichapat and Kanasawat, 1997: 23). The concept was to source as much as possible the locally produced parts and saved on the production and transport costs (Ibid.). This meant that Honda would comply with the Thai government's 54 per cent local content requirement[305]. The situation

[303] In other words, Firm D President wanted his engineering (and technician) team to engage in more product and tooling design activities, rather than passively accepting the given product specifications provided by the carmakers (and motorcycle makers).

[304] In the early 1990s, there was a significant Japanese foreign direct investment, of which Honda Automobiles was one of them. Honda had been selling cars in Thailand for quite some time through the assistance of a local assembly plant, Bangchan General Assembly (personal interview with ex-Managing Director of this assembly plant, November 6, 2004). But realizing the Thai booming economy and planning to setup an export production base, it had decided to establish a wholly-owned subsidiary in Thailand in 1992.

[305] For this Honda *City* model, the carmaker wanted to raise its percentage local content from 54 to 60 (personal interview with Firm D President, April 29, 2004)

created a business opportunity for Firm D Group, who had been a first-tier supplier for Honda[306].

Firm D President did not stop at viewing this as only a business growth opportunity; he viewed it as a **learning opportunity**. He negotiated with Honda (Japan) for technical assistance and full support for his engineering team. The purpose was for his team to engage in designing the hand brake, which will normally occur in Japan (personal interview with Firm D President, April 29, 2004). The negotiation was difficult, but was successful. Consequently, Firm D President assembled a team of design engineers to work with the Japanese counterpart on designing the hand brake prototype. This activity was challenging and invaluable, since Firm D President managed to contact the Honda research and development engineer (from Japan) to assist with the design. Once the prototype was produced, the Thai engineering team had to travel to Japan to obtain Honda managers' approval (Ibid., December 13, 2004). It could be argued that the Group learned significantly about the product design process, and since then, Firm D flagship product has been the parking hand brake for passenger cars and trucks[307] (corporate brochure, 2004).

The **second** learning activity involved the tooling maintenance capability. Initially, there were always problems with mold maintenance. The President described an instance where he had to again travel to Japan to learn about mold modification:

> "During the early stages of OEM production, the die casting mold was the most expensive piece of tooling and it was prone to damage during the production trial runs. Hence, the mold needed constant maintenance. Firm D Group know-how on mold repair was limited; often times, I had to carry a 30 to 40-kilogram mold to Japan to receive an expert advice. Once I arrived in Japan, I observed how the Japanese technicians conduct the maintenance activity. I recognized that they only welded certain little portions of the mold surface; then I thought to myself that my Thai technicians should be able to do this. I intended to transfer what I had *learned* and *trained* my own technicians to be more self-sufficient. [italics added] (personal interview with Firm D President, May 12, 2004)

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[306] In fact not only is Nissin Kogyo (partner in Firm D Group) a first-tier supplier of Honda, but Honda Motor (Japan) also owns 34.6 per cent of Nissin Kogyo (2005: 13). Hence it could be said that whatever Firm D Group propose, Honda Motor will take such proposal rather seriously. Moreover it would be even more so if such proposal leads to a mutual benefit for both Firm D Group and Honda Motor.

[307] This hand brake was first supplied to mainly Honda passenger cars (Honda *City*) since mid-1990s. Then later the similar type of hand brakes were indigenously designed, produced, and tested, and then supplied to other Japanese car and truck makers such as Isuzu, Hino (a truck manufacturer that is part of Toyota Group) and Toyota Hilux pick-up trucks (personal interview with Firm D President, April 29, 2004).

Firm D President was aware of his firm's existing capabilities and the learning capability of his own workers. He wanted his own technicians to be more self-sufficient in performing simple mold maintenance. More importantly, the President placed great emphasis on human resources development. This did not mean that Firm D President wanted to be fully independent from the Japanese firms; rather, the President believed that his engineers should consult the Japanese experts only on difficult technical matters. It appeared that Firm D President wanted to "stretch" his engineering team capability. Several years later the President invested in Firm D-tec (a tooling design unit), where most of the simple mold maintenance were done in-house.

The **last** learning activity involved the product diversification. The diversification on electronics product started in the 1990s, when the President recognized that Firm D Group's core competence in aluminium die casting process could be applied to the production of aluminium casing for electronic parts. In doing so, his engineers learned minor process adaptation.

Learning the Technology Linkage Activities

The number and quality of **domestic linkages** remained roughly the same[308], but the number of **foreign linkages** grew rapidly. Both Firm MMIH and Firm CKB assisted the Group to quickly expand its foreign joint venture network (see Table 7.2). Each foreign firm brought with it the technical knowledge. Firm D Group intended to leverage on these linkages to transfer the production knowledge and enhance the Group's capabilities (personal interview with Firm D Group President, November 16, 2004).

Learning the Marketing Activities

Firm D marketing activities were focused on the **domestic** market; very little auto-parts were **exported**. The exception was with the aluminium parts for the electronics industry; these were exported to Asian regional countries. However, the production volume of these parts was not significant when compared with the auto-parts (personal interview with Firm D President, May 12, 2004). In terms of moving up the product value chain, Firm D Group's ability to market its own design of the parking hand brake signified its progress towards more complex marketing activities.

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[308] These were basically linkages with public organizations such as BOI and other public organizations.

7.2.5 Firm L (1991 – pre-1997 crisis)

Learning the Investment Activities

Firm L major investment was in the CAD/CAM system and ANSYS software[309]. This enabled its engineers and technicians to design new alloy wheels efficiently. However, the painting system and the heat treatment were still manually operated, causing the products to suffer from many inconsistencies and defects[310]. The other **investment projects** were related to the incremental improvement in production technology such as the investment in low-pressure aluminium die casting **equipment.** Other minor investments included the hiring of foreign experts to assist with the production process. In addition, there was no **investment** in the new production facility.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** main learning activities: the searching and learning of better production process technology, learning to design large wheel, and learning to re-organize the firm internal structure (inclusive of human resources development).

The **first** learning activity was the improvement in the production process. The investment in new technology was the low-pressure die casting system. Back in 1987 when Firm L President was working within the joint venture, the technology used was gravity die casting. Through studying various books and consulting the experts, the President decided that the low-pressure die-casting was a superior technology[311]. He added that this technology is appropriate to mag wheel production since the molten aluminium is injected into the center of the mold (wheel) allowing uniform cooling to occur, and thus achieving the required strength and elongation[312] (Ibid.). Firm L was interested in producing high-quality alloy wheels. Most of the times, the firm performed many experiments via adjusting the temperature, pressure, and mold design to achieve better quality wheels.

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[309] ANSYS is a software used for analysis of alloy wheel strength.

[310] Later when the export production volume increased, Firm L invested in the latest automatic cleaning and painting system. In 2004, it claimed that this system is the most advanced in Southeast Asia.

[311] "In gravity casting you cannot accurately control the flow of aluminium once you poured it into the mold. The aluminium will naturally flow according to the gravitational pull. On the other hand, in the low pressure casting system, you can accurately control the aluminium flow by controlling the pressure. This will create smooth flow with the desired physical characteristics. Hence if the finished product quality is affected by the flow, you can perform the experiment to control the finished product quality by adjusting the aluminium flow" [italics added] (personal interview with Firm L President, May 4, 2004).

[312] Here the meaning of elongation is that opposite of brittleness. The elongation tends to be a trade-off with strength, i.e. a wheel that is too strong is usually very brittle (breaks easily under high impact force). Hence to simultaneously achieve both strength and elongation is a balancing act.

Many **trial runs** were made on new mold designs. Sometimes the experiments succeeded, and other times they failed. There were no formal training courses; it was just Firm L President and a group of engineers who fumbled around and **learn by trial-and-error** (personal interview Firm L President, May 4, 2004).

The **second** learning challenge was the design of larger alloy wheel suitable for the US market, targeting the sports utility vehicle (SUV). This was a challenge for the design team, since large mag wheels usually required higher-level production capability[313]. The engineering team had to ensure an effective cooling design within the mold to achieve uniform temperature distribution across the mold (personal interview with Firm L Factory Manager, May 5, 2004).

The **last** learning activity was the firm internal re-organization. Firm L learned that one of the crucial steps in achieving marketable wheel design involved customer collaboration, as well as meeting product standards and safety. Often times, the wheel drawings were shared with the prospective customers and discussions usually involved adjustments to the style. The product design comprised **two** important issues: 1) the aesthetic appeal or the wheel fashion trend and 2) the engineering quality and safety. Consequently, two separate internal departments within Firm L were created. One was responsible for coming up with the innovative, aesthetic wheel design (which collaborates extensively with customers), and another was responsible for testing such design on quality standard and safety. Once these departments were created, Firm L decided to penetrate the overseas market. Exporting wheels has been a difficult task, many things had to change. This included more **human resource development** and the emphasis on cross-functional team (Ibid.).

Learning the Technology Linkage Activities

When learning by trial-and-error failed, Firm L decided to hire external consultants. There were two sources: **domestic** and **foreign consultants**. The **domestic ones** were mostly university lecturers and private consultancy firm. For instance, during the early

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[313] Since the low-pressure die casting process injects the molten aluminium from the middle (wheel hub) of the mold, the cooling occurred as the raw material travels toward the rim. For larger wheels, the temperature difference between the hub and the rim is much greater, causing the physical properties (strength and elongation) of the product to deteriorate. This is the technical challenge.

1990s, various lecturers from Chulalongkorn University were hired in to teach the employees about computer aided design (CAD), computer-aided manufacturing (CAM)[314]. Other lecturers were hired to teach the engineers about the basic principles of low-pressure aluminium die casting (Ibid.).

The **foreign** technical **consultants** comprised one from the United States and another from Holland[315]. These two consultants were hired because Firm L was having many quality problems. Particularly, the firm could not achieve the required strength and elongation. Through these consultants, Firm L aimed to attempt the production of export-quality alloy wheels.

Learning the Marketing Activities

Firm L marketing activities were focusing on satisfying the high demand within the **domestic** economy. Very little emphasis was placed on export[316]. The President stated why export was not attractive,

> "Our firm decided not to engage in **export** due to the strength of Thai Baht [against the US dollar]. Consequently, domestic sale of alloy wheels gives us much better earnings than export" (personal interview with Firm L President, May 4, 2004).

It was not until after the 1997 crisis that export activity became crucial. In particular, the export to larger markets, such as the United States and Europe, was deemed a necessary survival route.

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[314] "When we started to build our engineering design team, we asked for Chulalongkorn University training courses in CAD/CAM. The duration of the training lasted for about 2 to 3 months" (personal interview with Firm L President, May 4, 2004).

[315] For instance, the President recalled his first consultant from the US. "I wrote a small advertisement in a US technical magazine stating that I would like to hire an expert on aluminium die casting. Many experts reply to Firm L with faxes. The technical expert travelled from the US and had visited our factory for two weeks" (personal interview with Firm L President, May 4, 2004). Another consultant was from Holland. "... at one time, the Dutch technician came and assisted our production team for one week. He taught us the basic principles of low pressure aluminium die casting and provided comments on our current production practices" (Ibid.).

[316] As the Factory Manager pointed out, "About a year prior to the 1997 crisis, our firm had exported only about 10 to 15 per cent of the total production volume and most of target countries were within Asia" (personal interview Firm L Factory Manager, May 5, 2004).

7.2.6 Firm S Group (1966 – pre-1997)

Learning the Investment Activities

Many **investment projects** were implemented. **First** was the 1965 investment to augment the production facility, to include production of more products such as brake and clutch linings[317]. Later in 1975, the Group **invested** in a malleable iron production plant[318]. Then in 1983, the Group **invested** in a foreign joint venture (Mitsubishi group) to assist in the transition from REM to OEM manufacturer. From 1989 to pre-1997 crisis, Firm S Group had also **invested** in a total of 8 foreign joint ventures (see Table 7.3). Other **investment projects** included the set up of another modern production facility in 1995, along with the **investment** in modern quality control system. The new facility has been producing the rear axle and trunnion shafts[319].

Learning the Production and Product Activities (Process, Product and IE & HRD)

Firm S Group had **three** main learning activities: learning to transition from REM to OEM auto-part manufacturer, learning to expand production capacity and operate modern equipment, and learning to develop the human resources.

The **first** learning activity occurred during the mid-1980s. It was the important transition from REM to OEM production, i.e. **learning to produce** OEM auto-parts. In1984 Firm S Group, via a technical assistance with Mitsubishi Steel Manufacturing, had entered the OEM market. The Group **learned** higher level of production technology with increased automation and more stringent requirements on quality and delivery schedule. The products supplied to Mitsubishi carmaker comprised four items: leaf spring, coil spring, brake lining, and stabilizer bars.

Secondly, in **1990** Firm S Group **learned** to expand production capacity and all the production lines were relocated to a new site. During this time, the learning activity was more systematic. There were incipient training schemes put in place with the plan to achieve the international quality accreditation. In addition, in **1995** a new subsidiary was

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[317] Then in 1976, there was an investment to expand the same production facility, enabled it to produce coil spring. In 1979, another production line was introduced and it produced stabilizer bars.

[318] This production plant received foreign technical support and collaboration; it was a malleable iron production facility to support the intermediate goods used in auto-part production.

[319] The key production process was the forging process, which required engineers who could operate automated machines and robots to achieve high-level precision. Firm S Group claimed that this production facility is the largest of its kind in Southeast Asia (plant visit and personal interview with Firm S Group Vice President, October 29, 2004).

established with initial paid-up capital of 80 million Baht (corporate website, 2003). Its competitive objective was to advance the Group into higher-level manufacturing activity and to secure its market leadership in axle shafts[320]. In the same year, the Group also invested in a computerized quality control system, to enable its product quality to meet the required standards[321]. Consequently, more engineering graduates were hired and they **learned** the operation of this system.

Lastly was the systematic learning to develop the **human resources**. The qualification of the Group's personnel during the 1960s and 1970s consisted mostly of technicians with only elementary or (at most) high school education. Historically, the Group hired few engineering graduates[322]. Through human resources training provided by Mitsubishi, the Group was able to improve its product quality (personal interview with Firm S Group Senior Engineering Manager, December 14, 2004).

After the firm had engaged in many foreign technical linkages, the Group started to hire formally-trained engineers (personal interview with Firm S Group ex-General Manager, October 20, 2004). The engineers' training became more intense once the Group had entered into the OEM market, and some of them travelled to Japan (Gohsyu Corporation) to learn the axle shaft production process[323]. These engineers learned through trial production and making process adjustments. In addition, in 1997 Firm S Group engaged in a 5S[324] training program; this was a collaborative effort between Firm S Group and the Thailand Productivity Institute (Anonymous, 1998)[325].

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[320] This production process and product design received technical assistance from two Japanese firms: Gohsyu Corporation and Ibara Seiki.

[321] "Quality is inspected at almost every stage of the production process" (corporate website, accessed 2006).

[322] In addition, during the first two decades of development, Firm S Group did not bother to source its personnel regionally or internationally. Even after the establishment of manufacturing business in the early 1960s and the late 1970s, the firm still did not have any systematic documentation for work management and the Group had a quite conservative view on upgrading (personal interview with ex-General Manager of Firm S Group, October 20, 2004). It was not until the firm was preparing itself for the partially liberalized automotive industry during the early 1990s that it had started to establish a systematic work management and collaborative joint venture partners.

[323] These engineers were responsible for collaborating with the Japanese engineers in checking and auditing the new imported production line (personal interview with Firm S Group Engineering Chief, November 15, 2004).

[324] 5S is a Japanese style of work management; it comprises Seiri, Seiton, Seiso, Seiketsu and Shitsuke. The main principle underlying 5S is the system for executing operational tasks in a timely, neat order. In doing so, the firm has the ability to quickly trace the root cause of problems and develop a prevention scheme to control the recurrence of such problems.

[325] The 5S learning strategy was a platform for Firm S Group to further build its positive organizational culture, to achieve higher work productivity (Ibid.). The program also served as a basis for further work on ISO 9002, QS 9000 and ISO 14001 accreditations.

Learning the Technology Linkage Activities

Both types of linkage (domestic and foreign) were present during this period. **Two** examples of important **domestic linkages** were discussed: TAPMA and Thai-Japan Technology Promotion Association.

First was the **domestic linkage** with the Thai Auto-part manufacturer Association (TAPMA). As the Vice President of Firm S Group was also the President of TAPMA, this linkage was obvious. As the President of TAPMA, he has the responsibility to ensure that the Thai auto-part suppliers **learn** to become more competitive[326]. **Second** was the **domestic linkage** with the Thai-Japan Technology Promotion Association. In early **1997,** Firm S Group collaborated with the association to train its staff on quality management[327]. Firm S **learned** to initiate a quality standard "cross functional team", which comprises a mixture of individuals from each subsidiary to ensure that all quality accreditations will be achieved in a timely manner. As a result, the ISO 9002 was obtained by the end of **1997** (Anonymous, 1998), and a year later the Group obtained QS 9000[328] and was able to supply auto-parts to the US carmakers.

In addition, Firm S Group **learned** to form several **foreign linkages**. For instance, there were 8 foreign joint ventures, 4 of which were with the Asahi Tec Group (Japan)[329]. The purpose was to acquire the die casting production know-how (see Table 7.3). Furthermore, Firm S Group was involved in **learning** the production technology through **linkage** such as foreign technical assistance agreements. From Table 7.4, all the assistance were provided by the Japanese firms, and the technology transfer focused on die casting production process, the machining of auto-parts, and the production of specific auto-parts such as axle shafts.

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[326] To provide technical as well as general knowledge to the Thai suppliers, TAPMA organized many seminars and training courses, often in collaboration with TAI.

[327] The training courses comprised mainly issues related to ISO9002, QS9000 and ISO14001 (personal interview with Firm S Group Engineering Chief, November 15, 2004).

[328] This is the quality accreditation system required by the US carmakers.

[329] The remaining joint ventures were targeted at learning the complex production of various auto-parts such as steering column, gearboxes, pumps, suspension ball joints and brake parts.

Table 7.3 Foreign Joint Ventures for Firm S Group During Its Expansion Phase (1966 – pre-1997 Crisis)

Year	Partner Firm (Country)	Expertise / Knowledge
1989	Asahi Tec Corporation (Japan)	Aluminium die casting process
1989	Asahi Malleable Iron (Japan)	Aluminium castings production
1993	Asahi Tec Group (Japan)	Iron castings production process
1993[330]	Asahi Tec Group (Japan) Shippo Moulds (Japan)	Know-how of aluminium mold used in the die casting production
1994	Yamada Seisakusho[331] (Japan) H.P.D.	Production of sophisticated auto-parts such as steering column, steering gear box, water pump and oil pump
1995	Tsuchiyoshi (Japan)	Coated sand resins for mold production
1996	Nisshinbo (Japan)	Production of automotive brake lining, disc brake pads and drum brake
1997[332]	Somic Ishikawa (Japan)	Production of steering linkages and suspension ball joints

Sources: corporate documents and personal interviews with the Group's Vice President

Table 7.4 Foreign Technical Assistance for Firm S Group During Its Expansion Phase (1966 – pre-1997 Crisis)

Year	Partner Firm (Country)	Expertise / Knowledge
1975	Nishioka Malleable Iron Industries (Japan)	Production process of malleable iron for auto-parts
1983	Mitsubishi Steel Manufacturing (Japan)	Production of steel products for supply to Mitsubishi carmaker
1988	Ibara Seiki (Japan)	Machining process
1989	Asahi Tec Corporation (Japan)	Aluminium die casting process
1994	Asahi Tec Corporation (Japan) Ibara Seiki (Japan)	Machining process of casting auto-parts
1995	Gohsyu Corporation (Japan) Ibara Seiki (Japan)	Production of automotive axle and trunnion shaft

Sources: corporate documents and personal interviews with the Group's Vice President

[330] It was a three-way joint venture.
[331] In 2006 this foreign joint venture firm is known as Yamada Manufacturing and it specializes in the production of functional parts for both 2-wheel and 4-wheel vehicles. Example of functional parts include: automatic transmission parts, oil pumps, water pumps, steering columns, rack & pinion, speedometer gearboxes and belt converter parts. For the Japanese firm the joint venture serves the purpose of creating a Southeast Asian manufacturing base.
[332] This joint venture was formed prior to the 1997 crisis.

Learning the Marketing Activities

Firm S Group's focus on only the **domestic** market started to shift towards **indirect export**. It had been supplying auto-parts to multinational carmakers who in turn export the completely built vehicles (CBU); hence the Group was technically an **indirect exporter**[333]. The Group attempted to become a direct exporter, but it faced **two** obstacles: the restrictive clause under the OEM contract (prohibiting the firm from exporting) and the inability to perform cost-effective product testing.

With the government policy now emphasizing export, the Group struggled to **try** to set up a direct export base for the Thai-made auto-parts[334]. However, the obstacles facing Thai firms were unqualified product testing facilities, and the issue of strict quality requirements. As a result, in 2006 Firm S Group current export level (determined as a proportion of its total production volume) is at a low 6 per cent[335] (Family Know-How, 2006). One possible explanation was most Thai testing facilities (inclusive of the ones provided by Thailand Automotive Institute, TAI) were insufficient. Most Thai suppliers had to rely on overseas testing facilities that charged exorbitant fees. Hence, TAPMA President has argued for the setup of the local Automotive Research and Testing Center (ARTC)[336].

7.2.7 Firm SOM (1996 – pre-1997 crisis)

Learning the Investment Activities

In 1997, Firm SOM **invested** in relocating its production equipment from the former **production site**. The registered capital was half a million Baht, obtained as a

[333] The first exporting experience came when carmaker M had decided that it will export it passenger car, Lancer Champ, to Canada for the first time[333]. Prior to this export carmaker M had asked all its Thai first-tier suppliers (inclusive of Firm S Group) to participate (personal interview with carmaker M, Executive Vice President, November 30, 2004).

[334] It sets up a subsidiary firm to cater for this (Firm APEC). Today the firm operated with limited success, due to its inability to meet the costly product testing required of exported auto-parts. Without such testing scheme, Thai-made auto-parts could not be exported to the large markets such as the US, Japan or the European Union.

[335] It is important to note that this low export volume of Firm S Group has persisted despite the fact that the Thai government has been promoting auto-parts export since mid-1980s. That was when the government started to shift from an import substitution to an export-oriented industrialization strategy. It is also important to note that despite the 1997 crisis, Firm S Group had maintained a 80:20 ratio of domestic versus export products (Anonymous, 1998). Hence it could be said that export earnings were not sufficient to alleviate the severe impact of the 1997 crisis. It is also worth exploring certain issues that had impeded Firm S Group's ability to export (see also the previous footnote, above).

[336] This was succinctly stated by TAPMA President (Firm S Group Vice President): "[The ARTC] is viewed as essential to certify the quality and standards of Thai auto parts as a control system for exports. Thai suppliers would no longer need to send their auto parts to Taiwan and Japan for testing as currently practised once the centre becomes operational, thereby reducing the testing costs by 30-50 percent" (Praiwan, 2004).

private loan from its main customer and several private banks[337]. Besides this investment, Firm SOM was not committed to invest in other important resources[338]. The firm continued its passive **learning activities,** operating the outmoded machines with very little knowledge on the **investment** in new equipment. The President provided the reason: "Ever since start-up, my firm has been laden with financial debt. We lacked sufficient working capital or funds to upgrade our machines" (Ibid.). But more importantly, even if the firm has sufficient finance to purchase the new equipment, it lacked the **investment** in hiring engineers, since most capable engineers had forsaken the firm and looked for better jobs elsewhere (Ibid.). This also implied that Firm SOM was facing a human resource crisis.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** leaning activities: learning production plant expansion and limited learning to develop the human resources. In addition, an example of missed business (and **learning**) opportunity was provided.

The **first learning activity** was the production expansion and product diversification. In 1997, Firm SOM expanded into a rented warehouse. The firm had two main product groups: the auto-parts and the metal parts for small musical instruments. From 1995 to 1997, the firm produced only auto-parts. At one stage, the firm was involved in producing automotive exhaust parts. But it failed to directly supply this part (this will be explained later) (personal interview with Firm SOM President, November 24, 2004). In 1997, the firm started to produce the parts for the musical instruments[339].

The **second learning activity** was related to the firm's poor human resources development. Firm SOM did not implement any formal procedure to ensure effective training program. Most of the jobs were assigned as they are deemed suitable to each worker's experience, and more importantly, job assignments were based heavily on machine availability. At times, the President was involved in the job allocation tasks. **Human resource training** was considered to be **poor**. There was a lack of work standards, and the tasks were performed repetitively. Using manually-operated machines, Firm SOM also faced other problems.

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[337] The collateral used was the residential home that belongs to Firm SOM President and his relatives.
[338] For instance, during the mid-1990s when other auto-part firms in the industry strategically expanded the business through investment in modern technology such as computer-aided design and manufacturing (CAD/CAM) and computer numerical control (CNC) machines, Firm SOM remained quite dormant.
[339] The orders were obtained from Mr. B's brother, who had closed ties with his former employer (personal interview with Firm SOM President, November 24, 2004).

> "Our technicians needed to be highly skilled to operate the manual machines. They needed to understand the job sequences as well as the selection of appropriate tools, in order to produce the right product. Furthermore, the workers needed to gain sufficient production experience to operate the machine. The manually operated machines, in my view, were much more difficult to operate when compare with the computerized ones" (personal interview with Firm SOM President, November 25, 2004).

Systematic training or documentation did not occur until 2003 when the firm acquired the ISO 9000 standard (personal interview with Firm SOM President, November 24, 2004). This lack of work standard and poor human resource training led Firm SOM to miss the opportunity to upgrade itself to become a first-tier auto-part supplier.

Last was the example illustrating Firm SOM poor strategic planning in quality management. The President made a "**sequential learning mistake**" in trying to upgrade his firm into a first-tier auto-part supplier *without first* upgrading the quality system. The President approached Arvin Meritor to sell his products. Arvin Meritor wanted to ensure that Firm SOM could meet its strict criteria of high quality, target cost and on-time delivery (QCD). It checked to see if Firm SOM had some sort of quality accreditation system put in place. It turned out that Firm SOM did not have any quality system. Hence, the US firm lacked the confidence that Firm SOM could meet its strict QCD criteria. Firm SOM ended up missing the opportunity to become a first-tier supplier[340].

> "In 1997, I sent in the price quotation to Arvin Meritor, but due to my firm *weakness* in quality system, the US firm declined to award me the production contract. Instead, they awarded the contract to Firm SML, who had full ISO 9000 as well as QS 9000 accreditations, and told us to supply to Firm SML and they, in turn, will buy the parts from Firm SML. I was very disappointed in my *poor* strategy, and missed out on the lucrative opportunity. Once Firm SML supplied Arvin Meritor, it was difficult for my firm to squeeze into the upper-tier. Our firm was virtually "*locked out*" of this market space" [italics added] (personal interview with Firm SOM President, November 24, 2004).

It could be said that Firm SOM lacked the strategic perspective. It did not understand that to compete, one must be fully equipped with the required quality standards. It could also be said that due to the President's inadequate exposure to external collaborations and his limited international perspective, Firm SOM lacked the strategic vision (In particular, the firm lacked the ability to formulate competitive learning strategy). But what could be said

[340] In the mean time, Firm SOM's long-time customer, Firm SML, had picked up where it had left off and secured production contract with Arvin Meritor, making Firm SOM as its second-tier supplier.

also was that Firm SOM learned from this mistake, and immediately decided to invest in ISO 9000 accreditation afterwards[341].

Learning the Technology Linkage Activities

Firm SOM only had internal joint venture agreement among family members. There were no external joint ventures. Given the debt-laden situation and poor firm performance, it was quite difficult to find a sympathetic business partner (personal interview with Firm SOM President, November 24, 2004).

Learning the Marketing Activities

As the firm mainly supplied auto-parts to only one main **domestic** customer, overall there was very little development of its marketing capability. Similarly, the idea of **exporting** was not planned for at all.

7.2.8 Firm TKT (1991 – pre-1997 crisis)

Learning the Investment Activities

In the late 1980s, Firm TKT started to engage in an **investment project** to set up a new production facility[342] and there were **investment** in new plastic injection machines and in the search and recruitment of engineers and technicians[343]. The new facility was capable of mass-producing plastic parts for both the automotive industry and the electrical appliance industry. In 1995, another important **investment** was related to the set up of a foreign joint venture[344]. Other **investment projects** included the set up of modern production system with computer-aided design and manufacturing (CAD/CAM) and the new paint room facility.

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[341] The firm received the ISO 9000 accreditation in 2003 (quite late when compared to its competitors), and obviously this was a bit too late to enter into a deal with Arvin Meritor.
[342] Firm TKT increased the registered capital to 45 million Baht and also set up another subsidiary firm, Firm TKT-PI, responsible mainly for export (SET, 2005b). The rationale for this investment was to obtain the BOI privilege since the Thai government was trying to encourage its small-and-medium enterprises (SMEs) to export, and it was easier for newly established firm to obtain such privilege (Lauridsen, 2000: 41).
[343] The new machines were capable of meeting the differentiated needs of the carmakers. In addition to the new machines, the number of employees increased to more than 200 (ASID, 2006).
[344] At this time, the registered investment capital increased to 100 million Baht (from 45 million in 1991).

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** main learning activities: learning to operate the new production facility, learning to operate the new modern production technology, and learning to upgrade the human resources.

First was the learning to operate the new production facility and product diversification. Firm TKT engaged in production of plastic auto-parts for the Japanese carmakers (Nissan and Toyota). Initially, the firm engaged only in the production of plastic parts for electrical appliance, with very few auto-parts. With the new factory, the firm had invested in more than 25 plastic injection machines, with varying capacity from 30 to 1,000 tons (Firm TKT corporate website, accessed December 20, 2005). Consequently, the engineers and operators learned to operate these machines; and **learning by doing** and problem solving were conducted on the shop floor. The initial **learning** was usually conducted through the assistance of the foreign equipment vendors.

The **second** learning activity was related to the operation of modern production technology. Firm TKT invested in computer-aided design and manufacturing (CAD/CAM) system; this had enabled the firm to set up an in-house mold design and manufacturing division. In addition, Firm TKT gradually accumulated the capability to conduct simple mold maintenance [345] (2004: 7). The firm also invested in a new paint room, and the employees also **learned** to operate the room's appropriate filtration and positive airflow system[346].

The **third** learning activity was the human resources development. It was not until 1990, that the firm started to hire engineering graduates (personal interview with Firm TKT Managing Director, November 5, 2004). The engineers were trained to operate modern plastic injection equipment; in 1993, the firm also started to engage in mold design and manufacturing activities (2004: 7). The OEMs' strict requirements on quality, cost, and on-time delivery posed the need for Firm TKT's engineers to effectively **learn** proper equipment operation. Consequently, the firm had also sent its employees for training at

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[345] This meant that, in the event where the customer-supplied injection mold broke down due to heavy repeated use, the firm could successfully perform simple routine maintenance in-house, with the guidance of the foreign customers.

[346] The major problems of the old paint room were the cloth fibers and dust particles that stuck onto the painted plastic parts, causing defective finished products (Khodee et al., 2004). The new filtration and positive air flow system helped in alleviating such problems (i.e. the pressure of the air within the room is higher than the environment, thus keeping the dust particles outside). Additionally, the filters were installed on windows, roofs and other places that prevented the incoming dust.

various public Thai universities such as Chulalongkorn and King Mongkut University of Technology (personal interview with Firm TKT Managing Director, November 5, 2004). Most of the courses involved informal on-the-job training.

Learning the Technology Linkage Activities

The **linkage** with **foreign** firm started in this period. Even though not extensive, the *single* foreign joint venture was formed in **1995**. After increasing its registered capital to 100 million Baht (from 45 million Baht in 1991), Firm TKT formed a Japanese-Thai joint venture with Ogawa (Japan)[347]. The purpose was to **learn** the chrome-plating technology. Instead of joint venture agreements, Firm TKT preferred to seek informal technical advice from the OEMs[348]. An exception to this would be the technical assistance (in **1996**) with Kansei Corporation[349] (Japan) (Anonymous, 1996). The assistance agreement was initially for five years, and it was not continued (hence it was an intermittent dispatch of Japanese experts). Consequently, it could be said that the linkage activities were quite limited.

Learning the Marketing Activities

Most of the products were targeted at the **domestic** customers, and Firm TKT did not engage in much **export**. Of the total production output, only 5 per cent were exported and these products were not yet up to the world-class standards (personal interview with Firm TKT Managing Director, November 5, 2004).

7.2.9 Firm TS Group (1981 – pre-1997 crisis)

Learning the Investment Activities

Firm TS Group aggressively **invested** in many new subsidiaries and built a diversified product portfolio (see Table 7.5). During the **1980s**, the products included aluminium die casting parts, automotive seats, and vehicle chassis. Then in the **1990s**, the

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[347] The new joint venture was to produce high-quality plastic parts with chrome plating to be utilized in both the auto-parts (radiator grilles for trucks) and electrical appliance parts industry (Lauridsen, 2000: 42).

[348] For instance, Firm TKT supplied the emblem for Toyota vehicles and during the trial production runs, Toyota personnel had come to audit and assist the firms with production problems for more than 20 times (personal interview with Firm TKT Injection Section Chief, November 5, 2004). Other than this, Firm TKT did not engage in signing formal technical assistance, and it had very limited exposure to formal assistance agreements; for instance in mold design and production department, "[Firm TKT] does *not* use any technology in production or technician [technical] assistance from other company" [italics added] (SET, 2005b).

[349] This is part of the Nissan Motor affiliated supplier group (Anonymous, 1996). This foreign firm assisted Firm TKT with the plastic resin technology.

Group diversified to produce stamped automotive body parts, plastic parts, springs, wiring harness, and electrical tapes[350]. Similarly, there were many **investments** in forming new foreign joint ventures[351] (see Table 7.6). Other **investments** included the training and development programs and the massive investment in modern technology[352].

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** main **learning activities**: learning to mass produce auto-parts, learning to produce diversified products, and learning to promote teamwork and upgrade human resources.

The **first learning activity** was the mass production of auto-parts. In the **late 1980s**, when Mitsubishi decided to setup a pick-up truck production base[353], Firm TS Group was selected as its first-tier supplier. Mitsubishi required the Group to invest in a new modern production facility (Firm TSLA)[354], to produce auto-parts for assembly into the pick-up trucks. The Group's engineers **learned** (with the assistance of foreign firms) to set up a trial production process, test it, and transfer it for mass production. Much production activities were carried out as **learning by systematic experimentation.**

Second was the **learning activity** related to product diversification. Other products produced by Firm TS Group included pressed metal automobile, motorcycle parts, and agricultural diesel engine parts. In the early 1990s, the Group diversified itself to produce plastics as well as electrical appliances parts, and later it also produced electrical wiring harness, plastics parts, moulds, dies and other tools (see Table 7.5).

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350 The plastic parts and springs were produced for both automotive (including motorcycles) and electrical appliance industries.
351 In total, there were about 5 new subsidiaries and 10 new foreign joint ventures established during this expansion period.
352 Examples included the investment of over 60 million Baht in sophisticated computer system such as Catia computer aided design (CAD) and other computer aided design manufacturing (CAM) softwares (Krungthep Turakij, 2003).
353 "Thailand will become the second largest maker of Mitsubishi cars after Japan." It was expected that the 14 companies operating in Laem Chabang will make 120,000 cars a year (Anonymous, 1990). Of these companies, more than half were subsidiaries and joint ventures owned by Firm TS Group; this illustrated the extent of ties that the Group had with the carmaker Mitsubishi (Ibid.).
354 Firm TSLA is one of the flagship firms managed by a General Manager is arguably the *most* capable engineer of Firm TS Group [italics added] (personal interview with Firm TS Group Vice President, October 19, 2004). At the request of the carmaker, Firm TSLA is located literally "next door" to Mitsubishi (own direct observation, 2004) and whenever there was any problem regarding the products manufactured it can immediately dispatch its own employees to rectify the situation with quick turn around time. In the automotive business, this policy of having the first-tier supplier located in close proximity to the vehicle assembly plant is called the "door to door" policy (personal direct observation during Firm TS Group meeting, 2004).

The **third** learning activity was related to upgrading of **human resources**. Not only did Firm TS Group subject its technicians and engineers to on-the-job training, but also its President nurtured the value of strong teamwork[355]. The Group claimed that it has a very strong team of engineers[356]. This was because of the many foreign technical assistance and joint venture agreements that had encouraged the engineers to travel overseas to **learn** the foreign technology. The President viewed overseas training as important:

> "I always encourage our employees to learn and enhance their knowledge. I encouraged them to have visits to other factories both domestically and internationally" (Somsak, 1983).

Hence it could be argued that Firm TS Group placed a strong emphasis on human resources development[357].

Learning the Technology Linkage Activities

Firm TS Group's foreign linkage capability had increased significantly. The **domestic linkages** were with the public organizations such as the BOI. More importantly were the **foreign linkages**. For the **foreign linkages**, the increase came in **two** forms: the foreign joint venture and technical assistance agreements. The joint ventures included many foreign firms; each had its own area of expertise (see Table 7.6). From Table 7.6, the notable **foreign joint ventures** occurred in 1983. About five years after establishment, Firm TS engaged in **joint venture** in Malaysia. This signified the first time that the Group had ventured abroad as a technology transferor[358].

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[355] "[Firm TS President] encourages all employees to have high responsibility and have ability to collectively solve any problems. My employees and I [the President] live together as a family unit; we enjoy the good times and weathered the bad times" (Somsak, 1983).

[356] "The production team that my father had built was *second to none*, both technically and operationally. I entrust them with all the details of complex production management, allowing myself to focus on higher-level issues such as business development, organizational development, and marketing [italics added] (personal interview with Firm TS Group Vice President, October 19, 2004).

[357] As a result of extensive human resource training, the Group received an award (in 1993) from MMC Sittipol (Mitsubishi joint venture based in Thailand) on excellent collaboration in training workers. The course was titled "Production Engineering & TQC Management Course" (corporate internal document, 1993).

[358] The Japanese OEMs entrusted Firm TS Group as their capable partner, who could assist them with the technology transfer task to Malaysia.

Table 7.5 **Products of Firm TS Group During the Expansion Phase (1981 – pre-1997 crisis)**

Starting Year	Subsidiary or Joint Venture	Main Products
1981	Firm TCI (subsidiary)	Produced aluminium die casting parts such as assembly parts for motorcycles, agricultural engines and automobiles. Later it produced aluminium parts for electrical appliance.
1982[359]	Firm QSI, OSI (joint venture)	Produced seats for carmakers and motorcycles in Malaysia
1989	Firm TSPKK, TSPKK-E and TSPKK-B (joint venture)	Started production of automobile and motorcycle chassis frames.
1989-90	Firm TSLP (subsidiary)	Initiated production of plastics parts for automobiles and motorcycles.
1991	Firm TSCSS (joint venture)	Joint venture firm started production of automotive and electrical appliance springs
1994	Firms TSH, TST (subsidiary, later joint venture)	Production of wiring harness and electrical tape
1994	Firm TSLA (subsidiary)	Mass production of stamping body parts, pressed parts, fuel tanks, instrument panels, and plastics parts, mostly for the carmaker Mitsubishi.
1996	Firm TSHP (subsidiary)	Diversified to produce plastics parts for household electrical appliances

Sources: corporate documents and personal interviews with the Group's Vice President

Similarly the **foreign technical assistance** sought by Firm TS Group consisted of many firms (see Table 7.7). From Table 7.7, one can discern that almost all the assistance agreements were made with Japanese firms.

[359] This year marked the first time that Firm TS had invested in an overseas manufacturing facility. Firms QSI and OSI were responsible for selling the Japanese know-how as well as machinery and tools to Malaysian firms (Anonymous, 1983b). This illustrated that the Japanese OEMs trusted Firm TS as a capable partner, with sufficient capability to train the Malaysian firms.

Table 7.6 Foreign Joint Ventures of Firm TS Group During the Expansion Phase (1981 – pre-1997 crisis)

Year	Partner Firm (country)	Expertise / Knowledge
1982	Firm QSI, OSI (Malaysia)	Produced seats for carmakers and motorcycles in Malaysia
1988	Mitsubishi Motors (Japan)	Design and setup of jigs and fixtures and machining center (lathe, drilling, boring, milling)
1988	Shinko Kogyo (Japan)	Propeller shaft manufacturing process
1989	Press Kogyo (Japan)	Automotive (one-ton pick-up) chassis and frame
1989	Honda, motorcycle (Japan)	Automotive die casting, clutch set and motorcycle parts
1991	Cheng Shing Spring Enterprise (Taiwan)	Automotive springs used in shock absorbers, engine and electrical appliances
1992[360]	DRB-Hicom Group (Malaysia)	First-tier supplier of Proton (Malaysian national car)
1993	Mitsuba Electric MFG (Japan)	Production process of electrical products (generators, starting motors and wiper motors) for automobile and motorcycle
1994	Nihon Sanso (Japan)	Machine tools for metal processing such as lathe for removing metal
1995	Ikuyo (Japan)	Mold manufacturing
1995	Honda (automobile and motorcycle) (Japan)	Production of speedometer

Sources: Corporate internal document, Project and Marketing Department (2004), ASID (2006), www.wesleynet.com and Firm TSLA website (accessed December 14, 2005)

The significant agreement was the Mitsubishi Motors Corporation (1989-1990), since this led to many other large-scale investment projects that contributed to the development of production capability[361]. Other important assistance agreements included many Japanese firms; each had accumulated its own expertise over many years[362].

[360] This joint venture is located overseas.

[361] It is also important to note in 1990 Mitsubishi dispatched a team of Japanese experts to assist Firm TS Group in setting up the new production lines, designing tools and other sophisticated auto-parts. All these learning activities formed part of the carmaker and Firm TS Group "mutual strategy" to transition into a larger-scale production of vehicles, mostly for export.

[362] The following are the Japanese firms that provided the technical assistance and their corresponding knowledge or technical expertise: Kokusan Denki (expert in the production of electric motor and magnetos), Sankei Industry (expert in the production of exhaust systems), Suiryo Plastics (expert in injection molding and urethane foam), Shinko Kogyo (expert in propeller shaft production), Press Kogyo (expert in vehicle chassis and frame production), Mitsuba Electric MFG (expert in electric motor production), Ikuyo (expert in mold production), Izumi Machine (expert in motorcycle parts-lower and upper arms), Wako Industrial (expert in oil and air filter elements production), Nagase (expert in plastics blow molding and its affiliate firms-Automotive Mold Technology and Creative Technology-both have expertise in computerized mold design) (personal interview with Firm TS Group Senior Manager, October 29, 2004 and various Japanese corporate websites, accessed February 15, 2006).

Table 7.7 Foreign Technical Assistance of Firm TS Group During the Expansion and Adaptation Phases (post 1981)

Year	Type of Agreement	Agreement Partner (Location)
1982	Technical assistance agreement	Kokusan Denki (Japan)
1986	License and technical assistance agreement	Shinagawa JT. Posha Densen (Japan)
1987	Technical assistance agreement	Sankei Industry (Japan) Suiryo Plastics (Japan) Mitsuba Cable Industries (Japan)
1988	Technical assistance agreement	Shinko Kogyo (Japan)
1989	License agreement	Mitsubishi Motors Corporation Press Kogyo (Japan)
1989	Technical assistance agreement	Press Kogyo (Japan)
1990	Personnel dispatch agreement	Mitsubishi Motors Corporation
1992	Gentlemen's agreement	Sankei Industry (Japan)
1992	Technical assistance agreement	Mitsuba Electric MFG (Japan)
1994	Technical assistance agreement	Ikuyo (Japan) Izumi Machine MFG (Japan) Wako Industrial (Japan)
1994	Update (continuation of) to prior technical assistance agreement	Mitsuba Electric MFG (Japan) Suiryo Plastics (Japan) Nagase (Japan, Thailand)
1995	Technical assistance agreement	Wako Industrial (Japan) Musashi Seimitsu Industry (Japan) Tensho Electric Industrial (Japan) Dynoplast Elbatainer (Germany)
1998	Technical assistance agreement	Sumino Kogyo (Japan)
2004	Technical collaboration	Automotive Mold Technology (Thailand) Creative Technology (Japan)

Source: Corporate internal document, Project and Marketing Department (2004) and several Japanese corporation websites (accessed 2006).

Learning the Marketing Activities

Most of Firm TS Group marketing activities were focused on only the **domestic** market, and very little products were **directly exported**[363]. Since the foreign joint ventures were assisting the Group with the **marketing activity**, Firm TS Group did not invest much time into systematic market research, distribution network or sales forecasting.

[363] Direct export means that Firm TS Group conducted the export by itself. Through connection with the Mitsubishi carmakers, Firm TS Group had been an *indirect* exporter since Mitsubishi has been exporting completely built vehicles from Thailand since the late 1980s.

7.2.10 Summary of Different Firm Learning Activities and Mechanisms (expansion phase)

The pattern of learning activities and mechanisms of the nine case study firms is summarized in Table 7.8. The pattern pointed to **three** groups of firm.

The **first** group **invested** in many learning activities (for e.g. Firm AH Group, Firm D Group, and Firm TS Group). In addition, to the normal routine production, these firms invested in the search activities and formed new businesses through foreign partners. These firms engaged in more complex **production** activities. Moreover, they were also extensively involved in the continuous improvement programs. Their **products** were becoming more complex, and involved some design activities. For instance, Firm AH Group started to design automotive jigs, and Firm D started to design the parking hand brake. Similarly, Firm TS Group invested in a new subsidiary to design and mass produce pick-up truck parts for export (by Mitsubishi carmaker). In terms of **linkage activities,** these firms further solidified their relationships with the foreign firms, forming many new technical assistance, and foreign joint ventures. Such linkages enabled the firms to access new sources of knowledge, enabling them to develop their capabilities. For these firms, one of the key factors leading to effective learning activities was the emphasis on human resources development. All these firms emphasize extensive training, and sometimes overseas training of their engineers and technicians. In terms of **marketing activities,** these firms were at an early stage of becoming indirect exporters (i.e. they produced auto-parts for carmakers to export).

The **second** group of firms were more moderate in their **investment** activities (for e.g. Firm L and Firm S Group). They also invested in search activities to link with foreign firms but not as extensive as the first group. Their **production process** and **products** were not as complex as the first group of firms, and involved limited design activities. For instance, Firm S Group produced undercarriage REM parts with little emphasis for OEM market. It was not until much later that the Group emphasized OEM auto-parts. Similarly, Firm L produced alloy wheels for both the OEM and REM markets, and the firm passively received finished drawings from their foreign partner and had limited design activities. In addition, these firms formed fewer **linkages** when compared with the first group, and their linkages did not involve much learning activities, nor were these linkages the result of a purposive search. Other factors retarding this group learning activities were poor (or

Table 7.8 Summary of Firm Learning Activities and Mechanisms – the Expansion Phase

FIRM	EXPANSION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm AH Group	• Investment activities • Production process activities • Product activities (related diversification) • Linkage activities (domestic and foreign) • Marketing Activities (domestic and foreign)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) • By continuous improvement in production **Active and Purposive:** • By searching and forming foreign joint ventures • By searching and signing technical assistance • By investing in modern production technology • By establishing a tooling design unit • By exporting and searching for overseas customers
Firm CPC	• Investment activities • Production process activities • Product activities (diversification; limited design capability)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) • By continuous improvement in production **Active and Purposive:** • By investing in modern production technology (though limited utilization) • By training of employees (not continuous)
Firm CSP	• Investment activities • Production process activities • Product activities (diversification; limited design capability) • Linkage activities (domestic only)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) • By continuous improvement in production **Active and Purposive:** • By investing in modern production technology • By hiring more engineers and external domestic consultants (TAI) • By training of employees

Source: own elaboration based on the research

Table 7.8 (continued). Summary of Firm Learning Activities and Mechanisms – the Expansion Phase

FIRM	EXPANSION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm D Group	• Investment activities • Production process activities • Product activities (diversification and design capability) • Linkage activities (few domestic and mostly foreign) • Marketing Activities (mostly domestic and rarely foreign)	**Passive and Semi-Automatic:** • By doing and changing production activities **Active and Purposive:** • By searching and formed 11 foreign joint ventures • By searching and signing technical assistance • By investing in modern production technology • By collaborating closely with the carmakers • By hiring more engineering graduates • By training employees (domestic and overseas)
Firm L	• Production process activities • Product design capability • Linkage activities (mostly domestic and rarely foreign) • Marketing Activities (mostly domestic and rarely foreign)	**Passive and Semi-Automatic:** • By doing and changing production activities **Active and Purposive:** • By searching and benchmarking with other firm • By investing in modern production technology • By collaborating: public organizations and customers • By hiring more engineering graduates • By training employees (domestic and overseas)
Firm S Group	• Investment activities; transition into OEM manufacturing • Production process activities • Product activities (REM and OEM auto-parts) • Linkage activities (domestic and foreign) • Marketing activities (domestic)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching and signed for technical assistance • By searching and formed 7 foreign joint ventures • By investing in modern production technology • By collaborating with the carmakers and public organizations • By hiring and training engineers and technicians

Source: own elaboration based on the research

Table 7.8 (continued). Summary of Firm Learning Activities and Mechanisms - the Expansion Phase

FIRM	EXPANSION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm SOM	• Investment activities • Production process activities • Product activities (diversification; no design)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By investing in capacity expansion (though not modern technology) • By training employees (on-the-job)
Firm TKT	• Investment activities; plant expansion • Production process activities • Product and tooling capability (diversification; no design) • Linkage activities (domestic) • Marketing activities (domestic)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching for technical assistance and foreign joint venture (limited) • By investing in modern production process • By collaborating with the carmakers • By hiring capable engineers and technicians • By training employees (domestic, later overseas)
Firm TS Group	• Investment activities; plant expansion • Production process activities • Product activities (diversification; auto-parts, electrical appliance, plastic parts, agricultural engine parts) • Linkage activities (domestic and foreign)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching, form 12 foreign joint ventures • By searching, sign 12 technical assistance • By investing in modern production plant • By investing in overseas manufacturing plant • By hiring capable technicians • By training employees (on- and off-the-job)

Source: own elaboration based on the research

delayed) development of the firms' human resources. In terms of **marketing activities**, these firms focused mainly on the domestic market, with almost no emphasis on exports.

The **third** group of firms was mostly passive (for e.g. Firm CPC, Firm CSP, Firm SOM, and Firm TKT). They did not engage in any plans to **invest** in the complex set of learning activities. At best, some of these firms were invested in more **production** equipment to increase the production capacity per se, and there were no explicit learning activities associated with such investment. These firms' products remained simple and there were no design activities. For instance, Firm CPC and Firm TKT produced simple plastic auto-parts. Similarly, Firm CSP continued to produce simple aluminium die casting parts. A third-tier auto-part supplier, Firm SOM was the worst performer, and severely lacked the understanding for continuous improvement. In addition, the firms did not engage in any **linkage activities**. An exception would be Firm TKT, which formed a Japanese joint venture (Okawa), but it was severely impacted by the 1997 crisis (see Section 7.3.8). There were neither foreign joint ventures nor extensive technical assistance agreements, consequently these firms access to knowledge sources were largely limited. In terms of **marketing activities**, all firms focused on the domestic market, except Firm AH Group which started to export to regional markets.

In addition, all firms were involved in using the passive **learning-by-doing mechanisms** (see Table 7.8). Not all firms engaged in the more active learning mechanisms. Only some firms implemented the more active learning by searching for foreign partners as well as importing the foreign technology (for example, Firm AH Group, Firm D Group, Firm L, Firm S Group, Firm TS Group). These firms extensively implemented the "link and learn" mechanisms to effectively access the external sources of knowledge. Other firms conducted the learning activities by relying mostly on passive learning by doing and changing production activities per se (for example, Firm CPC, Firm CSP, Firm SOM and Firm TKT). Even though some of these firms hired and trained engineers, their knowledge sources were limited due to inadequate initial linkages with foreign firms. The "link and learn" mechanisms were largely absent in these firms, and in the case when such mechanism was present (for e.g. Firm TKT), it was not sustained.

7.3 Learning Activities During the Adaptation Phase

7.3.1 Firm AH Group (post-1997 crisis)

Learning the Investment Activities

In terms of business expansion, there were **two** new **investment projects**: **investment** in a specialized subsidiary firm and several **investments in** firm acquisitions. For instance, Firm AH Group decided to invest in a new subsidiary dedicated to engineering design and research and development. What Firm AH currently lacks is the basic research, new product development and complete turnkey design of other auto-parts (besides the jigs). These activities could further assist Firm AH in meeting the co-design activity as requested by the multinational carmakers, and thus gains more confidence and eventually higher sales order. The President realizes this strategic capability gap; and hence in 2004 he decided to setup a wholly owned subsidiary, Firm AH's Engineering Unit[364]. With this new firm, the President is confident at upgrading the design capabilities.

Another example was the **investment** in **three** firm **acquisitions**. **First** was the acquisition of a German subsidiary in Malaysia. In 1999, the Group acquired a portion of German jig manufacturing subsidiary in Malaysia; this was a strategic move to produce jigs[365] for Mercedes Benz. **Second** was an acquisition of the US-based subsidiary in Thailand. In 2003, Firm AH Group made an acquisition which led to dramatic growth in both sales and technical knowledge. It acquired Parish Structural Products Thailand, PSPT. PSPT's main product was the chassis for Isuzu pick-up truck; PSPT was the sole supplier[366]. PSPT production activities included design dies, body shape, product testing and manufacture. In order to ensure successful acquisition, Firm AH needs to understand and master these production activities. After the acquisition, Firm AH installed a new

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[364] The Unit has the responsibility for Computer Aided Engineering (CAE) programs, engineering consultancy, engineering design and engineering research and development (2004).
[365] See footnote #3 for a definition.
[366] The deal will make Firm AH the sole manufacturer of automobile chassis frames for the one-ton pick-up trucks that are made by Japan's Isuzu (Anonymous, 2003a). Firm AH President and his board were very proud of this acquisition; stating that "if we can afford to buy an American [subsidiary] firm, this is [evidence of] reverse globalization; it illustrates the ability of [a] Thai [firm] who is willing to fight and compete" (Tangsriwong, 2003).

management system (Anonymous, 2004d) and rectified the existing problem of poor on-time delivery (i.e. 14 per cent late delivery) and 1000 parts-per-million (ppm) defect rate[367].

Last was an **investment acquisition** of a Chinese firm in 2003[368]. Our future plan is "to grow the company with additional diversified products from Thailand and to capitalize on the booming auto industry in China" (Ibid.). After the acquisition, the Group undertook an additional **investment** in new machinery to upgrade the plant to produce higher-quality product. In late 2004, the Group exported about 7 million US dollars worth of jigs to China, and this acquired firm assisted in such operations.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** important **learning activities**: the development of a continuous improvement program and the supply of high-end assembly jigs to Europe.

First was the development of a formal continuous improvement program. By 2002, Firm AH initiated a lean manufacturing program with the assistance from Ford/Mazda and Toyota Motor (Thailand). The Group had also **hired** LMC Lean Manufacturing Consulting GmbH to improve its production processes and train its workers. Firm AH President provided full support.

> "Firm AH Group intends to work with the LMC consultants to roll out further improvements in the factory line especially in our processes, overall layout and overall productivity in order to set a new standard in achieving record quality parts per million" (LMC, 2002).

The resulting improvement was significant. In 2004, Firm AH was selected as a model company (i.e. a positive example of successful implementation of lean manufacturing) by the LMC consultants.

After more than two years of implementation of lean manufacturing, Firm AH won the Toyota Production System (TPS) Championship Award[369]. The Group has proved itself worthy as a Toyota supplier by winning similar award (again in 2005). In addition, the

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[367] The resulting new productivity was 100 per cent on-time delivery and 40-ppm defect rate (AH Group, 2003: 15).
[368] Firm AH Group purchased 75 per cent equity stake in Kunshan Chaitai-Xincheng Precision Forging (KCPF) (Anonymous, 2004b).
[369] In a nutshell, the Toyota Production System (TPS) is a rational system (or a philosophy) that stresses low inventory and eliminating any non-productive work steps. Products are manufactured as per orders received and in the right quantity. The TPS Championship Award is a competition organized internally by Toyota Motor (Thailand) and its first-tier suppliers. The total number of firms who had participated was seventeen and the one of the criteria used in selecting the winner involved a 'surprise' visit to the manufacturing site by a panel of Toyota experts to observe and collect important data on the production process and product quality as well as productivity (personal interview with Firm AH Senior Manager, November 17, 2004).

Group began a new project "AH Production System (APS)[370]". It aims to upgrade the current lean manufacturing system through the use of modern information and communication technology.

Second was the design of automotive assembly jigs for the European carmakers. The Group was able to design assembly jigs that meet specifications provided by the most quality-stringent European carmaker – Mercedes Benz. This illustrated that there was an accumulation of tooling design capability as well as a talented team of management and engineers supporting such project undertaking. Additionally, the Group also won the contract to supply a complete set of assembly jigs to Volvo Car and Truck (Sweden)[371].

Today, Firm AH Group supply of jigs and dies continued with the quality-stringent US and European carmakers. For instance, the production engineers at Daimler Chrysler stated that they purchased the dies made by Firm AH Group since it is cheaper than the ones used in Germany, and the quality of the dies was always better than those made in China and India. DaimlerChrysler had used five different dies (produced by Firm AH) to produce automotive body parts at a German manufacturing plant (Shari, 2003).

Learning the Technology Linkage Activities

Firm AH Group displayed high-level of linkage capabilities. Since the project must be coordinated across different groups of individuals, the Group had **learned** to improve plant coordination beyond the traditional parent firm boundary. For instance, in the development of formal continuous improvement project, the Group **learned** to collaborate with one the world largest lean manufacturing software provider, Oracle[372] and Deloitte Consulting[373].

Other examples of **learning** the **linkage capabilities** included the firm's ability to search and form numerous foreign joint ventures and technical assistance agreements. In **1999**, the Group signed a technical assistance agreement with Siemens VDO (Germany), and later in **2002** formed a **joint venture**. The purpose of technical assistance and joint

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370 This is a hypothetical name since the researcher is obligated to maintain confidentiality.
371 Prior to the offering a contract, Volvo dispatched a team of engineers to visit Firm AH in Thailand to inspect the prototype jigs and to provide suggestion on further improvement (Charlesworth, 2003). Again this constituted abundant learning opportunities for Firm AH Group.
372 Oracle is one of the world largest enterprise software companies.
373 Of particular interest to Firm AH Group is the Oracle's Supply Chain Management (SCM) software module. Oracle stated that its software would assist a company like Firm AH to enable lean manufacturing, to reduce the risk in lean manufacturing implementation and to provide a flexible framework for bringing new facilities online (Anonymous, 2005b)

venture were to "tank sender"[374] for fuel tanks that were assembled into Ford/Mazda pick-up truck. Up until early 2000s, most of the firm's products and production activities focused solely on metal and none were in plastics. The management board decided that the firm should upgrade its production techniques on automotive plastics and electronics auto-parts. Therefore, the Group decided to sign a memorandum of understanding (MOU) to setup a **joint venture** with a Singaporean firm (Fischer Tech) whose main expertise is in plastics parts. The aim was to collaborate with Fischer Tech to produce automotive plastic products. In **2005**, the Group formed another **joint venture** with Sojitz Corporation[375] (Japan). The aims were:

- to broaden its product offerings in current regional markets
- to penetrate further in the Asian regional markets
- to reduce costs through higher productivity using information technology
- to achieve operational management excellence supported by IT and ERP implementation (Anonymous, 2006a).

Learning the Marketing Activities

With the onset of the 1997 financial crisis, the focus of Firm AH Group's **marketing activities** had shifted to export; the Group **learned** to dramatically increase its export volume. Its production capabilities were further upgraded to match those of export-quality products. This was directed by the President learning strategy to become a worldwide supplier of jigs and dies. Many projects were implemented, for example:

- Quality certification programs (ISO9000, QS9000, ISO14001, ISO/TS16949[376])
- Improvement to current lean manufacturing programs
- Upgrading the information systems and technology program

These projects contributed to support an increase in the export volume.

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[374] A "tank sender" is an instrument attached to the fuel tank used to measure the level of remaining fuel. It is connected electronically to the instrument panel inside the driver cockpit.

[375] Sojitz Corporation is a major player in world automotive industry. It is one the Japanese leading trading firms with 2004 sales of over 40 billion US dollars. Moreover it employed more than 14,000 employees, spreading among its 157 subsidiaries around the globe (Mr.Y, 2006: 18-19).

[376] It is the latest quality certification program that most multinational carmakers demanded from their first-tier suppliers. It is different from previous accreditation on the issue of continuous improvement. To be qualified for ISO/TS16949, firms must display explicit evidence of upgrading and continuous improvement activities.

7.3.2 Firm CPC (post-1997 crisis)

Learning the Investment Activities

Firm CPC did not engage in any significant investment projects. There was neither **investment** in subsidiary firms nor joint ventures. The minor investment projects included **investment** in training of human resources through linkage with public organizations. Other investments included the purchase of more machinery and the **investment** in the quality management such as the ISO 9000.

Learning the Production and Product Activities (Process, Product and IE & HRD)

The learning of production capability was ineffective. There were **three** obstacles: underutilization of invested modern production technology, lack of systematic and effective continuous improvement program and poor human resources management.

The **first** limitation deals with the problem of underutilized modern technology and poor commitment to invest in auto-part design tool. Having invested in CAD/CAM and CNC machines, Firm CPC was studying the cost and benefit of purchasing the Moldflow program[377] (Soucier, 2004). It was assessing the benefit achieved from virtual design of plastic injection mold (personal interview with Firm CPC President, December 18, 2004). The President was hesitant to buy the new software because: 1) most of the motorcycle parts did not require the production of prototype parts (or virtual part design), and Firm CPC was accustomed to producing the real auto-parts and 2) the computer aided design CAD/CAM system, which was acquired several years ago, was *not* fully utilized today (Ibid.). In addition, Firm CPC currently engages in very little auto-part parts design. Consequently, the benefits of the new Moldflow were doubtful. It could be said that Firm CPC was ambivalent about the preparation for future needs of customers, and it did not commit itself to seriously stretching the current production capability.

The **second** limitation deals with the poor ability of Firm CPC to continuously upgrade its production process and products. Firm CPC participation with the organizations and the search for expert assistance was passive, and focused mostly on the solution as an end in itself (*not* the means to an end). The TAI Consultant Engineer said:

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[377] Moldflow is the name of the program and its features include the ability to virtually simulate the flow of plastic melt as it enters the mold as well as the dynamic distribution of the temperature as the mold cools. The two variables: raw material flow path and the cooling temperature distribution are essential design parameters for the plastic injection production process.

> "The Japanese expert (*sensei*) had visited Firm CPC several years ago. Sensei had expressed that several years later, Firm CPC *still* focus on similar problems, namely high defect rates, designing jigs for product test, and understanding the physical properties of raw materials. The firm had *not yet* progressed to understand the problem-solving methods, the way to reach a fruitful solution on their own. Firm CPC workers were just interested in 'what the solution is' rather than 'what are the solution-finding methods' " [italics added] (Personal conversation with Sensei and TAI Engineer Consultant, November 26, 2004).

Here it could be said that Firm CPC did not put in place, the mechanisms required to capture the learning of new production knowledge required in order to conduct effective continuous improvement activities. Lacking such mechanisms, it is highly likely that the firm would remain passive and persistently depend on the Japanese expert assistance.

The **last** limitation was the inability of Firm CPC to improve on its human resources. The President was highly conservative in hiring new engineering graduates[378]. Most employees were trained through in-house training with sporadic visits of foreign experts. The President provided the reasons:

> "Firm CPC has not been keen on hiring the engineering graduates. Since the Thai education system is weak, it is unable to produce qualified plastic production engineers. Even if we provide in-house training for this new intern, we are unable to achieve satisfactory training result. Hence our firm's preferred way to human resource development is to engage the worker in long-term in-house training. This is a sensible route since the government had failed to provide qualified human resources" (Personal interview with Firm CPC President, December 18, 2004).

Consequently, it could be said that Firm CPC President was highly critical of the Thai education system. He had to rely on his ad-hoc in-house training programs and several other programs offered by the TAI. Note that there was a lack of complementarity here in what the firm needs and what the market could offer. The President's ability to accurately discern his firm capability gap and complimenting it with the market resources is crucial. Firm CPC did not appear to have achieved this complementarity.

Learning the Technology Linkage Activities

There are mainly two types of linkage: domestic and foreign, and Firm CPC tended to rely more on the former for its sources of technical knowledge. There were **two** domestic linkages and no foreign linkages. **First** domestic linkage was the collaboration

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[378] In 2003 out of 272 employees, there was only *one* engineer [italics added] (corporate internal document, accessed December, 2004).

had been with the Thailand Automotive Institute (TAI). The firm has been continuously involved with TAI's Automotive Expert Dispatching Program (AEDP). The AEDP would send out one Japanese expert along with one Thai engineer to visit Firm CPC. The objective was to have a discussion with the President about the current operational problems. Then the Japanese expert would require the firm to setup a *kaizen* team[379]. Firm CPC set up a team comprising six workers (TAI, 2005a). This team learned a new hot runner mold design[380]. They also learned the procedure to ensure optimally controlled temperature, one of the crucial variables in the design (Ibid.).

The **second domestic linkage** was the involvement in public organization. In year 2002, Firm CPC President was elected to lead the Thailand Plastic Industry Association (TPIA) as the President (from www.tpia.org, accessed January 15, 2006)[381]. Through such involvement, Firm CPC **learned** to stay up-to-date with the current technology. It also learned about the changes in government industrial policy.

In terms of **foreign linkages**, there was a limitation. Firm CPC did not engage in any foreign technical assistance or joint venture agreements. Hence, the only assistance received by Firm CPC was that of an informal expert assistance supplied by the OEM customers. Most often the assistance did not include any higher-value added learning activities such as product modification or design activities. The OEM-provided assistance was basically aiming for the Firm CPC acquisition of basic production techniques. It could be said due to this lack of formal assistance, Firm CPC had quite a limited exposure to the expertise available to upgrade itself to acquire the higher level of capability such as advanced OEM or product design capability.

Learning the Marketing Activities

Firm CPC, even under the impact of 1997 financial crisis, did not increase its export volume. The firm's marketing activities was focusing on only the domestic market. Until today, Firm CPC export was less than 10 per cent[382].

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[379] A *kaizen* team is a continuous improvement team form by the firm.
[380] The hot runner means the path that which the hot plastic melt travels prior to entering into the mold.
[381] The TPIA elected its President every two years, and Firm CPC President was elected in 2002 (from www.tpia.org, accessed March 15, 2006). The purpose of this organization was to collaborate with public organizations to ensure the stability and growth of Thai plastic industry information center for all Thai plastic manufacturers. Another purpose was to negotiate with the Thai government on the industry-related policies (BOI, 2005).
[382] In 2003, out of 488 million Baht total sales revenue, only about 31 million Baht came from export sales. Hence the export volume did not increase after the crisis either (corporate internal document, 2003).

7.3.3 Firm CSP (post-1997 crisis)

Learning the Investment Activities

Today, Firm CSP was deciding on several **investment** issues. In terms of more expensive **software** such as Enterprise Resource Planning (ERP) or casting simulation, Firm CSP felt ambivalent about such **investments**. The reasons are twofold[383]: expensive software[384] and insufficient capability of the human resources (personal interview with Firm CSP General Manager, December 15, 2004). Consequently, the General Manager decided that it was a better option for Firm CSP to currently utilize what the public organization (for e.g. NSTDA) had to offer on the ability to perform casting simulation. Based on short-term cost savings alone, it could be argued that this was a wise decision. However on the long-term learning activities, and if Firm CSP wanted to be involved in future design activities, it needed to invest in such advanced technology and also train its engineers.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **two** learning activities: learning to improve the productivity and learning to upgrade the human resources.

The **first** learning activities involve productivity improvement and product diversification. In late 2004, the auto-part production had increased dramatically, partly due to the establishment of pick-up truck production base (personal interview with Firm CSP General Manager, December 15, 2004). Currently, the firm is facing insufficient production capacity, and is undergoing a capacity stretching program, which receives technical assistance from TAI and NSTDA. In terms of products, Firm CSP had further diversified to produce more electrical parts as well as auto-parts[385]. The **second** learning activity was the human resources development. Firm CSP had setup a formal training scheme for its employees: one was the top-down training requirements, tailored to suit the firm needs, and another was the bottom-up employee-suggested training, tailored to suit

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[383] These reasons were also supported by the NSTDA's ITAP consultant who stated, "Most of the users of such high-level software are from the public research institutes and universities, and very few private firms actually purchase this type of simulation software for private use" (NSTDA, 2005b: 2).
[384] It costs over 3 million Baht just for a simple, functional module (personal interview with Firm CSP General Manager, December 15, 2004).
[385] Examples of current auto-parts produced are: aluminium oil pan for Isuzu trucks, compressor bracket for Toyota and other bracket mounts for Mitsubishi (personal plant visit, November 11, 2004).

each worker's personal needs (Ibid.). These internal training schemes when implemented together with the assistance programs from TAI, Firm CSP was able to successfully meet the requirements of ISO/TS 16949.

Learning the Technology Linkage Activities

Firm CSP began the transition from relying on domestic linkage to searching for foreign linkages. First was the discussion of another **domestic linkage**, followed by the search for **foreign linkage**.

The **domestic linkage** was the collaboration with the National Science and Technology Development Agency (Industrial Technology Assistance Program – ITAP). Firm CSP worked with a Japanese expert, who analyzed the firm's problems and solved them. Firm CSP problems (NSTDA, 2005a) comprised:

- High defect rates
- Too much raw materials waste, have to determine a method to reuse the scrap materials

The Japanese expert taught Firm CSP engineers and technicians to properly collect operational data and analyse the possible problems' root causes (Ibid.). The General Manager expressed his gratitude:

> "The ITAP program assisted our firm in reducing the defect rates. This led to increase in profits. NSTDA has dispatched a Japanese expert to advise our firm on operational improvement and quality control techniques. This enhanced the firm's credibility in the eyes of our customers, who viewed us as having a well-defined commitment to continuous improvement activities" (NSTDA, 2005a: 2).

Thus it could be said that without such assistance, Firm CSP (on its own) would be rather slow to accumulate such higher-level production capabilities.

At the time of this writing, Firm CSP had not collaborated internationally. However, since 2005 the firm is actively seeking for a foreign technical partner. For instance, the General Manager travelled to Germany to engage in a One-on-One Forum[386] designed by Bayern Innovativ[387] (Germany) (from www.1on1-forum.de, accessed March

[386] This Forum focuses on the platforms necessary for technology transfer. The one-on-one meetings aimed at the initiation of (technical) cooperation between firms (from www.bayern-innovativ.de, accessed March 26, 2006).

[387] Established in 1995, Bayern Innovativ (Germany) is a publicly held company located in the Bavarian State Government. It focuses on 10 future-oriented technologies. The firm is the driving force for the intensification

24, 2006). The ultimate goal was to search for the suitable technical cooperation partner as well as potential European OEM customers. Therefore, Firm CSP is more active in its search for potential foreign partner.

Learning the Marketing Activities

Firm CSP still would like to secure the **domestic** market share prior to expanding into export. Therefore, less than 10 per cent of the production volume were exported in 2005 (NSTDA, 2005a: 1). This is arguably because of the firm's young age as well as lack of readiness (perhaps insufficient marketing capabilities) for export.

7.3.4 Firm D Group (post-1997 crisis)

Learning the Investment Activities

The significant activity comprised the **overseas investment** in a manufacturing facility. The investment was requested by Honda (motorcycles). In **1999** Honda requested Firm D Group to invest in Vietnam. This **investment** signified the Group's first overseas investment[388]. During the **project execution,** the Group planned for appropriate **equipment** as well as tooling capable of producing large-scale OEM auto-parts. The Group also carefully managed its know-how transfer, i.e. the issue of what to transfer and what not to transfer. The President expressed:

> "When Firm D was investing in a Vietnam, we have to think about what we should teach the Vietnamese. We had to be careful *not* to divulge our core knowledge assets because once these people learned the "tricks of the trade", they could rise up to be our competitors" [italics added] (personal interview Firm D President, May 12, 2004).

Hence it could be said that Firm D group had achieved the status of technology transferor, rather than being only a recipient. Consequently, Firm D engineers could build upon such experience to fill their own capability gaps.

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of cooperation among companies and across technologies (from www.bayern-innovativ.de, accessed March 26, 2006).

[388] Honda informed them of 'ramping up' the motorcycle production capacity: first year with production capacity of 200,000 units, then increasing 200,000 each year until reaching 1 million units by the fifth year (personal interview with Firm D President, May 12, 2004).

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **four** main **learning activities**: the further **related diversification** and **deepening** of parking hand brake design, learning unrelated product diversification, learning improvement in production technology, and learning to improve the human resources.

The **first** learning activity was related to development of the Group's parking hand brake. Having succeeded in designing the product, Firm D **diversified** further to supply their hand brakes to almost all Honda passenger cars. It had monthly production volume of 30,000 hand brake sets and expected to increase to about 40,000 to 50,000 sets. Firm D did not rest on its laurels; it set the ambitious goal to supply virtually all of the Japanese carmakers in Thailand.

The successful design efforts had provided Firm D with sufficient credibility to approach Toyota and offered its parking hand brakes. Through several rounds of negotiation and lobbying, the Group won the contract to supply for Toyota[389].

> "As far as I know, I am the *first* company (outside of Japan) to design the parking hand brake for Toyota Motor Corporation. This was something that you can brag about, since most of Toyota auto-parts were always sourced from the conservative *keiretsu* suppliers" [italics added] (personal interview with Firm D President, May 12, 2004).

Not only did the Group successfully supply for Toyota, but it had also engaged in a bid to supply for Isuzu. This bid (and negotiation) is still ongoing (personal interview with Firm D Engineering Manager, December 13, 2004). It could be argued that the supply of parking hand brake to many carmakers had assisted Firm D Group to **deepen** its product design knowledge.

In addition, the Group's management had been thinking about future product. Currently Firm D manufactures the mechanical parking hand brake and has very little know-how on the future electronic hand brake. It is worth noting how Firm D Group had prepared itself for this change. The Engineering Manager discussed with the Japanese experts:

> "I had discussion with our Japanese partner about the engineering design of an electronic hand brake where the driver can simply push a button. We

[389] Toyota had used Thailand as the *only* pickup truck production base in the world with export to all countries [italics added] (Busarawong, 2004a), and it planned to produce 400,000 vehicles by the end of 2006 (Wiriyapong, 2004). Hence this is a large-scale production operation.

came up with a list of design variables. For example, how powerful should the electric motor be, how much tension should the cable withstand, should the tension be varied according to how hard should the driver push the button?" (personal interview with Firm D Engineering Manager, November 16, 2004).

The Engineering Manager admitted that the Group's know-how on electronic hand brake was limited. Firm D Group would most likely form more joint ventures to transfer the know-how on the design of an electro-mechanical system (Ibid.).

The **second** learning activity was related to the **unrelated product diversification** into electronics, which became crucial during the post-1997 crisis years. The financial crisis impact on the Group was not lethal. It did not significantly affect the sales volume of the electronic components, since most parts were exported (see section 6.3.4). Hence it could be argued that with proper product diversification, the Group learned to produce diversify product as well as ameliorating the severe impact of the 1997 crisis.

The **third** learning activity was the improvement in modern production technology. By 2001, Firm D invested in the computer-aided engineering (CAE) system[390] that enabled the design engineers to achieve a lower cost and rapid prototype development. The R&D Department Manager expressed,

> "Our firm uses CAE to develop product prototype, rectify the design problem points prior to the mass production phase. In all CAE activities has assisted us greatly with our R&D [product development] activities" (Anonymous, 2003b).

The software can perform many virtual experiments on a number of simulated prototype designs. As a result, the product development time was reduced "from 3 months to *only* 2 *weeks*"[391] [italics added] (Anonymous, 2003b).

The **fourth** was the improvement in human resources development. The Group hired engineering graduates as well as experienced Japanese engineers. The President expressed to his long-time Japanese friend[392]:

> "I knew [this Japanese friend] for quite some time and now I am asking him to find me a group of capable Japanese engineers. The Human Resource Manager and I will conduct the interview and the screening process and

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[390] The hardware and software bundle comprised up-to-date technology such as AutoCAD, Uni Graphics, Solid Works and Catia (personal interview with Engineering Manager, December 13, 2004).
[391] In achieving these design tasks, Firm D Group was not isolated; rather it had ample collaborative projects with other public organizations, who taught them the operational details of CAE software.
[392] This person was also an advisor to Toyota Motor (Thailand).

select the appropriate personnel to join Firm D-tec" (Personal interview with Firm D President, May 12, 2004).

Hence it could be said that the Group's vision on human resource strategy is ambitious and is not limited to hiring just hiring technicians[393]. The President's immediate plan is for the Group to be an engineering tooling design unit, supplying know-how on production line setup and testing; therefore, the engineering team must be capable of designing the production process as requested by the OEMs. To fulfil this endeavour, Firm D President planned to hire at least 50 more engineers and technicians, augmenting his current team of 220 technicians and 80 engineers (personal interview with Firm D President, May 12, 2004).

Learning the Technology Linkage Activities

Firm D Group had engaged in both types of linkages (**domestic** and **foreign linkages**) to enrich their **learning activities.** There were **three** projects. **First,** the **domestic linkage** assisted in the development of the automotive brake parts. It was a multilateral cooperation among Firm D Group, public research organizations, universities, and the Thailand Automotive Institute (TAI). For instance, Firm D Group started learning by collaborating with TAI since **2001.** The first project was with regards to the design of panel assy brake parts. The problem was with the porosity[394] within the finished die-casting aluminium parts. MTEC had assisted with building the computer simulation model of the casting process and determined the possible problem areas within the mold during the casting process[395].

The **second** interesting **domestic,** collaborative design project was concerning the parking hand brake lever. In the production process the sheet metal after being pressed, has to be folded into a U-shape to form the handle part of the brake. The problem was the

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[393] Moreover, the Group required that all engineers and technicians learn the English language, "All of my engineers and technicians have to learn the English language (personal interview with Firm D President, November 16, 2004). Since the President wanted his engineering team to travel overseas and conversed with foreign engineers, English language skills is a necessity.

[394] Here porosity means the little pockets of air trapped within the auto-parts as a result of improper ventilation during the casting process. Hence this is a mold design issue.

[395] Four other auto-parts that involved similar design techniques were investigated in 2003: bracket (TAI, 2003c), cover comp (TAI, 2003d), handle (TAI, 2003e) and plate oil separator (TAI, 2003f). All these parts involved the high-pressure die casting production process which involved the mold design via computer simulation model. All were collaborative projects involving Firm D engineers and MTEC researchers. On average, the number of trial runs for new mold is about 2 to 5 times and each time costs about 70,000 Baht. Using the computer simulation model the number of trial runs is reduced to only twice, thus achieving an average cost savings of over 140,000 Baht. Moreover the computer simulation also enables faster mold development time (TAI, 2002c).

sometimes this handle part is torn after the folding process. The MTEC researchers together with Firm D engineers had used the computer simulation and analysis technique to identify the area where the sheet metal is too thin as well as pointing out that folding the pressed sheet metal in one-single step into a U-shape handle is not a good idea[396] (TAI, 2002d).

The **last** example of **domestic linkage** was the collaborative project related to the chemistry of the plastics that cover the hand brake lever[397]. Normally this material was known to be polyvinyl chloride (PVC) and is toxic to the environment. Now with the growing awareness of the environment from the European Union, it was of mutual interest to both Honda and Firm D Group to use the environmentally-friendly material[398]. But due the lack of Firm D knowledge, it had requested a research team at MTEC to explore this possibility (TAI, 2003b). Currently, the project is ongoing and still waiting for approval by Honda headquarter in Japan[399].

With regard to **foreign linkages**, Firm D Group formed two more foreign joint ventures: with Kayama Corporation (Japan), to learn the technology for cutting tool and machining process and another with Honda Foundry and Asian Honda Motor, to learn the technology for producing automobile pistons.

Learning the Marketing Activities

Most of the sales were still focused on **domestic market** with little product diversification into electronic parts. After the 1997 crisis the market situation was different. The **export** activity improved significantly after the 1997 financial crisis. Despite such activity, the firm still did not invest heavily into the **export** of auto-parts.

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[396] The single-step folding process does not allow the metal sufficient time to flow and form a U-shape; hence the recommendation is to adjust the folding process from one to two-step process: 1) fold into a V-shape and then 2) fold into a U-shape (personal interview with Firm D Engineering Manager, December 13, 2004).
[397] Even though the risk of using TPOs as a plastic cover for hand brake lever was high, Firm D President was still willing to undertake the project. The reason can be explained via his learning strategy; he wanted to illustrate to the Japanese carmakers (Honda and in the future Toyota) that Firm D was willing to invest in higher-level, complex learning activities.
[398] It all started when one of Firm D employees noted that new environmentally-friendly chemical material called thermoplastic polyolefins (TPOs) at a seminar and brought about a discussion between Firm D President and his engineering team about the possibility of replacing PVC with TPOs.
[399] "Once the researcher at MTEC had developed a chemical formula for production of TPOs, the development needed to be tested in a practical product application. None of the other Thai firms were willing to risk having their product image ruined due to poor quality plastic parts. Firm D was one of the few firms who were willing to take this risk and signed a three-way contract (Firm D, MTEC and TAI) for the development of TPOs used in the prototype hand brake. Once the prototype was produced, Firm D President travelled to Japan to ask permission from the Honda carmaker executives and have the Japanese engineers tested the prototypes (personal interview with Firm D President, November 16, 2004).

7.3.5 Firm L (post-1997 crisis)

Learning the Investment Activities

The **investment projects** involved a major plant expansion and installation of modern production technology. Within the firm, there was an **investment** to set up the in-house mold design department capable of designing more than 10 molds per month. In addition, the firm also recently invested in an engineering design team capable of collaborating with public organizations on the up-to-date engineering analysis on product safety and quality (plant visit and personal interview with Design Department Chief, December 8, 2004) [400]. Other **minor investments** included an **investment** in a formal training facility.

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were mainly **four learning activities**: learning to operate the modern production process, learning to operate the new software for die casting simulation, learning to attempt to supply the British Formula One racing team, and the problematic learning due to limited human resources development.

The **first** learning activity was the operation of new production technology. Firm L realized that to be competitive in this alloy wheel business, it needed to enhance the productivity. It does this by investing in a new production facility, which increased the **2003** production capacity from 250,000 wheels per year to 500,000 in 2005. There was also an investment in a modern cleaning and paint room. The old paint room was operated manually by operators and suffered from lack of consistency; it also suffered from dust particles that could contaminate the product surface during the painting process. Hence to cope with increasing exports, Firm L President had invested about 50 million Baht in an automatic cleaning and painting line[401] (plant visit, December 8, 2004). Hence the huge

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[400] In 2004, Firm L was no longer a small firm; it has grown to become a medium-to-large size, family-owned firm with about 300 employees, of which 20 were engineers and technicians (Ibid.).

[401] To properly clean the work-in-process mag wheel, sometimes there is more than one cleaning solution. The new automatic line had the capability to incorporate the application of sequential cleaning solutions. Likewise, the painting process is becoming more complex, accommodating more than a single color. The new automatic line has the capability to lay down the paint sequences to achieve the exactly desired colour. For instance, "Some overseas customers preferred their alloy wheel color to be neither pure silver nor plain black, but something in between. Hence what we did during the painting was we setup the paint sequence to be first black and then follow by silver. The new paint was 'smoked silver', as we would like to call it. Without the automatic painting line, the consistency of such paint task was and still is quite difficult to achieve" (personal interview with Firm L R&D engineer, December 8, 2004).

investment in new painting facility had allowed Firm L to produce the alloy wheel targeting specific customer preferences.

The **second** learning activity involved the operation of the advanced **casting simulation software.** Firm L President decided to purchase the software into a collaborative research project with TAI, NSTDA, MTEC, Kasetsart University and Chulalongkorn University, "I think we are one of the first private companies that bought such advanced casting simulation software"[402] (personal interview with Firm L President, May 4, 2004). After the training courses and collaborative research, Firm L soon realized the benefit of such software in lowering the design costs and reducing the product development time. The software package comprised two parts: flow and thermal analysis (personal interview with Firm L's R & D Section Head, December 8, 2004). Software training was conducted with an academic from Chulalongkorn University[403].

To challenge the design team, Firm L decided to engage in an attempt to sponsor the British Formula One team with light-weight alloy wheels (2005). Firm L General Manager stated,

> "We have a market dealership in England and the F1 [Formula One] team was interested in our products. They already sent people to have a look at our factory already" (The Nation, 2005).

If the negotiation went as planned, then Firm L would start supplying the racing wheels to England by 2007 (Ibid.). This means that Firm L will be investing in a new production facility to the supply of racing alloy wheels (2005).

By supplying the British Formula One racing team, Firm L's ambitious goal was to build superior brand image. More importantly, the firm wanted its design engineers in more **complex learning activities.** This was a more important learning goal.

> "We view this (forthcoming) collaboration with the British Formula One team as a good [learning] opportunity. Even though we might *not* gain any financial profit in the short rum, what would follow is our rather extensive investment in research, development and manufacturing of prototype racing wheels, which will provide our engineering design unit a world-class [learning] experience" [italics added] (The Nation, 2005)

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[402] An NSTDA consultant commented on the software purchase as a bold move since very few private firms actually purchase this advanced simulation software simply for private use. This is because the software is very expensive, and the complicated settings of many parameters required knowledgeable engineers (NSTDA, 2005b: 2).

[403] The contact with the researcher at Chulalongkorn University was established with the aid of National Science and Technology Development Agency (NSTDA)'s program, Industrial Technology Assistance Project (ITAP) (NSTDA, 2005b).

The General Manager added that the exposure to the technology of the world-class racing wheel will provide the firm with sufficient knowledge to produce premium-brand alloy wheels.

The **last** learning activity concerned the deficient training of the human resources. Having extensive investment in new equipment and advanced software, Firm L physical assets are second to none, but its human assets had problems keeping up. There were **two** problems: 1) the low aspiration of each employee and 2) the lack of formal training facility. The President attempted to solve these problems by investing in more technical books, building a library, and a training room. In short, the President was building an encouraging environment for learning.

> "In the past, our firm *lacked* a formal plan for human resource training; hence now I am building a formal training plan. I am investing 1 million Baht[404] and building a training room that can accommodate 100 people. There will be training courses in English language training and computer software. I am trying to instil a learning culture within my firm" [italics added] (personal interview Firm L President, May 4, 2004).

Firm L believes strongly that a capable team of design engineers will constitute its future core competence. Specifically, the design team must be able to pinpoint the exact customer preferences (the aesthetic design) and assure the international standards on product safety and quality.

To **remedy** the problem of **limited human resources training**, the President had committed Firm L to obtain the ISO 9000 quality accreditation project, which had commenced shortly before the crisis. After the 1997 financial crisis, the project was accelerated[405] and Firm L received its first formal quality accreditation in **1998** (corporate website, accessed 2006). It could be said Firm L converted the 1997 crisis into an impetus, a catalyst for its employees to stretch their production capabilities, to survive in the export market. But also important was the President, who can successfully conduct marketing activities accessing overseas market. Today, the firm also received the latest quality

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[404] This was considered to be a small proportion of its annual revenue of 800 million Baht in 2004.

[405] The acceleration of the ISO 9000 project was feasible due to the financial crisis. Production orders were down and this allowed more free time from the employees, who later decided to focus on the ISO 9000 project (personal interview with Firm L President, May 4, 2004).

accreditation, ISO/TS 16949:2002[406] and continues to increase its export (personal interview with Firm L President, May 4, 2004).

Learning the Technology Linkage Activities

There are **two** types of linkages: domestic and foreign, Firm L tended to rely more on the **domestic** linkages for **learning activities**. Furthermore, there were **two** important sources of domestic linkages: another alloy wheel manufacturer (Siam Lemmerz[407]) and public organizations (TAI, MTEC and NSTDA).

The **first** domestic linkage was Siam Lemmerz. Having a negative experience with the former Japanese joint venture partner, Firm L did not engage in any more joint ventures. Rather it searched for **technical assistance** via informal discussions and training courses. Firm L President and the Managing Director of Siam Lemmerz were good friends. Firm L benchmarked its production performance with Siam Lemmerz. Consequently, the President knew the strengths and weaknesses of Firm L performance. For instance, in production defect rates, Firm L has 19 per cent defect rates, while Siam Lemmerz had only 7 per cent. Hence the gap (12 per cent) had to be analyzed as to pinpoint the causes.

> "Soon we realized that our production defect rates were too high. We took immediate action to check the engineering design process. For any product whose defect rate exceeds 7 per cent, the processes and the work procedures were isolated for analysis. We conducted multiple brainstorm sessions, using quality tool such as cause-and-effect diagrams[408] to pinpoint the problem's root cause" (Personal interview with Firm L Factory Manager, May 5, 2004).

Hence it could be said that this linkage with Siam Lemmerz enabled effective benchmarking and allowed Firm L to set key performance indices.

The **second** domestic linkage was the collaborative research with public organizations. The Thailand Automotive Institute (TAI) acted as the **link**, introducing Firm L to researchers within other organizations such as National Metal and Material Technology Center (MTEC) and Kasetsart University. The **three** formal collaborative projects are worth noting:

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[406] This is the latest quality system accreditation within the automotive industry; all carmakers (worldwide) accepted this quality system.
[407] Located in Thailand, Siam Lemmerz is a joint venture firm between Hayes Lemmerz SpA and the Siam Cement group (Thailand). Its main product includes aluminium alloy wheels for passenger cars and pick-up trucks (TSAE, 2003).
[408] This diagram is also known as the Fishbone (Ishikawa) diagram.

- In **2002** collaboration with TAI and Kasetsart University researcher on the analysis of impact test using a computer simulation model (TAI, 2002a)
- In **2003** another collaboration with TAI and MTEC on the aluminium alloy wheel design process (TAI, 2003a)
- In **2004** collaboration with NSTDA and Chulalongkorn University engineering researcher[409] on the application of computer software in designing the aluminium wheels[410] (Horee et al., 2005)

The common element among these collaborative projects was the emphasis on the use of advanced computer simulation model for new product development. As a result, Firm L engineers **gained better understand** of their advanced design modelling tools and their limitations.

Learning the Marketing Activities

Firm L President created a capable marketing team, which assisted in increasing the firm's export. Today Firm L marketing success was evident in its 70 per cent production volume exported to more than 30 countries worldwide, including the United States – Firm L largest overseas market (corporate website, accessed on March 15, 2006)[411]. Firm L also collaborated extensively with overseas customers on satisfying their needs, in terms of innovative wheel design (Personal interview with Firm L Factory Manager, May 5, 2004).

7.3.6 Firm S Group (post-1997 crisis)

Learning the Investment Activities

After the 1997 financial, Firm S Group took a strong defensive stance on its **investment activities**; it attempted to salvage what was left of the Group's foreign joint ventures[412]. Consequently the **only** major **investment project** during this period came later

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[409] This researcher has a doctoral qualification from the Massachusetts Institute of Technology (MIT), USA, in the area of Metallurgy (Chulalongkorn University website, accessed 2006).
[410] This project also resulted in another journal article publication at Prince of Songkhla University. See (Lalitu-rai et al., 2005) for more details.
[411] The actual name of the website was withheld to uphold Ethics Committee agreement, which is to assure the firm confidentiality.
[412] "The [Firm S] Group, one of Thailand's top three auto-part makers, has sold most of its stakes in nine subsidiaries to Japanese companies and creditors. The company has decided to reduce its 51% holding in nine affiliates to just 5%. Existing Japanese partners have agreed to buy the shares in order to keep the operations of the companies afloat" (Anonymous, 1999b: 5).

in 2005[413]. The project was the modern manufacturing plant in Eastern Seaboard area[414]. The plant will focus on the mass production the Group's flagship product, the axle shaft, supplying both the Japanese and US carmakers.

Learning the Production and Product Activities (Process, Product and IE & HRD)

Firm S Group was pre-occupied with corporate debt restructuring, it did not engage in much learning through the operation of production activity. Furthermore, the massive shrinkage in the domestic demand impacted the learning by doing activities, and there was not much to do in terms of introducing new products. The **only learning activity** was the set up of a training scheme to develop the **human resources**. Initially the training followed the outline stated in the ISO 9000 quality accreditation system, which was obtained by the end of 1997 (Anonymous, 1998), and a year later, the Group obtained QS 9000 and was able to supply auto-parts to the US carmakers.

In 1998, Firm S Group created an internal training department. The training program consisted of collaborative project with the Thai Productivity Institute (TPI). The TPI sent in a team to assist the Group with productivity improvement. After six months, Firm S Group had achieved the targeted level of productivity. It was selected by TPI as a role model factory (Anonymous, 1998). In addition, Firm S Group also collaborated with the Department of Skills Development (DSD) to learn formulation of skills development strategy. In October 1998, the Group planned an upgrade of the education levels of its employees[415].

Hence it could be said that one of the positive impact of the crisis was the idle time for Firm S Group to think about human resources development.

Learning the Technology Linkage Activities

Both types of learning linkage **(domestic and foreign)** were initiated by Firm S Group, though much focus was on the former. There were at least **two** examples of **domestic linkages**.

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[413] To alleviate the burgeoning debt and expedite the restructuring process, in 2005 Firm S Group was converted from a family-owned private firm to a public one. The capital raised from the stock market was used to fund new investment project.
[414] This area was dubbed by the Thai government and Asian Week magazine as 'the Detroit of the East'.
[415] For workers who had achieved year 1 to year 4 of high school education diploma, Firm S Group will continue to support their education at the vocational level.

First was the **domestic link** with the university research group. In the early 2000s, Firm S Group collaborated with the academics at the Center of Operations for Computer Aided Research Engineering (COCARE) Department of King Mongkut University. Most of the projects were related to the enhancement to the firm's design capabilities[416]. **Second** was the **linkage** with TAI. During the early 2000s, the Group sent its engineers to attend three off-the-job training courses offered by TAI: Preventive Maintenance course, Workers' Safety course, and Metal Fatigue course[417]. In addition, Firm S Group collaborated with TAI on productivity improvement[418]. The problem was concerning the overwhelming increase in demand of axle shafts from the multinational carmakers and the need to stretch production capacity. The TAI consultancy team requested Firm S Group to set up a *kaizen* team[419], responsible for **learning** the productivity improvement technique. After about four months of **learning** the continuous improvement activities (cycle time and bottleneck analyses), the Group was able to increase its production capacity[420]. Another example of collaborative project with TAI involved the production of rear axle shaft. The purpose was to **learn** the design of axle shaft via "**reverse engineering**". Again Firm S engineering team collaborated with Kasetsart University research team and come up with an optimized design of axle shaft[421].

Another **domestic linkage** was with TAPMA. The Vice President of Firm S Group was elected as TAPMA President in March 2003 (Automobile Information Center, 2003). Historically, TAPMA was renowned for its ability to effectively lobby Thai government for

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[416] Examples of training courses comprised: design and development of disc brake (casting and machining), design and development of leaf spring and courses in finite elements analysis (a form of mathematical analysis to determine the physical properties of auto-parts).

[417] The researcher had the opportunity to attend this training course and observed that Firm S Group had requested an academic at Department of Aerospace Engineering, Kasetsart University to perform a virtual testing and experimentation of its flagship product, the rear axle shaft.

[418] This project was part of a wider project undertaken by the TAI, the Automotive Experts Dispatching Program (AEDP). At the time of this writing, AEDP is still on going and it is a collaborative effort between TAI and Japan External Trade Related Organization (JETRO) to upgrade Thai auto-part suppliers.

[419] The continuous improvement team (*kaizen*) consisted of 5 engineers and technicians from Firm S Group (personal plant visit, December 17, 2004)

[420] Together the TAI team and Firm S Group kaizen team performed three things (TAI, 2005b): 1) balancing workload between the five different work operations and two different machines, 2) improvement on the tooling (combining tools and adjusting the speeds), and 3) reconfigure jigs and re-balancing the work operations.

[421] The recommendation was proposed for Firm S Group to reduce the use of its surface heat treatment coatings by 2 millimeters (TAI, 2004a: 7); this would reduce the processing time by 0.2 seconds per axle shaft. The reduction contributed to higher productivity and lower production costs (Ibid.).

protectionist policies. TAPMA collaborated actively with other public organizations[422] for appropriate policy formulation. One issue was the set up of a modern, public product testing facility (as discussed earlier). TAPMA President has argued for public investment in a local Automotive Research and Testing Center (ARTC) responsible for auto-part testing[423].

With regards to **learning** through **foreign linkages**, Firm S Group was passive. It neither searches for more foreign technical assistance nor joint venture agreements[424]. **First** was the lack of new **technical assistance**. From 1999 to 2005, the Group had renewed a total of three agreements with no active search for more agreements[425].

> "[Firm S] Group has a policy of renewing technical agreements for the production processes and product development that are deemed to still require future technical assistance in order to develop greater efficiency and process improvements" (SET, 2005a).

Thus it could be said that the Group intended to continue to receive the "usual" technical assistance, but the more pressing issue was the quality of such assistance in meeting future competition, which seemed to be lacking. Historically, the Group appeared to underemphasize the building of its product design capabilities.

Second was the lack of new **foreign joint venture**. After the 1997 crisis, there were no new foreign joint ventures. However, in 2005 the Group had bought back some of its lost equity in former joint ventures[426]. Firm S Group is currently on the lookout for more potential foreign partners.

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422 Example organizations were Ministry of Industry, Thailand Automotive Institute and Federation of Thai Industries.

423 TAPMA President argued: "[The ARTC] is viewed as *essential* to certify the quality and standards of Thai auto parts. Thai suppliers would no longer need to send their auto parts to Taiwan and Japan for testing as currently practised once the centre becomes operational, thereby reducing the testing costs by 30-50 percent" [italics added] (Praiwan, 2004).

424 One possible explanation of lack of learning through foreign linkages was the severe impact of the 1997 crisis. There were primarily two main impacts: burgeoning debt and selling of equity to Japanese joint venture partners. One year after the onset of the 1997 crisis, the Group sales had plunged to 750 million Baht (from 1.3 billion in the previous year) (Anonymous, 1999b). On issue of debt, the Group had about 3.5 billion Baht debt and a monthly interest payment of 20 million Baht (Anonymous, 1999a; 2000). Since the crisis until early 2000s, the Group had been continuously engaging in debt restructuring process, leaving no room for resource commitment to learning. Consequently, most learning activities were paused due to the significant lost of control on all its Japanese joint ventures formed during 1993-1997. The Group was operating in a "damage control" mode to salvage whatever that was left of the corporation.

425 These agreements were with three Japanese firms: Ibara Seiki, Mitsubishi Steel Manufacturing, and Gohsyu Corporation.

426 The management board approved the following two equity buy-back purchases (Anonymous, 2006d): 1) purchase the shares holding in Somic Manufacturing joint venture, shares transacted was 600,000 (97.8 million Baht) and Firm S Group's equity will be increased to 20 per cent and 2) purchase the shares holding

"With some products, relying on [the current] technical [assistance] agreements is not enough; we may need to find more joint-venture partners, ... Firm S Group is seeking a foreign partner for its coil-spring business[427] ..." (Khumkun and Changsorn, 2003).

Thus it could be said that Firm S Group aimed to strengthen its foreign linkage capability, and planned to learn more about its coil spring design.

Learning the Marketing Activities

Most of the **marketing activities** were focused on supplying the **domestic market** and very little on **export**. It was because Firm S Group faced the obstacle of unqualified product testing facilities. It was also because the investment in the testing facility required large capital resources and the Group was unwilling to commit. As a result, Firm S Group current export level is at a low 6 per cent of its total production output[428] (Family Know-How, 2006).

7.3.7 Firm SOM (post-1997 crisis)

Learning the Investment Activities

In 2001, Firm SOM **invested** in **production capacity expansion**, and at that time, the firm employees increased to about 100. The firm registered capital was 1 million Baht[429]. The firm also **invested** in training courses with TAI (Personal interview with Firm SOM President, November 24, 2004). In addition, Firm SOM did not have any other new **investment projects**. On the contrary, in 2004 the firm suffered severe **downsizing**

in Yamada joint venture, shares transacted was 12,000 (2 million Baht) and Firm S Group's equity will be increased to 20 per cent.

[427] A comment could be made here about the slow rate of Firm S Group in seeking such a foreign partner. Since relative to its competitors (for e.g. Firm D Group and Firm TS Group), Firm S Group appeared to be very slow in acquiring the product design capability.

[428] It is important to note that this low export volume of Firm S Group has persisted despite the fact that the Thai government has been promoting auto-parts export since mid-1980s. That was when the government started to shift from an import substitution to an export-oriented industrialization strategy. It is also important to note that despite the 1997 crisis, Firm S Group had maintained a 80:20 ratio of domestic versus export market products (Anonymous, 1998). Hence it could be said that export earnings were not sufficient to alleviate the severe impact of the 1997 crisis. It is also worth exploring certain issues that had impeded Firm S Group's ability to export.

[429] In 2001, the firm registered capital increased to 1 million Baht (from half a million in 1995), which is not high when compared to an average Thai auto-part firm. However, the increase in capital investment was large when compared to Firm SOM's small size.

(personal plant visit, November 15, 2004)[430]. This was due to the cancellation of production order from its *main* customer in early 2004. In addition, Firm SOM also **liquidated** some of its outdated **equipment and machinery**, and it managed to keep the remaining key **equipment**. Since the firm was in financial trouble, there was no **investment plan** to purchase any modern equipment (personal interview with Firm SOM President, November 24, 2004).

Learning the Production and Product Activities (Process, Product and IE & HRD)

The firm learned to produce **diversified product** (metal parts for musical instruments) using the same production facility. Since the firm did not have sufficient capability to invest in modern production technology, the **learning activity** related to such technology was absent. In addition, the firm also suffered from other operational problems[431]. Since early 2000s, the firm suffered from poor **human resources management**. In 2004, the high personnel turnover prevented Firm SOM from achieving an effective training program. Once trained, the personnel tended to seek better job opportunities elsewhere[432]. Due to lingering financial trouble, Firm SOM was unable to provide the incentives and fringe benefits to attract great talents to stay with the firm. The poor human resource management greatly affected the firm's learning strategy. In particular, it limited the scope of learning activities that Firm SOM can engage in.

Learning the Technology Linkage Activities

The **learning** through **foreign linkage** was very limited. Since Firm SOM was busy with solving operational as well as financial problems, it did not have sufficient time to concentrate on searching for new technical assistance agreement or any joint ventures[433]. Frequently, Firm SOM's only **learning activity** occurs through limited **domestic linkage,**

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[430] The floor space used for production activity had decreased by more than 50 per cent. Firm SOM technicians along with TAI Japanese expert were determining ways to cramp the remaining equipment into the remaining floor space (Ibid.).

[431] In 2004, the firm had ample problems trying to keep its domestic manufacturing operations afloat. After the decision to cancel the large production orders from its main customer, Firm SOM President stated: "Now I have to find ways to generate revenue in order to pay all the overhead expenses. December [2004] will be the crucial month for my firm. If I cannot increase the cash inflow, my firm will be in *serious trouble*" [italics added] (personal interview with Firm SOM President, November 24, 2004).

[432] Out of the 100 employees that Firm SOM had in 2003, only 40 remained with the firm in 2004 (personal interview with Firm SOM President, November 24, 2004).

[433] Even if Firm SOM could successfully locate the potential foreign partner, it is highly unlikely that this would lead to the set up of a joint venture. This was because of the firm's serious financial trouble and massive downsizing in 2004.

consists of general continuous improvement activity[434] offered by the TAI. The firm had limited collaboration with other public organizations, and most collaboration lacked specific target. This was to be expected since the firm was not able to formulate a well-defined learning strategy. Due to high personnel turnover rate, the benefits that arose from the **linkage activities** were not fully captured[435]. The President was pre-occupied with the more immediate problems of severe shortage of working capital (personal interview with Firm SOM President, November 24, 2004). Again, the firm had little time to focus on an appropriate **learning strategy**.

Learning the Marketing Activities

Firm SOM's **learning** related to **marketing activities** was focused on supplying the auto-parts only for the **domestic market** and no **export**. Hence, it could be said that Firm SOM had limited exposure to **exporting** activity, and that most of its marketing activities were **domestically** oriented. Within the domestic market, Firm SOM was very passive in terms of searching for new customers. It continued to rely on the few customers, of which Firm SML was the main one.

7.3.8 Firm TKT (post-1997 crisis)

Learning the Investment Activities

After the recovery from the 1997 crisis, there were **three** significant investment projects. **First,** in 2003 the firm was **investing** in the second factory (2004: 32). This new factory produced plastic parts for electrical appliances, and some auto-parts for Toyota[436].

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[434] For instance, the Japanese expert and the Thai engineer from TAI assisted Firm SOM in plant management issues such as plant layout and productivity improvements. The focus was more on the former rather than the latter. For instance in 2004, Firm SOM had downsized and the TAI team was responsible for finding ways to fit the remaining machinery and equipment into the reduced manufacturing floor space.

[435] Two technicians went missing for three days without informing Firm SOM's Personnel Department of their whereabouts. Other newly arrived workers stayed and worked for only about a year (on average), then they decided to leave the firm and searched for better jobs (personal plant visit, November 15, 2004). This high turnover rate caused much delay in the scheduled production plan as well as discontinuous implementation of learning strategy. In all, the collaborative efforts expended with TAI did not achieve full benefits. This was due to the lack of long-term commitment of Firm SOM's employees, the lack of willingness to learn as well as the poor qualifications of the workers. Since Firm SOM had been in financial trouble, it reduced the manager's monthly salary. This caused some of the management team to resign from the company and seeked better job opportunities elsewhere. The result of high turnover of personnel was the discontinuous leaning activity and poor accumulation of firm capabilities.

[436] Toyota planned to launch a new Innovative International Multi-vehicle (IMV) project, producing Hilux Vigo pick-up trucks. IMV Project uses Thailand as a global production base. This explained part of the reasons why Firm TKT was eager to invest in the production plant expansion.

Second, it **invested** in the third production facility to produce mold for injection process. **Third,** Firm TKT invested in an acquisition. It competitively aimed at becoming self-sufficient in the mold design and manufacturing; hence, it acquired Mold and Die Manufacturing (Anonymous, 2004e). Currently, Firm TKT is searching for an **investment** in a possible joint venture (personal interview with Firm TKT Managing Director, November 5, 2004).

Learning the Production and Product Activities (Process, Product and IE & HRD)

There were **three** learning activities: the limited advancement in learning to use new design tool, limited learning through the foreign joint venture, and learning to develop the human resources.

The **first** learning activity was concerned with the limited learning in new design tool. Firm TKT did not invest in the computer assisted engineering (CAE) software for mold design. It relied heavily on the manual labor of highly skilled technicians, whose responsibilities were to observe and rectify design problems during the trial production runs (personal interview with Firm TKT Injection Section Chief, November 5, 2004). The manually-adjusted mold design was costly (and time-consuming) when compared with the computer-assisted design. **Secondly,** the joint venture with Okawa did *not* last because of the 1997 crisis, by **1999** Firm TKT had to sell its shares (SET, 2005b). As a result, the planned expansion through joint venture was put on hold. Consequently, the attempt to **learn** the chromium-plating technology from Okawa did not fully materialize (i.e. it was prematurely truncated). The **third** learning activity was upgrading the human resources. To keep up with the production expansion, Firm TKT must upgrade its human resource[437]. All the employees were required to undergo formal training to achieve a vocational diploma status[438]. Human resources development was viewed as necessary, since Firm TKT must be able to continuously reduce its manufacturing costs (3 to 5 per cent annually) as requested by the carmakers (Ibid.: 6).

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[437] In the early 2000s, the firm utilized a "4-6-3" plan, meaning that those who had achieved grade 4 and 6 elementary education were encouraged to continue formal education until the 3rd year high school diploma.
[438] "We have 107 employees[438] that have educational qualifications lower than *mat-tha-yom* 3[438]. We supported these workers to further their education and anticipated that by mid-2003, all our employees will graduate with *mat-tha-yom* 3 certificate" (TAI, 2003i: 7).

Learning the Technology Linkage Activities

There were **two** types of "link and learn" activities: domestic and foreign linkages. On the **domestic** side, Firm TKT linked with BOI and TAI. Currently, Firm TKT also searches for possible **linkage** with a **foreign** technology supplier.

First was the **domestic linkage** with BOI. During 1993-94, Firm TKT was involved in the BOI Unit for Industrial Linkage Development (BUILD) Program. The program was designed by BOI to conduct matchmaking activities (i.e. between the Japanese OEMs and the small-to-medium Thai suppliers). The program resulted in mixed success for linking the firm with their prospective Japanese customers. As Lauridsen wrote

> "The firm Managing Director ... did not remember these match-making activities but did not rule out the possibility of a match-making effects, ..." [italics added] (Lauridsen, 2000: 18)

Hence, the benefit of such collaborative linkage with BOI was unclear. **Second** was the **domestic linkage** with TAI. Later after **2000**, the collaborative projects between Firm TKT and Thailand Automotive Institute (TAI) had intensified. Firm TKT had two collaborative projects with TAI. The **first** was a training course, conducted in December 2002, in raw material selection for plastic parts design[439]. The **second** project involved more hands-on activity. It was concerned with the defect reduction in the plastic part painting process[440]. From both projects, Firm TKT employees learn the productivity improvement methods.

Currently, Firm TKT stepped up its search for a **foreign linkage.** This was because the firm was aware of the limited foreign linkages as well as the existing knowledge (capability) gaps. Historically, the firm was deficient in the capability to design and manufacture large injection mold, and the acquisition made in 2004 was insufficient. Therefore, Firm TKT needed the foreign technology on large injection mold production. Consequently, the firm is now searching for any potential foreign partner[441].

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[439] It was a three-day course conducted as within lecture theater environment, and hence there were not much on-the-job learning activities.

[440] The TAI sent in a team of 3 personnel: one Japanese expert and two Thai engineers. Firm TKT had to set up a corresponding *kaizen* team, responsible for performing the learning activities as advised by the Japanese expert's team (Khodee et al., 2004).

[441] "[Firm TKT] is interested in setting up a firm, joint venture, a holding or subsidiary with interested EU [European Union] firms and is also seeking assistance in R&D [research and development] as well as manufacturing rights. The business would also like to establish mutual technical cooperation and a joint production agreement" (from www.euthailandpartenariat.com, accessed March 15, 2006).

Learning the Marketing Activities

Currently, Firm TKT **export** activity was still limited. In **2002**, Firm TKT-PI, which was set up as an exporting firm in **1991** under the BOI export privileges, was liquidated (SET, 2005b), thus the firm's export volume had declined. It was not until recently when Firm TKT decided that it wanted to focus more on **export**[442].

7.3.9 Firm TS Group (post-1997 crisis)

Learning the Investment Activities

The **investment** in new manufacturing facilities and foreign joint ventures continued. After 2000, these included **overseas investment** in India and Malaysia[443]. The President stated, "Doing businesses today, you *can't* stay just in one country" [italics added] (Changsorn, 2004). In addition, the Group invested in a representative office in Yokohama, Japan (personal interview with Firm TS Group Vice President, October 19, 2004). All of these investments were conducted through the Engineering Managers of Firm TS Group, some of which were Japanese experts. Consequently, it is clear from these investments that the Group possesses sufficient **investment and project execution capability** and aims to become a competitive regional auto-part supplier.

Learning the Production and Product Activities (Process, Product and IE & HRD)

Firm TS Group **production capability** progressed toward a more diverse stance yet focused on specific product development. There were **three** main learning activities: learning to operate modern production technology to mass-produce auto-parts for all carmakers[444], learning to design its own tooling and to produce own brand product, and learning to upgrade the human resources.

First was the **learning activity** related to the operation of modern production facility and mass production. To qualify as a first-tier supplier for US carmakers, the

[442] Another reason why (historically) domestic market was more attractive than export was because of the establishment of production bases by many multinational carmakers since the mid-1990s, and this had led to a dramatic increase in the domestic demand for plastic auto-parts (Ibid.).

[443] As of 2006, the Group is currently searching for ways to expand its production overseas in India, Indonesia, Cambodia, and possibly China.

[444] Prior to the 1997 crisis, most of the Group customers were mainly the Japanese OEMs. Since 1996 onwards, the Group began to supply auto-parts to the US carmakers and European such as Ford, General Motors and DaimlerChrysler. This constituted a new learning activity in terms of increasing the proportion of modern production equipment and paying attention to new quality accreditation system such as the QS 9000 and TS 16949.

Group had to undergo the QS 9000 accreditation process, which was completed in **1998**. The Group started to supply plastics interior trim and stamped sheet metal parts to AutoAlliance (personal interview with Firm TSLA Plant Manager, October 25, 2004). Later in 2003, Firm TS Group felt the need to better meet the on-time delivery requirement and decided to invest 2 billion Baht in the largest[445] auto-part production plant in the Eastern Seaboard Industrial Estate (Hemaraj Land and Development, 2003). The new plant aimed to supply auto-parts to the US "Big Three" (Changsorn, 2005).

The **second** learning activity was an improvement in the firm's tooling and product capability. In 2001, the Group continued to invest in the software, computer aided engineering (CAE) for tooling design and production (Krungthep Turakij, 2003). Currently, the Group is capable of producing large tooling (molds and dies) according to the OEM-provided conceptual drawings (personal interview with Firm TS Group Engineering Manager, October 29, 2004). Another remarkable achievement was the Group's first own brand product – a small electric vehicle. The Group conducted R&D informally since 2002 and established a formal R&D Unit[446] in 2003. Since inception, R&D comprised **two** main projects: the design of an electric golf cart and the design of a three-wheeled vehicle for the Asian market[447] (personal interview with Firm TS Group Chief Engineer – R&D Unit, November 2, 2004).

The **third** learning activity involved the improvement in **human resources**. Firm TS Group has been sending its engineers and technicians for training related to CAD/CAM and CAE, and quality management systems[448]. Within the R&D Unit, formal technical training by Japanese experts occurs frequently. Recently, the Group has been sending its staff to station in Yokohama (Japan) to actively absorb the technology and skills on product design, but this has been a difficult task, due to the high operating cost (2004a). The rationale for sending engineers overseas was because most of the new product development

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[445] Rated by the annual production capacity, this new plant is the largest in Thailand (Changsorn, 2005).
[446] Currently, this Unit has the responsibility of internalizing parts design capability (Anonymous, 2005a).
[447] As of 2005, this project was still on going.
[448] Examples of these courses were: Computer Aided Engineering (CAE) applications to tooling design. Quality management training courses comprised ISO 9000:2000, ISO 14000, ISO 18001, QS 9000 needs assessment (GPC, 2003), and ISO/TS 16949. Design software training courses were: PRO/Engineer and Unigraphics.

occurred outside of Thailand[449]. As part of an efficient human resource management, the Group constantly emphasizes teamwork.

> "If you compare company to company, our [Firm TS Group] teamwork is *second to none*, especially at the management level. I believe you *cannot* buy teamwork. The only thing you can do is to *build* it, and the only thing you invest in is time" [italics added] (Panthong and Master, 2005: 46).

Hence it could be said that Firm TS Group has come a long way since its inception on human resources development, with the current emphasis on unique organizational culture emphasizing teamwork. The Group also aimed to become self-sufficient in advanced product design capability.

Learning the Technology Linkage Activities

Firm TS Group engaged extensively in searching for technical assistance from both **domestic** and **foreign** sources. First were the main domestic linkages with **TAI** and the **public universities.**

An exemplar of **domestic linkage** was the electric golf cart project. Firm TS Group did not design the entire vehicle in isolation; it was developed with the assistance of many interested parties (for instance: Thailand Automotive Institute (TAI), Japanese foreign experts[450], its supplier, and researchers from Kasetsart University and King Mongkut Institute of Technology). **Three** notable collaborative projects were:

- The design and testing of the steering system for an electric vehicle (TAI, 2004e)[451].
- The design and testing of a damper system for an electric vehicle (TAI, 2004c)[452].

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[449] The President succinctly described the persistent lack of Thai engineers and technicians' experience in auto-part design: "The development of human resource is *very important* and considered one of the critical success factors. Unfortunately in Thailand, most of the training activities on engineering design lacked the required technological depth. Our group had been in auto-part business for a long time, but we still have knowledge deficiency on product design capability. I think the Thai government should try to setup a training course to close this knowledge gap" [italics added] (Krungthep Turakij, 2003).

[450] Within Firm TS Group, there are well over 30 Japanese permanent employees spreading across all the subsidiaries (personal interview with Firm TS Group Vice President, October 19, 2004).

[451] Two design problems were pointed out: 1) the poorly-designed rubber bushing was damaged easily after a few usages and 2) the design of the spindle arm was too much on the conservative side, that is excessive raw materials were expended. After rectification, the Group learned better design of rubber bushing, and the computer modelling skills useful for future designs.

[452] Another collaborative project with the university was the design of the golf cart chassis; it was a team effort between the university researcher and personnel from Firm TSR&D (a subsidiary within the tooling business group) (Ibid.). The research team had calculated the appropriate value of spring stiffness as well as displaying the mechanical characteristics of the damper system under varying loads (the amount of weight that was placed on the vehicle, both static--when vehicle is at rest--and dynamic--when the vehicle is in

- Finally, the design and development of a transmission system for an electric vehicle (TAI, 2004f)[453].

Once the design activities were finalized, about 10 golf cart prototypes were produced. The product was tested on Firm TS Group own golf course and the procedures were emulated from the Japanese carmakers[454]. During testing, the prototypes suffered from some design problems (personal interview with Firm TSLA Plant Manager, October 25, 2004). Once these problems were rectified, the golf cart was finally launched in 2005 (Anonymous, 2005a). It is important to note that over 95 per cent of the golf cart components were indigenously developed by Firm TS Group and its suppliers. The remaining 5 per cent was the electric motor[455]. Prior to the golf cart launch, the Group decided to invest in a new production plant; Firm TSVT[456].

Another example of **domestic linkage** was by Firm TSLA[457], who engaged in a collaborative project with the Institute of Field Robotics (FIBO) at King Mongkut Institute of Technology University (Saeng, 2005). The project involved two developments: the development of automatic welding process[458] and the design a three-axis robotic material handling system. Again this automated system provided the required consistency with lesser cycle time, hence higher level of productivity. There were four other collaborative projects by Firm TS Group on issues such as quality control, preventive maintenance, and improvement in general plant productivity[459].

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motion). Firm TS Group's engineers learned the techniques related to computer aided engineering (CAE) analysis. This knowledge will be useful for future design of a damper system, reducing the manufacturing costs and lead-time for product development.

[453] The research team built and tested prototypes, to plot out the mechanical and other physical (noise) properties. As a result, the engineers learned the design and analysis of the properties of a transmission system. Furthermore, the engineers also learned the optimized design techniques. This made the transmission system lighter, yet still passed the product safety requirements.

[454] "[Having been their first-tier suppliers for many years,] Firm TS Group learned from carmakers such as Toyota and Mitsubishi. When they finished building the prototype vehicle, they actually use it to see if any problems may occur during the actual usage. After the golf cart prototypes were used for quite some time, the Group took the whole vehicle apart. An analysis was conducted for each parts and components, searching for signs of any premature failure" (personal interview with Firm TSLA Plant Manager, October 25, 2004).

[455] The motor was sourced from General Electrics (USA) (personal interview with Firm TS Group Engineering Manager, October 29, 2004).

[456] The investment was 144 million Baht to produce the golf carts with annual production capacity of 6,000 units. The firm is wholly Thai-owned and employed about 144 Thai nationals. It was expected that the export of golf carts will occur in 2008 and would generate approximately 692 million Baht in annual earnings.

[457] This is a subsidiary within Firm TS Group.

[458] The auto-parts were for Mitsubishi vehicles: 1) the "front end" and 2) the "upper plate lower skirt" (Ibid.).

[459] The collaboration was with the Department of Industrial Management at King Mongkut Institute of Technology, North Bangkok. The four projects were: 1) development of a handbook for quality control tools in process improvement and supplier quality improvement (Koonsuwan and Sreprapai, 2001; Pengsuwan and

Similar to the **domestic** linkages, Firm TS Group engaged in extensive **foreign linkage,** with many investments in **foreign joint ventures**[460] (see Table 7.9). For instance in 1997, the Group formed a joint venture with Honda and established Firm TTD[461] (ASID, 2006). Another joint venture formed in the same year was a four-way joint venture with two Indonesian firms and one Malaysian firm. In 2002, Firm TS Group formed another joint venture with Press Kogyo (Japan) and learned about the production processes of pick-up truck chassis[462]. Additionally, the Group acquired Siam Auto Manufacturing (SAM)[463] in 2005 and planned to be the *largest* supplier of one-ton pick-up truck chassis in Thailand. In addition, there were **three** more important **foreign** joint ventures. **First** was an Indian joint venture with Jay Bharat Maruti Group (Menon, 2003; Than Settakij, 2005) (see Table 7.9). The aim was to produce motorcycle parts for Honda and Suzuki (in India) and then followed by the automobile parts. In addition, the Group also signed additional contracts to produce fuel tanks[464] (Than Settakij, 2005).

Nawaphanom, 2001), 2) the study of (critical success) factors (Meksuwant and Suelung, 2002), 3) increase of welding process efficiency and quality (Suasawat and Pongjumpee, 2001), and finally, 4) development of preventive maintenance handbook for press machines (Udomsri et al., 2002).

[460] Amidst the 1997 crisis and its aftermath, Firm TS Group took only a short time to re-cooperate and had ameliorated the severe impacts. The Group, however, did not remain dormant throughout the crisis and its aftermath period. It actively searched for domestic business opportunities as well as international ones by forming more foreign joint ventures (Automotive World, 2003).

[461] This firm produces plastics parts such as power window switch. The production technologies used were dies, plastic injection machine and machining center.

[462] Today, the Group produced chassis parts for Mitsubishi, Ford and Mazda pick-up trucks (personal interview with Firm TS Group Vice President, October 19, 2004).

[463] "SAM is a subsidiary of Nissan [Japan] and is the sole supplier of one-ton pickup truck chassis for Nissan" (Anonymous, 2005c). In March 2005, Nissan had plans to setup a global pickup truck production base in Thailand. The President of Nissan (Thailand) stated, "We're transferring all pickup truck capacity to Thailand" (Arnold, 2005). Consequently this important acquisition was a very sensible strategic move for Firm TS Group: "[Firm TS Group] will be the *largest* producer of one-ton pickup chassis in Thailand with annual production capacity of 580,000 units (50,000 of which came from Siam Auto Manufacturing" [italics added] (Anonymous, 2005c; Duangkaew and Savangvareesakul, 2005).

[464] 1) Bajaj Company, a producer of motorcycles. Currently construction of the new 350 million-Baht factory is ongoing. The targeted product is fuel tanks, supplied at an output of 5,000 units per day and 2) another Indian firm located in the city of Aurangabad. The investment amount was 200 million Baht and similar to above the targeted product is fuel tanks, supplied at the same production output.

Table 7.9 Foreign Joint Ventures of Firm TS Group During the Adaptation Phase (post-1997 crisis)

Year	Partner Firm	Partner Expertise
1997	Honda (automobile and motorcycle)	Production of plastic switch for power windows and tooling for plastics production process
1997*	DRB-Hicom Group (Malaysia) PT Amalmus Wibawa Agung (Indonesia) PT Timor Industri Komponen (Indonesia)	To supply auto-parts to the Timor car (Indonesian national car)
2002	Press Kogyo (Japan)	Design and production of automotive chassis
2003*	Jay Bharat Maruti Group (India)	To supply motorcycle parts within the Indian market
2003	Ion Bond (USA)	Metal surface finishing (plating/dipping) processes
2004	Dra'xlmier (Germany)	Production of wiring harness and automotive wiring to all European carmakers
2005	Mitsubishi Cable Industries (Japan) Ryosei Electro-Circuit Systems (Japan)	Local product design and testing capabilities. Plan to setup a locally based R&D center.
2005	IT One and Accenture (Thailand)	Productivity improvement via software such as the Enterprise Resource Planning (ERP)
2005**	Ashok Leyland (India) Tata (India)	Currently discussing the possibility joint pick-up truck production plant

* This joint venture is located overseas. ** This possible joint venture is currently under discussion.
Sources: Corporate internal document, Project and Marketing Department (2004), ASID (2006), www.wesleynet.com and Firm TSLA website (accessed December, 2005)

Second was the German **joint venture** to produce electrical wiring harness and cable[465]. In 2004, Firm TS Group formed a joint venture with Dra'xlmier Company (Germany), aiming to supply the wiring harness to all the European carmakers (in Thailand) (Chamber of Commerce, 2004). **Third** was the Malaysian joint venture. Firm TS Group had decided that it lacked the expertise in logistics and wanted to sell off 49 per cent equity (of its subsidiary, Firm SLC) to a Malaysian Konsortium Logistics (Changsorn, 2004). According to the President of Firm TS Group, "... the move reflected the Group's policy to focus on core businesses while outsourcing *non-core* businesses by forming joint ventures with professionals [italics added] (Ibid.). Thus it could be said that Firm TS Group's decision to outsource its logistics activity will incur two benefits: 1) more focus of the Group's resources on core activities and 2) learning experience via knowledge transfer from Konsortium Logistics.

[465] This venture also included the set up of a technical R&D center that would oversee the development and design of integrated wiring system. With such center, the Group does not need to send the product to Japan for testing.

Besides these joint ventures, Firm TS Group also engaged in other **foreign technical assistance and collaboration**. For instance, in July 1998 the Group signed a technical assistance agreement with Sumino Kogyo (Japan)[466] (See Table 7.7). This agreement enabled the Group to supply metal-stamping auto-parts to AutoAlliance, and also **learned** the progressive stamping technology. In December **2005**, Ford (partner of AutoAlliance) announced that Firm TS Group will enter into a new "Aligned Business Framework" agreement[467] (Ford Motor Company, 2005).

In sum, Firm TS Group has been highly active in nurturing both domestic and foreign linkages which led to many diverse learning activities. With the sufficient ability to manage such diversity, all these learning activities would contribute to higher rate of capability development.

Learning the Marketing Activities

Firm TS Group has been an indirect exporter because it supplied auto-parts to the carmakers, which in turn did the exporting (personal interview with Firm TS Group Vice President, October 19, 2004)[468]. Additionally, the Group did not engage in any direct export. About 93 per cent of all production volume were targeted at the domestic market and the remaining amount were directly exported (Anonymous, 2005d).

Even though the Group did not engage in much direct product export, it had a history on the export of technical know-how. It had exported the installation know-how to the two Malaysian subsidiaries (Firm OSI and Firm QSI) during the 1980s. Another recent agreement on the export of know-how was to Cambodia. The recipient firm is Firm NCX, and the transferred technologies was the production of motorcycle handle bar, wiring harness, and motorcycle frame (Anonymous, 2006b). In addition in 2005, Firm TSMM started to export automotive tooling to regional Asian countries (Firm TS Group corporate website, accessed June 15, 2006).

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466 This firm has been a long-time affiliated supplier of Mazda Motor Corporation (Sumino Kogyo, 2000).
467 Firm TS Group was one among a list of handful strategic suppliers announced by Ford. Some other first-tier auto-part suppliers comprised: Johnson Controls, Dana, Delphi, Hella, Pirelli and Visteon. Furthermore Ford said that these first-tier strategic suppliers have "the capability to provide technological innovations and show a commitment to quality, costs and delivery performance"(Autoindustry UK, 2005).
468 Another corroboration on the Group's low export activity: in 2002, Firm TS Group exported a negligible amount: out of its 15 billion Baht annual sales, only 2 per cent were (direct) exports (Krungthep Turakij, 2003).

7.3.10 Summary of Different Firm Learning Activities and Mechanisms: Adaptation Phase

The pattern of learning activities and mechanisms of the nine case study firms is summarized in Table 7.10. Similar to the Expansion Phase, the pattern pointed to **three** groups of firm.

The **first** group **invested** in many activities (for e.g. Firm AH Group, Firm D Group, and Firm TS Group). In addition to the routine production activities, these firms invested in the extensive search activities and formed many new businesses as well as foreign joint ventures (some are overseas). For instance, Firm AH Group invested in an acquisition in China, and Firm D Group invested a production plant in Vietnam. Similarly, Firm TS Group invested in production plant in India, Malaysia, and Indonesia. These firms engaged in more complex **production** activities, utilizing modern production technology such as CAD/CAM and CAE. Moreover, they were also committed to be extensively involved in the continuous improvement programs and more systematic human resources development.

For Firm AH Group, Firm D Group and Firm TS Group, their **products** were becoming more complex, advancing from ordinary OEM auto-parts to own design manufacturing (Firm AH Group and Firm D Group) and even own brand manufacturing (OBM) (Firm TS Group's golf cart). In terms of **linkage activities**, these firms further solidified their relationships with the foreign firms. The extensive foreign linkages enabled the firms to:

- access many new sources of knowledge, enabling them to develop their capabilities
- access overseas market

For these firms, one of the key factors leading to successfully capability development was the emphasis on human resources. All these firms (for e.g. Firm AH Group, Firm D Group, and Firm TS Group) emphasize extensive in-house and overseas training of their engineers and technicians. In terms of **marketing activities**, these firms have been indirect exporters (i.e. they produced auto-parts for carmakers to export). In addition, Firm AH Group was considered to be a direct exporter, since it has been exporting automotive jigs and dies to many carmakers around the globe. As of 2006, Firm TS Group also planed to export its Thai-made electric golf carts.

Table 7.10 Summary of Firm Learning Activities and Mechanisms – the Adaptation Phase

FIRM	ADAPTATION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm AH Group	• (overseas) Investment activities • Production process activities • Product activities (moderate design capability) • Linkage activities (domestic and foreign) • Marketing activities (domestic and foreign)	**Passive and Semi-Automatic:** • By doing continuous improvement and production activities **Active and Purposive:** • By searching and forming foreign joint ventures • By searching and acquiring firms • By investing in new specialized subsidiary firms • By collaborating closely with carmakers, investing in manufacturing facility overseas • By hiring external consultants, domestic and international and hiring foreign engineers • By training employees (domestic and overseas) • By exporting products
Firm CPC	• Production process activities • Product activities (diversification; limited design capability) • Linkage activities (domestic) • Marketing activities (domestic)	**Passive and Semi-Automatic:** • By doing continuous improvement **Active and Purposive:** • By collaborating with motorcycle makers • By hiring external consultants (TAI, etc.) • By training employees (in-house)
Firm CSP	• Investment activities • Production process activities • Product activities (diversification; limited design capability) • Linkage activities (domestic) • Marketing activities (domestic)	**Passive and Semi-Automatic:** • By doing continuous improvement **Active and Purposive:** • By searching for possible foreign collaboration (incipient) • By hiring external domestic consultants (TAI, NSTDA, etc.) • By training employees (domestic)

Source: own elaboration based on the research

Table 7.10 (continued). Summary of Firm Learning Activities and Mechanisms - the Adaptation Phase

FIRM	ADAPTATION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm D Group	• (Overseas) Investment activities • Production process activities • Product activities and design • Linkage activities (domestic and foreign) • Marketing activities (mostly domestic)	**Passive and Semi-Automatic:** • By doing continuous improvement **Active and Purposive:** • By searching and forming foreign joint ventures • By investing in modern production technology • By collaborating closely with the OEMs and public organizations • By hiring external consultants (domestic and international) • By training employees (domestic and overseas)
Firm L	• Investment activities • Production process activities • Product and tooling design capability • Linkage activities (domestic and foreign) • Marketing activities (domestic and foreign)	**Passive and Semi-Automatic:** • By doing continuous improvement **Active and Purposive:** • By searching for premium foreign customers • By investing in modern production technology • By collaborating closely with public organizations • By hiring consultants (domestic and foreign) • By training employees (on- and off-the-job) • By exporting products
Firm S Group	• Investment activities (follow source) • Production process activities • Product activities (OEM auto-parts; incipient design) • Linkage activities (domestic and foreign) • Marketing activities	**Passive and Semi-Automatic:** • By continuous improvement activities **Active and Purposive:** • By renewing *existing* technical assistance • By investing in modern production technology • By collaborating with the public organizations • By hiring some foreign engineers, training Thai engineers • By training employees (domestic, later overseas)

Source: own elaboration based on the research

Table 7.10 (continued). Summary of Firm Learning Activities and Mechanisms – the Adaptation Phase

FIRM	ADAPTATION PHASE	
	Learning Object(s) "what the firm learns"	**Learning Mechanisms "how the firm learns"**
Firm SOM	• Investment activities • Production process activities • Product activities (diversification; no design) • Linkage activities (domestic; poor)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By investing in capacity expansion (downsizing later) • By collaborating with public organizations (TAI) • By training employees (limited)
Firm TKT	• Investment activities; plant expansion • Production process activities • Product and tooling capability (diversification; no design) • Linkage activities (domestic and foreign, incipient stage) • Marketing activities (domestic)	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching for more foreign technical collaboration (incipient) • By searching and acquired a firm • By collaborating with the public organizations • By hiring capable engineers and technicians • By training employees (on- and off-the-job)
Firm TS Group	• Extensive investment activities (overseas) • Production process activities • Product activities (incipient product design & own brand) • Linkage activities (domestic and foreign) • Marketing activities	**Passive and Semi-Automatic:** • By doing production activities (trial and error) **Active and Purposive:** • By searching, form 7 foreign joint ventures • By searching, acquiring firm • By collaborating with the public organizations • By investing in more modern production plants • By investing in overseas manufacturing plants • By hiring engineers and professional managers • By training employees (on- and off-the-job)

Source: own elaboration based on the research

The **second** group of firms were more moderate in their **investment** activities (for e.g. Firm L and Firm S Group). They invested in search activities to link with foreign firms but these were limited and somewhat hampered by the impact of the financial crisis (for e.g. Firm S Group). Their **production process** and **product technology** were not as sophisticated as the first group of firms, and involved limited or simpler design activities[469]. For instance, Firm S Group completed the transition from REM to OEM auto-parts. It had recently engaged in preliminary design activities by setting up an Engineering Design unit, but is still in its infancy stage. Firm S Group development was hampered by the severe impact of the 1997 crisis. For Firm L, it has been producing alloy wheels for the REM markets, and recently the firm started to co-design the alloy wheels with their customers. However, the wheel design was much simpler when compared to that of more complex auto-parts such as a parking hand brake or an electric vehicle. In addition, these firms formed fewer foreign **linkages** when compared with the first group. Other factors retarding this group learning activities were the unsystematic development of human resources. In terms of **marketing activities**, Firm S Group has been focusing mainly on the domestic market, while Firm L had shifted it focus to export. Export increased dramatically for Firm L after the 1997 crisis, because it was viewed as the only survival route. On the other hand, Firm S Group's export did not increase much because it could not meet the product quality and testing requirements, due to lack of local product testing facilities.

The **third** group of firms was the worst performers (Firm CPC, Firm CSP, Firm SOM, and Firm TKT). They did not engage in any plans to **invest** in the complex set of learning activities. At best, some of these firms invested in modern **production** equipment to increase the production capacity, and there were insufficient learning activities to fully utilize such investment (for e.g. Firm CPC and Firm SOM). These firms produced only simple products. For instance, Firm CPC and Firm TKT produced simple auto-parts. Similarly, Firm CSP continued to produce simple aluminium die casting parts, and was reluctant to commit in the co-design activity with the carmaker. Among the four firms in this group, Firm SOM was still the worst performer. It suffered severely from financial mismanagement and other operational problems. Overall, these firms did not engage in any product design activities.

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[469] The words "limited", "simple", "moderate", and "complex" were used to denote the relative differences in the learning activities between the firms in the first and the second group. These words should not be interpreted using their absolute meanings.

In addition, the firms did not engage in any long-term **linkage activities**. There were neither foreign joint ventures nor extensive technical assistance agreements, consequently these firms access to knowledge sources were very limited. For Firm TKT, its foreign joint venture failed to continue after the 1997 crisis. However, the situation today is changing. Both Firm CSP and Firm TKT are searching for potential foreign technical collaboration. In terms of **marketing activities**, all firms focused on the domestic market, and there were limited exports[470].

In addition, all firms continued using the passive **learning-by-doing mechanisms** (see Table 7.8). Only some firms implemented the more active "learning by searching" for foreign partners as well as extensively learning the foreign technology (for example, Firm AH Group, Firm D Group, and Firm TS Group). These firms extensively leveraged on the linkages with foreign firms and learned new production and product technology. In short, they implemented "link and learn" mechanisms. Some firms attempted to link with the foreign firms and learn, but their linkages did not last and the learning activities were prematurely truncated. For instance, Firm S Group's joint ventures suffered severely during the 1997 crisis, and their learning activities were paused. Similarly, Firm L foreign joint venture was dissolved, and since then, the owner had negative perception about other Japanese joint ventures. Other firms accumulated their capabilities by relying mostly on just learning by doing per se (for example, Firm CPC, Firm CSP, Firm SOM, and Firm TKT). Even though some of these firms hired and trained engineers, their knowledge sources were very limited due to limited linkages. Their "link and learn" mechanisms were largely absent.

7.4 Summary of Different Patterns of Firm Learning Activities and Mechanisms

Having presented firm learning activities and mechanisms for each common phase, it is useful to combine the key characteristics across all phases, for each firm. The objective is to derive a dynamic, learning activities (and mechanisms) pattern(s) across the firms. From Table 7.11, there are **three** groups of pattern of firm learning activities and mechanisms.

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470 This does not mean that these firms do not want to export. It simply means that the firms are not ready for export (for e.g. Firm CSP and Firm TKT, who states that in the future they plan to export to Asian countries).

First are the patterns of the **"strong learner"** firms (Firm AH Group, Firm D Group, and Firm TS Group). They shared several common characteristics. Each firm had successfully migrated from simple **learning activities** (for e.g. basic investment and routine production activities) to engage in more complex activities (for e.g. own product/brand design and advanced production processes). Their **learning mechanisms** also shifted from passive (i.e. learning-by-doing) to ones that are more active (for e.g. learning-by-searching, by-hiring, and by-training). It is important to note that once these firms migrated to more active learning mechanisms, they did *not* stop the passive learning-by-doing activities. They conducted both types of mechanisms, and moreover, the passive and active learning mechanisms complemented each other. In other words, these progressive-learning firms ensured that their combinations of various learning mechanisms were synergistic (thus achieving "**synergistic combination**") (see Table 7.11). These firms performed extensive "search, link, and learn" activities with foreign partners in order to sufficiently gain access and acquire the targeted know-how. They also coupled the complex learning activities with sufficient (and timely) strategic human resources development, enhancing the learning ability of their engineers.

On the contrary, the **"weak learner"** firms (Firm CPC, Firm CSP, Firm SOM, and Firm TKT) did not complete the transition from simple learning activities to the more complex ones (see Table 7.11). In other words, each firm failed to migrate from the basic investment and routine production and linkage activities to engage in the more complex ones (for e.g. own product/brand design and advanced production processes). Their **learning mechanisms** remained at the passive level (i.e. learning-by-doing per se), largely neglecting the more active mechanisms (for e.g. learning-by-searching, by-hiring, and by-training and by linking with foreign firms). It appeared that these firms (due to their poor planning or lack of commitment) did not want to engage in more complex learning activities, and thus there were no need to execute the more active mechanisms for learning. In other words, these sluggish-learning firms failed to strategically plan for future competition, and thus did not engage in more complex learning activities to build capabilities. These firms did not sufficiently perform the "search, link, and learn" activities with foreign partners; this was not part of their strategic goals. They also did not put much emphasis on the strategic human resources development (or if they did, it was planned rather inadequately). This led to the limited learning ability of their engineers and technicians.

Table 7.11 Summary of Firm Learning Activities and Mechanisms Across All Phases

FIRM	START-UP PHASE		EXPANSION PHASE		ADAPTATION PHASE		Overall Rating
	LA	LM	LA	LM	LA	LM	
Firm AH Group	Simple	Passive	Moderate	More Active	Complex	Synergistic Combination	**Strong**
Firm CPC	Simple	Passive	Simple	Passive	Simple	More Active	**Weak**
Firm CSP	Simple	Passive	Simple	Passive	Simple	More Active	**Weak**
Firm D Group	Simple	Passive	Moderate	More Active	Complex	Synergistic Combination	**Strong**
Firm L	Simple	Passive	Moderate	More Active	Moderate	More Active	**Average**
Firm S Group	Simple	Passive	Moderate	More Active	Moderate	More Active	**Average**
Firm SOM	Simple	Passive	Simple	Passive	Simple	Passive	**Weak**
Firm TKT	Simple	Passive	Simple	Passive	Simple	More Active	**Weak**
Firm TS Group	Simple	Passive	Moderate	More Active	Complex	Synergistic Combination	**Strong**

Notes: LA = Learning Activities LM = Learning Mechanisms
Source: own elaboration based on the research

The **third** group of firms is the **"average learner"** firms (Firm L and Firm S Group). These firms located in between the strong and the weak. They *partially* completed the transition from simple learning activities to the more complex ones (see Table 7.11). In other words, each firm failed to fully engage in the complex **learning activities** (i.e. limited ability to design product and to operate advanced production processes). Their **learning mechanisms** remained at the moderate level (i.e. learning-by-doing plus few other active mechanisms). Similar to "weak learner" firms, these firms largely neglected the more active learning mechanisms (for e.g. learning-by-searching for foreign partners and sustaining that linkage). It appeared that these firms did not want to fully engage in more complex learning activities, and thus there were no need to synergistically combine the active learning mechanisms with the more passive ones. In other words, these moderate-learning firms failed to strategically plan for future growth, and perceived little value of synergy between learning mechanisms to build capabilities (see Table 7.11). These firms did not sufficiently perform the "search, link, and learn" activities with foreign partners. Initially, they searched for and linked with foreign partners, later when such activity faced obstacles these firms abandoned their effort and did not sufficiently learn from their foreign partners (i.e. the learning was truncated). They placed some emphasis on the strategic human resources development, but their training programs were either unsystematic or lacking continuity. This inadequate human resources training led to the insufficient learning ability of their engineers.

Chapter 8 – Inter-firm Differences in Strategies, Learning and Capability Development

In this chapter, the findings discussed in Chapters 5 to 7 are drawn together and assessed from the perspectives of the conceptual and analytical frameworks provided in Chapter 3 and 4 (see Tables 3.1 to 3.4 and Figures 3.1 to 3.3). Particular emphasis is placed on the inter-firm differences in strategies, learning activities, and capability development. The analysis also addresses the three research questions (see Section 1.2).

8.1 Intra-Industry Differences in Firm Strategic Paths

Through four and a half decades, the Thai automotive industry has undergone a sequence of changes in policies, incentives, market growth rates and it has experienced external shocks (see Chapter 5). Throughout this period, different firms perceived this sequence of changes differently. Some firms viewed the changes as business opportunities (i.e. challenge to be overcome); whereas, other firms viewed these changes as threats and did not attempt to embrace them. Consequently, different firms formulated different competitive and learning strategies depending in part on their perceptions of the external changes (see Tables 6.2 to 6.5).

8.1.1 Firm Competitive Strategy

8.1.1.1 Competitive Goals

As the automotive industry evolved, the evidence in Chapters 6 and 7 suggests that the case study firms had different perceptions of external opportunities and challenges. The "**strong learners**"[471] (Firm AH Group, Firm D Group and Firm TS Group) tended to view many challenges as business opportunities (i.e. challenging competitive goals). Through external networking with foreign firms and their personal connections (see Tables 7.2, 7.6 to 7.8) on numerous foreign technical assistance and joint ventures), these firms assessed such challenging opportunities with greater confidence that they could manage the risks. These firms were able to determine the feasibility of realizing their competitive strategy, since it would be futile to aim for an ambitious but unachievable competitive goal.

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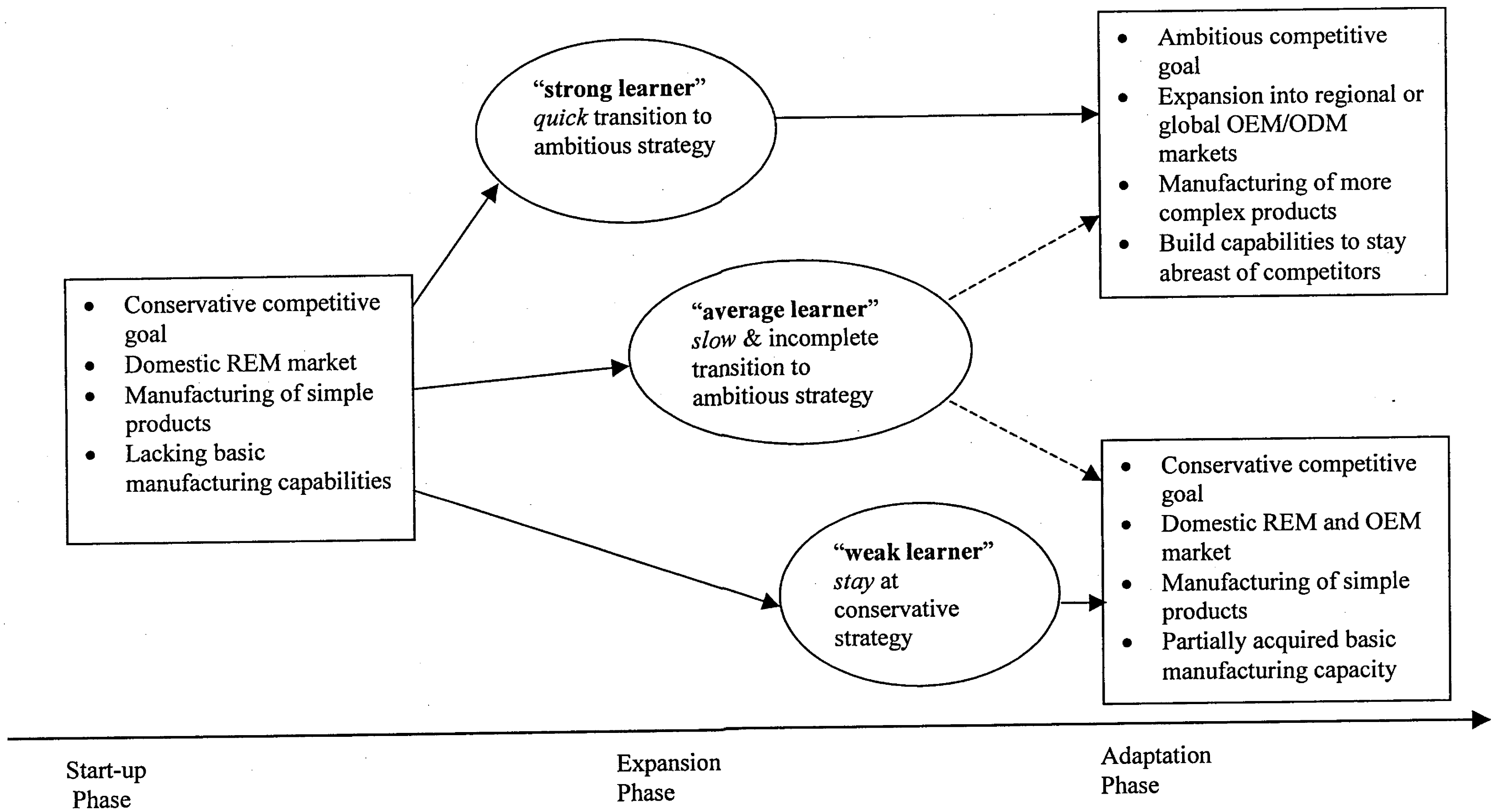
[471] It is important to note that the labels "strong learner", "average learner", and "weak learner" are defined relative to each other. These labels serve the purpose of simplifying the cross-firm comparative analysis.

Figure 8.1 Divergence in Competitive Strategy: Paths and Positions



Source: own elaboration based on the data analysis

Once the assessment and feasibility were conducted, these firms pursued their ambitious goals by aggressively expanding their businesses through investment in overseas markets, manufacturing more complex products that were demanded by the carmakers, and planned the development of capabilities to stay abreast of their competitors (see Figure 8.1).

In contrast, the "**weak learners**" firms (Firm CPC, Firm CSP, Firm SOM, and Firm TKT) were extremely slow to perceive the implications of changes within the external environment and even slower to see these as opportunities. They tended to view these changes as problems that they should avoid. As a result, these firms tended to stay with the unambitious competitive goals (Figure 8.1). These firms tended to be passive in their business outlook and invested little to expand their business operations. They were satisfied with the existing business operations and the domestic market share. Without ambitious goals, there were no systematic assessment or feasibility studies for investment in new ventures or learning programs. Most of their competitive strategies focused on current firm operations, emphasizing the increase of domestic market share.

The **"average learners"** (Firm S Group and Firm L) had ambitious competitive goals, but the development of strategies to achieve those goals lacked rigor and focus (see Figure 8.1, middle oval). Their competitive goals were not achieved in a timely manner, causing them to lose out on some business opportunities. For instance, Firm L aimed to become an OEM supplier. But due to its failed investment in building a relationship with a Japanese auto-part supplier as well as the slow implementation of human resource training programs, it did not succeed with the OEM joint venture business (see Section 7.1.5). Since establishment, Firm L's ability to manage a transition from REM auto-parts to an OEM auto-part producer was not developed (this situation is resembled by the two dotted arrows coming out of the "average learner" oval in Figure 8.1). Should the firm able to remedy such situation it might be able to successfully achieve the competitive goal, it would take on the upper path, the upper dotted arrow in Figure 8.1. On the other hand, if Firm L failed to successfully realize its goal (i.e. unsuccessful competitive strategy), then it is likely that the firm will move onto the lower dotted arrow in Figure 8.1.

8.1.1.2 Competitive Positions

With respect to the product-market position (see Table 3.1 for a definition), the **"strong learner"** firms (i.e. Firm AH Group, Firm D Group and Firm TS Group) quickly re-positioned themselves from distributing (or producing) low-value added REM auto-parts to full-scale manufacturer of OEM auto-parts, and finally, to start engaging in product design with the carmakers. From the start, these firms have collaborated with the vehicle makers to start to become actively involved in the production organization process (see Sections 6.1.1, 6.1.4, and 6.1.9 during start-up phase, Sections 6.2.1, 6.2.4, and 6.2.9 during the expansion phase). Product design capability is one of the crucial requirements if indeed these firms decided that they wanted to position themselves as first-tier auto-part suppliers. For instance, Firm AH Group actively involved itself with the Mercedes Benz design engineers to come up with successful designs of automotive assembly jigs. As a result, the firm became an international jig supplier for Mercedes Benz. Similarly, Firm D Group engaged actively in hand brake design. Likewise, Firm TS Group set up a representative office in Japan (see Section 7.3.9 for details) to ensure that any urgent product design issues and problems are addressed in a timely manner.

In contrast, the "**weak learner**" firms had conservative competitive goals, which precluded the possibility of engaging in intensive collaboration with the carmakers, thus foregoing the opportunity to learn to design new products. The longer they postpone such collaboration, the more their product-market position will deteriorate, because the higher the likelihood that they could not meet the carmakers' new product design requirements. The "**average learner**" firms tended to position their products in either the REM market (for e.g. Firm L) or low-value added OEM parts (for e.g. Firm S Group). They were unsure of the route to strengthening their competitive positions; hence they were slow to engage in an ambitious competitive strategy.

With respect to the capability-market position (see Table 3.1 for a definition), the **"strong learner"** firms tended to focus resources on product design capability. Importantly, external linkages enabled these firms to gauge their existing design capabilities against the upcoming requirements posed by the carmakers. Product design capability became important because as the Asian automotive industry moved toward higher levels of liberalization, most foreign carmakers engaged in setting up regional production networks want to have their auto-part suppliers able to follow them both in auto-part design activity and in sourcing locations. Hence, the crucial capability for the first-tier suppliers is to send in their "guest engineer" (i.e. Thai engineer usually had to travel overseas) and participate with the carmakers on designing new products. This was indeed what Firm AH Group, Firm D Group, and Firm TS Group were engaging in (at the time of this writing).

In contrast, the **"weak learner"** firms engaged in neither producing more complex products nor did they collaborate to build the necessary capabilities to "stay ahead" of the competition. They merely exploited the existing capabilities just to survive the current competition. Additionally, some of these firms (for e.g. Firm SOM and Firm CPC) were still struggling with meeting the basic manufacturing capability requirements of quality and price. The **"average learner"** firms (i.e. Firm S Group, Firm L) were neither focused nor coherent and their learning activities did not strengthen their capability-market positions when compared to those of the "strong learner" firms.

8.1.2 Firm Learning Strategy

8.1.2.1 Learning Goals and Capability Gaps

For **"strong learner"** firms, their learning goals, similar to the competitive goals, were also ambitious. In other words, their specified target knowledge and skills acquisition goals were at a higher level, and it usually required the firm to stretch their existing capabilities. For instance, after having been in operation for about a decade, Firm AH Group wanted to acquire the knowledge to build assembly jig and to be able to supply these for the European carmakers (for e.g. Volvo and Mercedes Benz, see Section 6.3.1 and 7.3.1). Often times, the foreign design engineers visited the Group to discuss, exchange design knowledge, and solve problems on the prototype jigs. In this way, Firm AH Group attempted to close their product design capability gap. Similarly, Firm TS Group also had ambitious learning goals. The Group wanted to acquire the knowledge to successfully build its own indigenous golf cart (see Sections 7.3.9 for details). Likewise, Firm D Group collaborated extensively with the Japanese carmakers to acquire the knowledge to fully design the hand brake (see Section 6.2.4 for details).

In contrast, the **"weak learner"** firms did not have ambitious learning goals. There were no specific targets pertaining to what knowledge acquisition activities were needed to fill capability gaps. As a result, the knowledge acquisition activities were at best ad hoc, and some of these capability gaps remained unfilled. For instance, both Firm SOM and Firm CPC had always been a customer of Thailand Automotive Institute, receiving much technical assistance from the Japanese experts. Despite extensive assistance, the firms still dwelled on the same continuous improvement activities (for e.g. same defect problem on similar auto-parts) and did not move on to more challenging tasks (see Section 7.3.2 and

7.3.7). This was because these firms lacked an explicit target for knowledge acquisition. Their perception of the competitive environment also focused mostly on short-term profit gain, rather than on long-term sustainability.

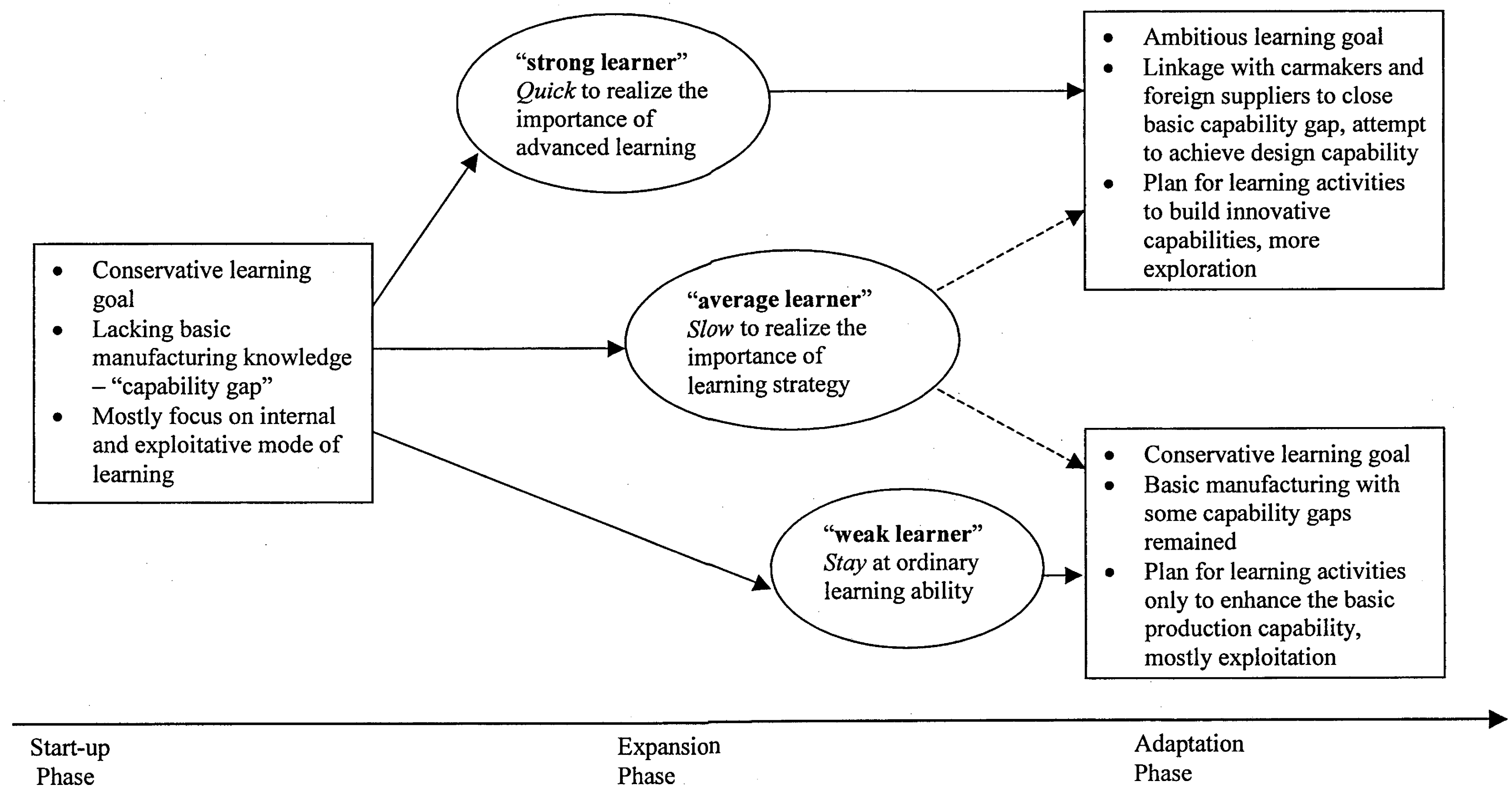
The "**average learner**" firms occasionally had ambitious learning goals, but they were slow to realize the importance of commitment to such learning strategy. For instance, during the start-up phase Firm L started out an ambitious learning goal. It wanted to learn the production process of an OEM alloy wheel, but after learning for 4 years with a foreign partner it had decided to become independent and moved into the REM auto-part business (Section 6.1.5). Additionally Firm L did not aim to train its human resources pool early enough to keep up with the new technological equipment.

In sum, the "**strong learner**" firms first set ambitious learning goals, and then this was followed by the identification of the existing capability gaps that must be filled. This in turn led to the acquisition of requisite knowledge, skills, and resources to fill the gaps. Firm AH Group, Firm D Group, and Firm TS Group served as examples of firms who realized the importance of advanced learning and moved quickly from conservative strategy (i.e. OEM subcontractor learning strategy) to an ambitious strategy (for e.g. own design and own brand learning strategy) (see Figure 8.2). Their learning approach could be characterized as ambitious, realistic, goal-oriented and committed. The "**weak learner**" firms set conservative goals and did not have explicit plan for knowledge acquisition. Often times, they focused on mainly enhancing the basic production capability, at the cost of foregoing the development of innovative capabilities. Finally, the "**average learner**" firms were somewhere between the characteristics of the strong and the weak learners.

8.1.2.2 Learning Positions: Balancing the Tensions

There are **two** tensions that needed to be managed. **First** was the tension between exploitation and exploration. By engaging in designing world-class jigs (for e.g. Firm AH Group), designing OEM hand brake for carmakers (for e.g. Firm D Group), and its own golf cart (for e.g. Firm TS Group), these firms were exploring ways to compete for the future. They attempted to balance the tension between learning to exploit today's capabilities and learning to explore future possibilities. On the other hand, the "weak learner" and "average learner" firms did not engage in sufficient exploration learning strategy.

Figure 8.2 Divergence in Learning Strategy: Paths and Positions



Source: own elaboration based on the data analysis

Their rather conservative strategy or slow-pace aggressive learning strategy did not encourage such exploration. These firms tended to remain in learning to exploit today's capabilities, and they were largely ill-prepared to compete for the future.

Second was the tension between internal capability and external sources of knowledge. Having taken such ambitious learning aims, the "strong learner" firms also sought external sources of knowledge as well as technical assistance. They attempted to achieve synergy and integration between internal capabilities and the new external sources of knowledge. These "strong learners" accomplished this over a long period of time, as it was evident that they took the initiatives to link with foreign firms (usually since start-up period) (see Sections 6.1.1, 6.1.4, and 6.1.9). It is important to note that the development of collaborative mechanisms with foreign firms required investment (sometime over long periods) in relationship-building (i.e. trust-building) to then enable learning (Firm D Group and Firm TS Group served as clear exemplars).

The "**weak learner**" firm, on the other hand, did not seek much external knowledge. This was because they neither aimed at becoming a world-class auto-part supplier nor engaged in design auto-part for carmakers. Their conservative learning goals required the use of their internal capabilities with sporadic access to external knowledge and capabilities. It is also the case that these weak learners had (or would have had) difficulty building collaborative relationship with foreign auto-part suppliers and/or carmakers.
Likewise, for "**average learner**" firms, they sometimes required extensive external assistance (usually during plant start-up or installation of major plant equipment), but after such events, these firms did not tap into external sources of knowledge. Consequently, the degree of synergy and integration between internal capabilities and external sources of knowledge was more sporadic when compared with those of the "strong learner" firms.

8.2 Cross-firm Differences in Processes: Learning Activities and Mechanisms

8.2.1 Firm Learning Activities

"**Strong learner**" firms started their foreign partner linkage activity very early on, usually in the start-up phase. For instance, Firm AH Group had personal connection with the Regional Director of Ford (see Section 7.1.1). Similarly, Firm D Group linked up with their long-time Japanese supplier. This occurred at the time when Firm D Group was only a mere after-market auto-part trader, this relationship later formalized into a Japanese-Thai joint venture producing OEM automotive brake parts (see Chapter 7, start-up phase – "learning the investment activities"). Likewise, Firm TS Group started as part of a joint venture with the Japanese motorcycle maker firm.

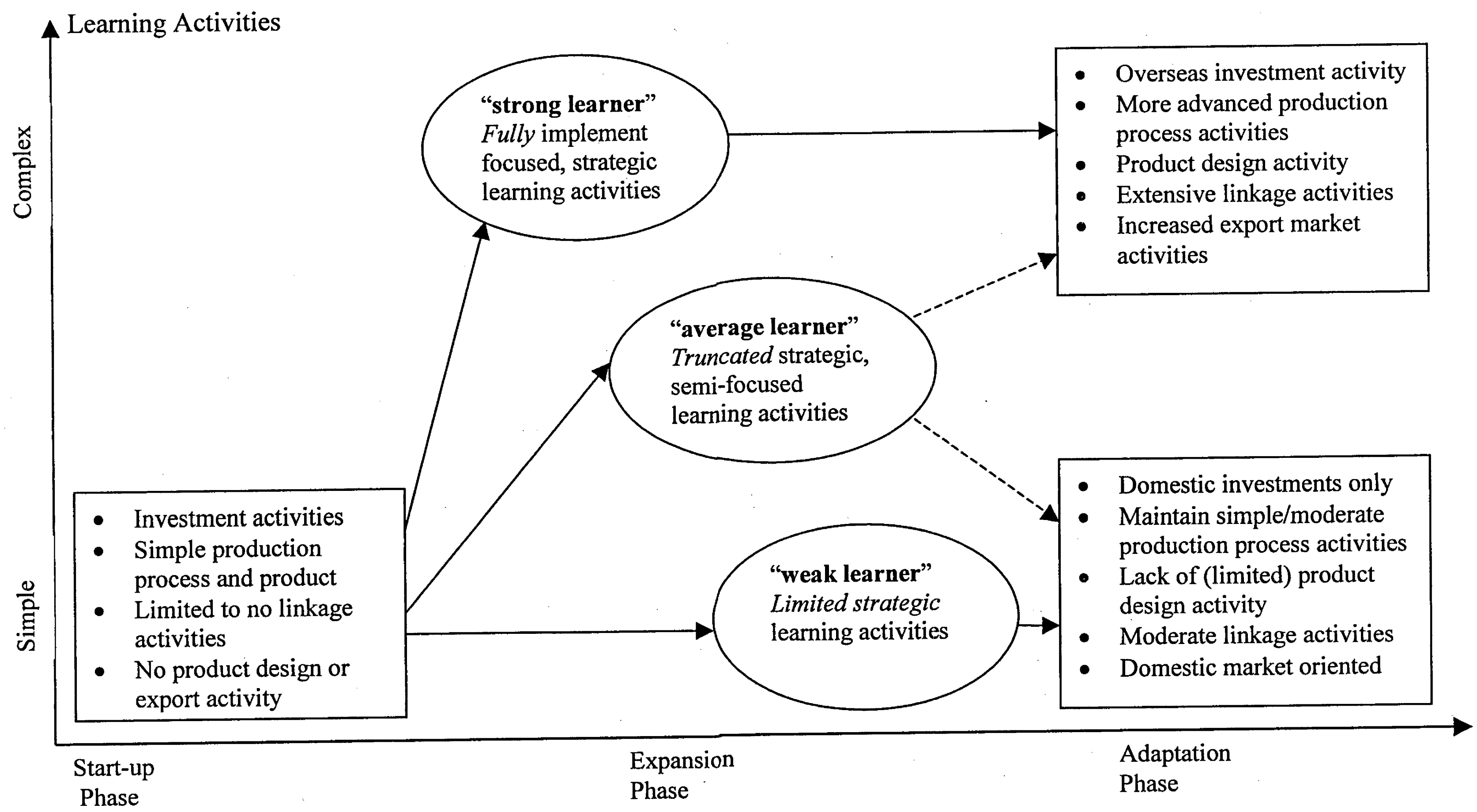
As the demands of customers changed, these firms were also committed and responded to invest in modern production technology. For instance, Firm AH Group set up a tooling design unit equipped with computer-aided design capability. Similarly, Firm D Group set up a subsidiary, Firm D-tec, whose responsibility was to enhance the Group parking hand brake design capability. In pursuing the goal of achieving product design capability, Firm TS Group established an R&D Unit capable to indigenous design and manufacture the golf cart (see Figure 8.3). Hence, these external and internal organizational developments played a major role in developing the capability to learn.

While "**weak learner**" firms developed investment and routine production activities, their ability to link up with foreign technological partners (i.e. sources of knowledge) was very limited. For instance, Firm SOM had *no* linkage with foreign firms at all. The firm's only linkages were with its main customer (see Sections 7.1.7, 7.2.7, and 7.3.7). Similarly, Firm CPC had limited linkages with foreign firms. Its main learning activities focused on production capability improvement, which was occasionally supported by foreign technical consultants. The linkage was by no means a committed relationship over an extended periods and lacked continuity. Consequently, there were no effective relationship-building activities for the weak learners. The "**weak learner**" firms also had limited investment in ambitious learning activities. For example, Firm SOM, Firm CSP, and Firm CPC did not aim at learning to design auto-parts, but passively used the pre-specified drawings provided by the vehicle manufacturers. These firms were not interested in investment in activities, which would lead to higher auto-part design capability[472].

The "**average learner**" firms were located in between the weak and the strong. Similar to the "strong learners", these firms were interested in investing in activities to learn to produce better quality auto-parts. But their learning activities tended to lack commitment and were mostly incomplete.

[472] For the time being, they were not also interested in moving up the production value chain.

Figure 8.3 Divergence in Processes: Learning Activities



Source: own elaboration based on the data analysis

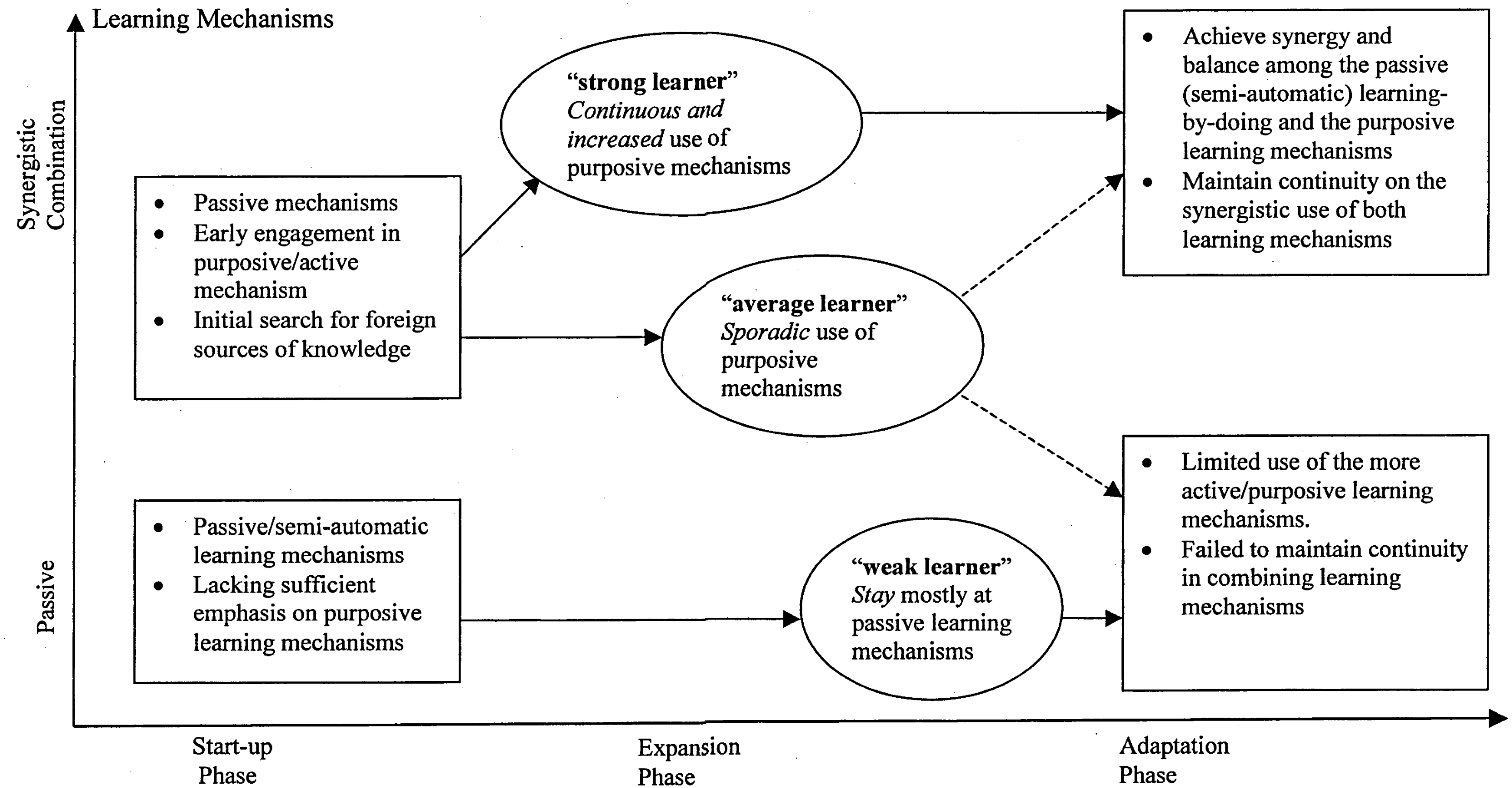
For instance, Firm L invested heavily in upgrading its production technology and bought state-of-the-art machinery; but it neglected the human resource development and training. In this way, the ability of its personnel to fully capitalize on the equipment capability was not realized (see Section 7.3.5 for details)

8.2.2 Firm Learning Mechanisms

For both the "**strong learner**" and "**average learner**" firms, their learning mechanisms had transitioned from passive, semi-automatic learning by doing to a combination of passive learning-by-doing and more active learning mechanisms. In particular, the "strong learner" firms began to continuously experiment with new ideas as a way of learning. For instance, Firm TS Group experimented with electric golf cart construction (for the first time), to pull together its varied expertise, its auto-part supplier group, and technical collaboration with Thailand Automotive Institute (TAI). In this project, a multitude of learning mechanisms was involved, ranging from learning-by-doing, by searching for the most suitable electric motor vendor, by continuously collaborating with TAI (and lower-tier suppliers) and by hiring permanent Japanese employees. Similarly, Firm D Group, during its start-up phase, engaged extensively in learning-by-visiting Japanese factories as well as learning-by-doing production activities. The firm combined in a synergistic way the passive and active learning mechanisms. In addition, the firm also attempted to continuously maintain such synergy throughout its learning activities, i.e. these learning mechanisms were maintained throughout the start-up, expansion, and adaptation phase (see Figure 8.4).

Although engaging in both passive and active learning mechanisms, the "**average learner**" firms did not achieve a balance and synergy between two types of learning mechanisms. At times, these firms would learn by investing in more conscious activity such as searching for foreign technical expert, hiring more capable engineers, and training its employees. However, these were conducted at best sporadically and not continuously. For instance, Firm L had hired foreign technical experts for several weeks to teach the employees about die casting technique. Then it moved on to rely on the training from Thailand Automotive Institute on the same subject matter. These were not done systematically. As these approaches lacked synergy, the firm did not achieve the overall learning objective.

Figure 8.4 Divergence in Processes: Learning Mechanisms



Source: own elaboration based on the data analysis

Unlike the other groups, the "**weak learner**" firms largely neglected the use of more active learning mechanisms. For instance, Firm TKT, Firm CSP, Firm CPC and Firm SOM relied on the passive learning-by-doing and did not pursue active learning by searching or hiring more capable engineers (see Sections 7.3.2, 7.3.3, 7.3.7, and 7.3.8). The firms conservatively relied on the traditional internal learning by trial and error, and when problems arise they would occasionally ask some external experts for assistance. Most of the assistance was focused on improving the general basic production capability, and not on product design capability.

8.2.3 Impact of Firm Strategies on Learning Activities and Mechanisms

From the evidence provided in Chapters 5 to 7, and the analysis conducted above, it appears that "**strong learner**" firms who had more ambitious competitive and learning strategies were more adept at focusing on the strategic learning activities. Additionally, these firms were also able to effectively implement both the passive and active learning mechanisms. On the contrary, the "**weak learner**" and "**average learner**" firms, who did not have the ambitious competitive and learning strategies, were not able to systematically manage their choice of learning activities and mechanisms. In addition, these firms choice of learning activities tended to focus on basic production capacity and general productivity improvement.

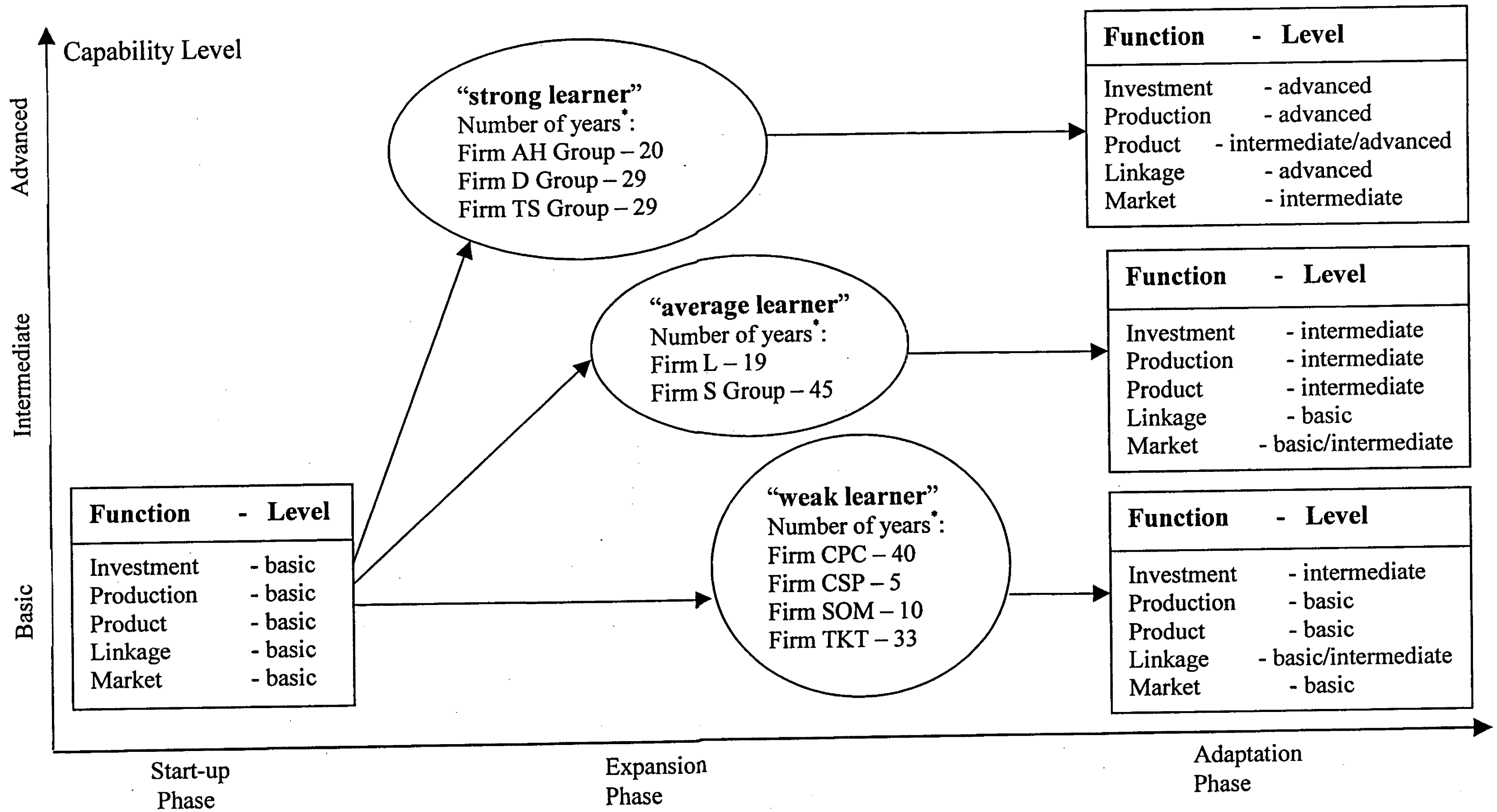
The characteristics of firm strategies had a significant impact on the way firms conducted their learning activities and choice of learning mechanisms.

8.3 Cross-firm Differences in Capability Development and Alignment

8.3.1 Rates and Types of Capability Development

Even though *all* firms started out with a basic level of capability during the start-up phase, through time firms implemented different strategies and learning activities and mechanisms, and achieved different rates and types of capability development. For "**strong learner**" firms, it took them on average about 20 to 29 years to move from the basic level of capability to advanced capabilities in almost all technical functions (see Figure 8.5).

Figure 8.5 Divergence in Capability Development – Rates, Functions, and Levels



Note: * This denotes the elapsed time, as the firm progressed from the basic levels of capability to intermediate/advanced levels.
Source: own elaboration based on the analysis and latecomer firm capability development framework (Table 3.4)

For instance, Firm AH Group took 20 years (i.e. 1985-2005) to progress from basic production capability to an advanced level of capability in all areas. Since its start-up the Group ambitiously aimed at becoming an OEM auto-part supplier, and hence, it engaged in the necessary investment in learning activities. Examples included search and linkage activities executed to obtain updated information on technical changes and to assess different routes to becoming an OEM part supplier. This was the inception of the Group's **linkage capability** which led to information for acquiring the automotive tooling manufacturing firm (see Section 7.1.1). During the expansion phase, Firm AH Group engaged in investment expansion, both in the modern equipment and hiring (and poaching) of capable human resources. This was when the firm developed its **investment capability**. Later, during the beginning of adaptation phase, the firm also set up a formal tooling design unit and engaged in extensive, systematic productivity improvement programs. This was at the time when the Group enhanced its **production process** and **product design capabilities**.

Similarly, both Firm D Group and Firm TS Group achieved similar progress within 29 years (i.e. 1976-2005 for both firms). For example, Firm D Group started with an ambitious goal of supplying OEM auto-parts, and its opportunity came during the early localization policy period. Not only did the Japanese firm decide to invest in Thailand, it also wanted to form a joint venture with a Thai firm that it could trust. Firm D Group was such a firm. Firm D had been in close ties (both personal and business ties) with a Japanese automotive brake supplier. This was the starting point of the Group accumulating the **linkage capability**, followed by the **investment capability**. From that time onwards, Firm D Group engaged in extensive technological licensing as well as forming over 10 foreign joint ventures (see Table 7.2). These relationships with many Japanese firms led to the accumulation of **production process and product capabilities**. The capability culminated in Firm D Group's ability to achieve a turnkey design and manufacturing of automotive hand brakes by mid-1990s (see Section 7.2.4).

For the "strong learner" firms, all of firm-level strategies, the learning activities, and learning mechanisms functioned as a "learning system" – in that the various specific activities and mechanisms were developed within a coherent strategic framework and were interdependent. This contributed to the firm's success in progressing from the basic production capability to the intermediate, and then, the innovative level of capabilities. It is also worth noting that most of the "strong learner" firms did *not* develop an advanced level of **marketing capability**[473]. This was because most of these firms were OEM auto-part suppliers, and they did not have to conduct extensive, systematic market research. These firms worked as OEM subcontractors responding the production orders as dictated by the carmakers.

The "**weak learner**" firms required a longer time to achieve *only* the intermediate levels of capability. For instance, Firm CPC and Firm TKT spent over 40 and 33 years, respectively, to achieve only the intermediate level of **investment** and **linkage capability**. These firms' production and product capabilities still remained at the basic level, since they did not have the ambitious strategies to collaborate with the vehicle makers to engage in product co-design activities. Additionally, their linkage capability only recently moved into the intermediate level due to their recent effort to search for a technological collaboration partner (for e.g. Firm TKT and Firm CSP, see Sections 7.3.3 and 7.3.8).

Among the "**weak learner**" firms, Firm CSP was a young firm, and it was too early to assess whether it will develop higher levels of capability in the future. However, what could be said (at the time of this writing) is that this firm did not have sufficient commitment to engage in product design activity with the carmaker[474]; hence, it is highly likely that the firm will not achieve the intermediate level of **production process and product capabilities** in the near future. Among all the "weak learner" firms (i.e. Firm CPC, Firm CSP, Firm SOM, and Firm TKT), Firm SOM was the worst performer, in terms of strategies, learning activities, and rates of capability development. Additionally, Firm SOM suffered from a multitude of managerial as well as operational problems (see Sections 7.1.7, 7.2.7, and 7.3.7). Within 10 years, the firm barely reached the intermediate level in investment capability, and its linkage capability remained at a basic level.

It is important to note that, because these "weak learner" firms did not initially commit themselves to form linkage with foreign firms and to formulate ambitious competitive and learning strategies during its start-up phase, their learning activities lacked direction, rigor, and focus. Consequently, when compared to the "strong learner" firms, these firms' capability development did not progress rapidly.

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[473] Another reason why these firms did not develop advanced marketing capability was pointed out by Schmitz and Knorringa (2000: 190-191), who stated that due to the fear (of the multinational firms) that once the local firms acquired the marketing capability, they are capable to directly competing head-on. Consequently, most multinational firms were willing to assist the local firms *only* with the production capabilities, *not* the marketing capability.

[474] From personal interview Firm CSP General Manager on December 15, 2004. For more details, please refer to Section 6.3.3

For "**average learner**" firms, the time required to achieve the intermediate level of **capability** ranged from 19 to 45 years (see Figure 8.5). Firm L, who took 19 years to achieve the intermediate level of capability in all technical functions (except linkage capability), was heavily involved with equipping itself with state-of-the-art production equipment and machinery. It did not however improve the other aspects of the firm; for instance, it did not bother to search for and implement foreign technological linkages that would enable it to sell the products to the Japanese carmakers.

Similarly, after about 45 years of development, **Firm S Group** also excelled in all technical areas, except linkage and marketing activities. Its linkage capability was not as stable and continuous as that of the "strong learner" firms (the links with foreign partner firms were abruptly truncated during the 1997 financial crisis). This was in contrast to the "strong learner" firms who were able to maintain their linkages, though through much negotiation and financial assistance from the carmakers (for e.g. Firm TS Group) as well as negotiation with the local financial institutions (for e.g. Firm AH Group). As a result of its poor linkage activities, Firm S Group suffered severely during the post-1997 crisis years, and most of its process and product learning activities were paused for quite some time (see Section 6.3.6).

Hence, "strong learners" were able to develop an advanced level of capability in almost all areas more quickly than the other groups of firms.

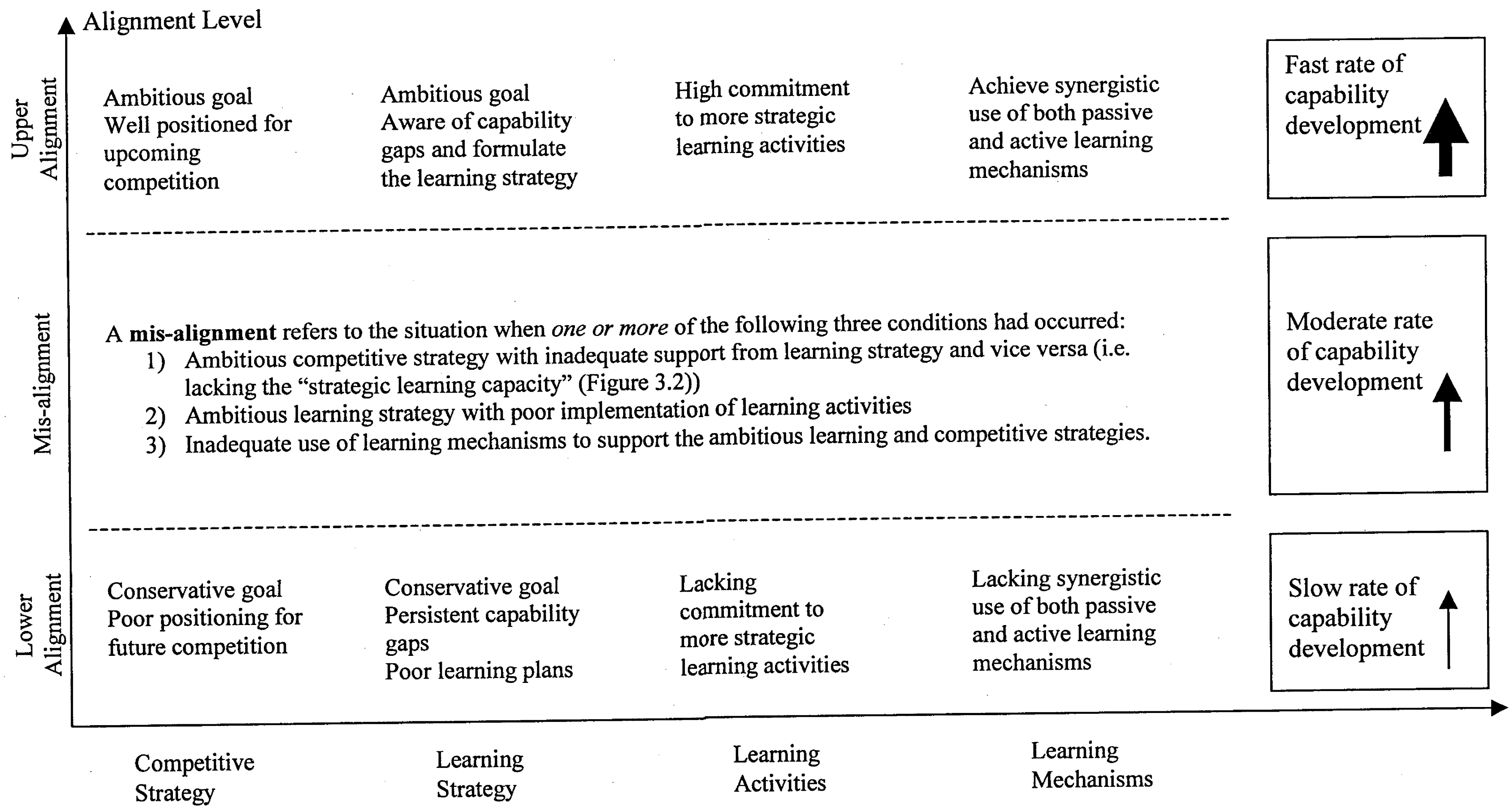
8.3.2 Dynamic Multiple Alignment and Firm Learning System

The above analysis suggests that firm learning processes are both manageable and systemic. The evidence suggests that for firms to develop a fast rate of capability development, *all* "learning system" elements must continually be aligned (firm's competitive strategy, learning strategy, learning activities, and learning mechanisms) (see Figure 8.6).

On the basis of this analysis, the "learning system" elements that need to be managed and aligned and the characteristics that contribute to building a faster rate of capability development are:

- **Competitive strategy** – ambitious goal aimed at building set of capabilities to prepare the firm to progress into future competitive positions

Figure 8.6 Dynamic Multiple Alignments and Capability Development



Source: own elaboration based on the analysis

- **Learning strategy** – ambitious goal aimed at learning to both exploit existing capabilities and to explore the future capability building, and at the same time, achieving balance and integration between the internal and external sources of knowledge
- **Learning activities** – high-level of continuous commitment to implement the strategic learning activities as directed by the firm learning strategy
- **Learning mechanisms** – achieving balance and synergy between the passive and active types of learning mechanisms

To be able to quickly develop capability, firms must ensure that these four elements **aligned** *all the time* at the *upper level* (see Figure 8.6). However, this is not to be misconstrued that if all the above properties were achieved, then firms will automatically achieve capability development. The internal dynamics within the firm and the ever-changing external environment also have significant impacts, and firms must continually be on the lookout for any mis-alignment that may occur. Firms should always properly re-align the "out of aligned" element(s) to ensure that its "learning system" will function properly. This requires much conscious monitoring effort. Additionally, firms must also learn to manage its "learning system" so that it could acquire the "capacity to learn".

"Weak learners" had a form of alignment but at the *lower* level (see Figure 8.6). At this level, firm competitive and learning strategies lacked ambitious goals, and at the same time, these firms' learning activities did not involve the strategic or synergistic combination of learning mechanisms. These firms' "learning system" performed at a lower level, until a trigger (e.g. aspiration to formulate ambitious goals) is used to transition the system into a temporary mis-alignment, and then once the system elements are re-adjusted the firm would eventually move into the upper level alignment. Absent such a trigger (for e.g. ambitious goals), these firms will most likely continue to develop a slower rate of capability accumulation and remain vulnerable to changes in the competitive environment.

A **mis-alignment** occurs when *at least* one of the system elements is "out of alignment" with the others (see Figure 8.6). For example, a firm is in mis-alignment when it has an ambitious competitive strategy with an inadequate support from the learning strategy, or when it has an ambitious learning and competitive strategy, but does not implement the required learning activities. Mis-alignment can also occur when a firm's learning activities are carried out with poor choice of learning mechanisms. For instance, Firm L, which aimed to become an OEM supplier (i.e. competitive strategy), did not manage the linkage activities and human resource investment activities well enough to enable it to achieve that goal. As a result, the firm competitive and its learning strategy and learning activities were mis-aligned.

Similarly, a **mis-alignment** can also occur when firms do not have any ambitious strategy, but attempt to engage in complex learning activities which require proper management of the combination of learning mechanisms (see Figure 8.6). For instance, Firm CSP, who neither aimed to become a world-class auto-part producer nor to be involved in co-designing auto-parts, started to engage in complex learning activities such as advanced inventory management and cost-reduction design techniques. But without the proper guidance from the competitive and learning strategies, it would be rather difficult for such firm to coordinate and synergistically combine the learning activities and mechanisms. Such mis-alignments would certainly slow down the firm rate of capability development.

8.4 Summary

Several points arise from this analysis.

1. Following the key assumptions from both the **SRBL** (Penrose (1959; 1995), Rumelt (1984; 1991), Hamel and Prahalad (1989), Prahalad and Hamel (1990), Nelson (1991), Stalk (1992), Hamel and Prahalad (1993), Teece and Pisano (1994)) and the **LFL** (Mukdapitak, 1994) that firms are heterogeneous with respect to their strategies, this research extended this view further by emphasizing that the latecomer firms' are different with respect to their **competitive** and **learning strategies**. These two strategies depended crucially on how each firm perceived the external changes in the meso environment. In particular, the sequence of meso-level changes offered each firm with a unique perspective on business opportunities as well as challenges.

   Firms which perceived such changes as opportunities (i.e. the "strong learners") will respond with ambitious competitive and learning strategies (i.e. strong "strategic intent" (Hamel and Prahalad, 1989) and "strategy as stretch" as well as "leverage" (Hamel and Prahalad, 1993)). These firms often aimed at significantly upgrading their competitive as well as current capability positions, in order to successfully seize the emerging, future business opportunities. In contrast, firms who did not embrace such changes (i.e. "weak learner" firms who lacked the "strategic intent") or embrace such challenges but did not follow-through with well-coordinated learning activities (i.e.

"average learner" firms who had "strategic intent" but lacked the management of learning activities) were more likely to view the external changes more as threats. As a result, their learning activities remained conservative, lacked commitment, and unfocused with very low emphasis on new knowledge acquisition.

2. The analysis indicated that the **relationship** between firm strategies and the learning activities and choice of learning mechanisms was significant. This findings went beyond the learning concepts expressed in the **LFL** (for example, Bell et al. (1982), Scott-Kemmis and Bell (1988), Hobday (1991; 1995b), Kim (1997a; 1998; 1997b), and Tran (1999; 2002)) and in the **SRBL** (Winter (2000), Zack (1999) and Zollo and Winter (2002)). In particular, not only did the evidence confirm that learning is not an automatic process, but the evidence also suggests that the relationship between firm competitive and learning strategies and firm learning activities and mechanisms was similar to the "extended learning process" concept (Rush et al., 2004: 328) and "integrated learning" (Bessant et al., 1996). This extended view of firm learning did not look at firm internal learning-by-doing activities per se, it looked at the firm's broader strategic learning activities comprising firm awareness, willingness to change, willingness to learn (Schmitz and Knorringa, 2000), and the formulation of realistic learning strategy based upon firm capability as well as the awareness (and assessment) of external opportunities and challenges.

   In other words, it could be said that the emphasis on firm awareness, willingness to change, and learning strategy directs our attention more to the firm's "**capacity to learn**" rather than the specific learning activities themselves. In addition, the evidence suggests that this "capacity to learn" should also include the firms' choice of learning mechanisms in relation to their learning activities and strategies. If a firm chooses to adopt an ambitious learning strategy and complex learning activities, then it should choose a well-balance, synergistic combination of learning mechanisms. This finding is in line with the widely accepted stylized fact expressed in the LFL (Bell (1984), Tran (1999), Figueiredo (2001; 2002a) and Dutrenit (2000)) that the choice of learning-by-doing per se was insufficient for effective accumulation of capability.

3. The analysis also suggests that *all* the "strong learner" firms possessed the initial ability to first "link-up" with the foreign firms[475], then leveraged on these linkages to enable effective transfer of the technical know-how and learn the production and product technology (i.e. these firms searched, linked, and learned, see Section 7.4). This emphasized the importance of the non-technical capabilities expressed in some of the **LFL** (for e.g. technology linkage capability (Abdulsomad, 2003; Arnold and Thuriaux, 1997; Ernst et al., 1998a; Kim, 1998; Poapongsakorn and Tonguthai, 1998; Techakanont, 2001; Techakanont and Terdudomtham, 2004; Tran, 1999; UNIDO, 2002; Virasa, 2005)). Without such an initial search and linkage, it was highly likely that the "strong learner" firms would not be able to tap into the important foreign knowledge sources. Poor search and linkage capability would hinder the significant know-how transfer for these latecomer firms. Hence, the ability to initially search, link, leverage, and learn is essential (Mathews, 2002; UNIDO, 2002), and should be emphasized as a component of the latecomer's firm "capacity to learn".

    It is also important to note that some latecomer firms may be able to initiate successful search and linkage activities, but they cannot sustain their complex learning activities and manage the diverse range of learning mechanisms (for e.g. Firm S Group, Firm L, or Firm TKT). The evidence in chapters 6 and 7 suggests that this failure to learn is due to the inability to synergistically combine the external with the internal sources of knowledge. In other words, these firms lacked the "combinative capabilities" (Kogut and Zander, 1992) and/or "integrative capabilities" (Iansiti and Clark, 1994) and/or the ability to learn from others (Garvin, 1994; Levitt and March, 1988) and/or the "potential absorptive capacity" (i.e. the ability to acquire external knowledge and assimilate and learn) (Zahra and George, 2002). In addition, the analysis went beyond these factors, and suggests that one additional reason why these firms failed to manage their "learning system" was because of the lack of the higher-level alignment (see Figure 8.6).

4. The dynamic capabilities framework (of the SRBL) and particularly the concepts of paths, positions, and processes (Teece and Pisano, 1994; Teece et al., 1997) can

[475] For examples, Firm AH Group initially linked with Ford (later known as Ford/Mazda joint venture), while Firm D Group linked with Japanese automotive brake suppliers through a joint venture and Firm TS Group initially linked with the Japanese motorcycle makers, also through a joint venture. All of these linkage activities started during the firm's start-up phase and were maintained throughout the expansion and adaptation phases.

usefully be extended to the **LFL** (Kim and Nelson, 2000a; Teece, 2000). In this analysis, the "strong learner" firms chose ambitious strategies, thus embarking on ambitious competitive and learning "paths". Although initially located at a disadvantaged "position" (i.e. poor assets, inadequate resources, and significant capability gaps), they managed to utilize their ambitious strategies as a focusing tool to efficiently direct and coordinate the firm's learning "processes" in order to achieve a fast rate of capability accumulation. The analysis extends Teece's proposition (see Section 3.3.1) that although latecomer firms are initially at a disadvantage "position", they can successfully overcome this disadvantage if they are willing to:

a. intelligently select the desirable competitive and learning "paths" (i.e. competitive and learning strategies), with high level of commitment
b. learn to become better at managing the learning "processes" (Teece, 2000: 123) (i.e. firm learning activities and choice of learning mechanisms)
c. engage in the linkage and collaboration with foreign firms, and learn to strengthen their own weak "positions"

5. The concept of firm "**learning system**" and **alignment** was emphasized in both the SRBL (Senge (1990), Tidd et al. (2001; 2005), Beer et al. (2005), Leonard-Barton (1995; 1993), Garvin (1994), Bontis et al. (2002), Sanchez and Heene (2005), Drejer and Riis (1999) and Drejer (2000; 2002)) and the LFL (Figueiredo (2002a; Figueiredo, 2002c), Dutrenit (2000) and Alcorta (2005)). This analysis suggests that a firm's learning system evolves over time and that the system elements (i.e. competitive strategy, learning strategy, learning activities and mechanisms) must function properly and be aligned (and re-aligned when necessary).

The "**strong learner**" firms in this analysis had ambitious competitive and learning strategies that were aligned with their complex learning activities and a synergistic combination of learning mechanisms. Such ambitious strategies had to be well-aligned with changes in the external opportunities and challenges. At times, the external opportunities occasionally required these firms to re-adjust their strategies, aiming for more ambitious targets (and seized the opportunities). Thus, if a firm is committed to achieving the stretch competitive and learning goals, it must learn to re-adjust the associated learning activities and mechanisms to be able to achieve the ambitious competitive and learning strategies. However, it is also important to note that what is clearly important is a firm's (or more precisely its owners or senior managers) understanding of the external environment (in order to identify changes, opportunities, and threats) and internal environment (capability gaps and goals). Equipped with sufficient external (foreign) linkages, the "strong learners" tended to have a well-informed understanding of the external context as well as better ability to assess their own capability gaps and goals; and hence, clearer perceptions of opportunities (i.e. better than either the "average learners" or the "weak learners").

Chapter 9 – Conclusions

This thesis has focused on the key characteristics of strategies for learning in auto-part firms in Thailand. It has sought to explain the sources of variation in the level and type of strategic learning effort put into learning activities, learning mechanisms, and the consequent rates of accumulation of firm capabilities. While the case studies show the marked differences between firms (at the level of strategy, structure, and capability – i.e. "paths", "positions", and "processes"[476]), they also show that firms are not isolated islands, rather they are a group of "connected islands" capable of extensive collaboration with other organization. Collaborative learning was among the business firms themselves and between firms and non-firm organizations.

The issue of how firm competitive strategies influence inter-firm differences in competitive advantage has been addressed in the SRBL (see for example, Nelson (1991), Teece and Pisano (1994), Leonard-Barton (1995), Mumford (2000), and Drejer (2000)). The issue of how learning activities can ensure that latecomer firms will catch-up technologically has been addressed in the LFL (see for example, Bell et al. (1982), Scott-Kemmis and Bell (1988), Dutrenit (2000), and Figueiredo (2001). However, an integrated approach, combining the three key concepts (firm strategies, learning activities (including learning mechanisms), and firm capability accumulation), has not been explicitly explored in either body of literature. Moreover, an approach that combines these concepts while linking them to the role of the dynamic meso-level environment has also been lacking. Hence, this thesis has drawn on the insights provided by the SRBL and LFL, and developed an integrated conceptual framework (see Chapter 3), which is capable of better explaining the learning processes used by the latecomer firms in accumulating the capability.

The motivating objective of this study has been to develop a conceptual framework that provides a foundation for effective managerial decision-making. For this purpose, concepts must not only have explanatory power in an abstract conceptual framework per se, but they must also have a direct link to the managerial practice. Consequently, the research

[476] These three terms were borrowed from the dynamic capabilities framework (Teece and Pisano, 1994; Teece et al., 1997).

strategy has combined multiple sources of evidence (mostly qualitative) and was based on a comparative, multiple-case study approach and detailed and extensive fieldwork.

9.1 Revisiting the Research Questions

The section draws together the findings and analyses of this research in relation to the **three** research questions:

1. What were the competitive and learning strategies of Thai auto-part firms?
    a. How did these firms perceive the opportunities and challenges arising from changes in the macro- and meso-environment?
    b. How did firms respond, in terms of their firms' competitive and learning strategies, to these external changes?
2. To what extent can the differences in firm learning activities and mechanisms be explained by the differences in firm competitive and learning strategies?
3. What are the implications of the firm "learning system" – the dynamic alignment (and re-alignment) between the key characteristics of firm competitive and learning strategies and the learning activities and learning mechanisms – on the rate of firm capability accumulation?

9.1.1 Impact of the Meso-Environment Changes on Firm Strategies

Chapter 5 described the development of the Thai automotive industry over four and half decades. Over this period, there were many important changes. These were described in terms of changes in the **three** main sets of actors: 1) the institutions (inclusive of public policies, regulations and incentives), 2) the private sector firms, and 3) the non-firm organizations. The private auto-part firms have been the central focus for analysis. This industry analysis suggested that throughout its development, the industry had offered the private firms with a sequence of business challenges as well as opportunities. The Thai auto-part firms, who were rated as "strong learners" (see Chapters 6 to 8 on the analysis) were the ones who exhibited high degree of "strategic learning capacity" (Figure 3.2) and "balanced aggressiveness" (Table 6.5). In other words, their competitive and learning strategies responded positively to the changes within the industry, adjusting and/or increasing in their investment in intensive learning effort and conducting a diverse, yet more or less strategic set of learning activities. In addition, the strong learners' strategies were by no means passive. Their strategies actively anticipated the upcoming changes within the global, regional, and the Thai automotive industry, and aggressively responded to create future business opportunities (see Table 9.1 for the description of how "strong learner" firm strategies were unique from the others).

In contrast, as the industrial changes took place, the "weak learners[477]" and "average learner" firms were the ones who were slow to adapt, relying on a conservative view, believing that the conversion of the Thai automotive industry from protection to liberalization offered too much challenges (mainly threats) and few business opportunities. The competitive and learning strategies in such firms were both parochial (i.e. built few links with foreign firms and sought little export opportunities) and conservative (i.e. engaged in few or no attempts to form stretch goals). The "weak learner" firms were reluctant to embrace the opportunities inherent in industrial changes. Compared to the "strong learners", they were slower to commit to search and foreign linkage activities. They moderately invested in learning effort and conducted a narrow range of learning activities with poorly-coordinated learning mechanisms. Thus, these firms had a relatively passive learning stance, lacking aggressiveness, and ambitious goals. Rather than anticipating future business opportunities, these firms reacted to the current changes within the Thai automotive industry.

The industry-level changes impacted the latecomer firm strategies in **two** ways. These changes offered both opportunities and threats, but most importantly, it was the firm-level subjective perception of such opportunities and threats that guided the formulation of firms' competitive and learning strategies. **First**, if firms perceived the changes as business opportunities, they would: 1) positively formulate ambitious competitive as well as learning goals to capture such opportunities and 2) assess the existing capabilities and the feasible means (i.e. the "gap-closing strategy", see Tables 6.2 to 6.4) to realize the goals.

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[477] It is important to note that the difference between "strong learner" and "weak learner" firms is a matter of degree (as Chapter 8 had indicated with the "average learner" category). Here the "weak learner" and "strong learner" are presented here as a dichotomy for the purpose of a simple summary (summarized from Chapters 6 to 8) of the comparative analysis among firms with the different set of strategies and learning activities, and how this difference would contribute to accelerating or slowing down the process of firm capability accumulation.

Table 9.1 Meso-level Changes and the Impact on Firm Strategies

Thai Automotive Industrial Phases	**Differences in Firm Competitive and Learning Strategies**	
	"Weak Learner" and "Average Learner" Firms	**"Strong Learner" Firms**
Industry Inception and Early Protection Phase (1960s and 1970s)[478]	• Conservative (or lack of) competitive and learning goals with (sometimes unclear) learning strategy, focusing on only accumulating basic production capabilities	• Initial conservative goals with *quick* transition to more ambitious competitive and learning strategies, focusing on accumulating higher-level capabilities • Use of local networks and overseas links to develop a well-informed "strategic outlook" (see Figure 9.1)
Industrial Expansion and Early Liberalization Period (1980s to early 1990s)[479]	• Maintain conservative goals with conservative competitive and learning strategies, focused on similar learning activities with little degree of aggressiveness	• Continuously pursue "balanced aggressive" competitive and learning strategies, focusing on accumulating relatively advanced (innovative) capabilities
Full Liberalization Phase (post 1997 crisis)	• Maintain conservative goals with moderate ambitions • Most adopted conservative competitive and learning strategies, focusing on basic production capabilities with few focusing on building strategic capabilities • Exploitation of the existing capabilities, capturing only the current business opportunities	• Maintain ambitious competitive and learning goals • Most adopted "balanced aggressive" competitive and learning strategies, focusing on building higher-level capabilities • Both exploitation of existing capabilities and exploration of new capabilities, trying to achieve synergy and capture the future business opportunities

Source: own elaboration based on the research

[478] Evidence in this period is from all the case study firms, except Firm CSP (established in year 2000), Firm SOM (established in year 1995) and Firm L Group (established in year 1990).
[479] Evidence in this period is from all the case study firms, except Firm CSP, which was established in year 2000.

These "positive thinking" firms were usually large in size and their strategies, once implemented, would normally have an impact on the competitive level within the industry (i.e. these firms raised the "competitive benchmark levels" for the other competitors or smaller firms). In this way, these firms' competitive and learning strategies also shaped the meso environment.

Secondly, in contrast to the "strong learner" firms, weaker firms tended to perceive upcoming challenges more as threats, and hence, they were more likely to plan for defensive (i.e. not ambitious) competitive or learning strategies, whose main purpose was to guard their businesses (i.e. neutralize threats) and not to capture the growing business opportunities. These firms did not wish to set the industry benchmark levels, rather these weaker firms were usually *shaped by* the environment, and had very little influence on the future industry development trajectory.

9.1.2 Firm Strategies and the Impact on Firm Learning Activities and Mechanisms

As described in Chapters 6 to 8, "strong learner" firms set ambitious, yet realizable future learning goals. The implication of setting such goals is the widening gaps between the actual (current) firm capability and the capability required to achieve such goals. Hence, the "strong learner" firms were highly aware of such gaps. They were aware of the search activities required to locate the specific knowledge sources. Often times, these sources were located outside the firm; and the formal agreements such as technical assistance or joint ventures were necessary to access these resources. Positively embracing industrial changes, the strong learners promptly anticipated and formed such agreements in order to close the future (as well as current) capability gaps and achieve their ambitious competitive and learning goals.

It is important to note that forming such agreements per se was insufficient to ensure a fast rate of capability accumulation, the concurrent improvement in the firm learning activities was necessary as well. The strong learners were aware of this fact and re-adjusted the firm learning activities in a timely manner. For instance, Firm AH Group realized that in order to better capture the benefits of foreign assistance and joint venture agreements (and also better serve their foreign customers), the Group needed to re-organize the corporate structure, enabling it to actively engage in more engineering design activities.

Therefore, it invested in an Engineering Unit to oversee the advanced engineering design tasks[480]. Similarly, both Firm D Group and Firm TS Group also re-organized its corporate structure, by investing an R&D Unit, to focus more on engineering design activities. In sum, the "strong learner" firms had ambitious, future-oriented goals, and sufficient supporting learning activities, and they made the firm's overall strategic direction clear to the employees and in turn making the ambitious goal more realizable.

In contrast, the analysis in Chapters 6 to 8 suggested that the "weak learner" firms did not set ambitious competitive and learning goals. They were quite content with the conservative competitive goal and exploitation of their current business operations, with little desire to either expand the future business opportunities. As a result, the managers (or owners) of such firms paid less attention to firm capability development and were only partially aware (or unaware) of the firm's existing capability gaps. The managers of "weak learner" firms were only partially aware that in a liberalized automotive environment, firms must adjust (and continually re-adjust) their learning activities in a timely manner. Additionally, they were even less aware of the future capability gaps, and learning activities and mechanisms needed to fill such gaps. With such limited awareness, the search space for new knowledge in these firms was limited mostly to only internal search activities, with less learning effort expended on external searches for foreign technical assistance as well as joint venture agreements. Consequently, the improvement to firm capability mostly focused on internal learning activities and more passive learning-by-doing mechanism, with very little external knowledge input and other more active learning mechanisms.

In sum, the "weak learner" firms had unambitious competitive and learning goals, with limited awareness of future capability needs and persistent knowledge gaps. This led to a low level of learning effort to search for new knowledge to improve the firms' capabilities. The poor learning activities, in turn, led to unclear firm strategic direction (poorly formulated learning strategy), with poor goal-setting that self-reinforced the limited awareness on firms' capability gap leading to (again) limited improvement in the firms'

[480] These tasks included computer-aided design and manufacturing (CAD/CAM), moreover it also included computer-aided engineering (CAE) capable of simulating the product design and trial production run prior to actual production (i.e. "learning before doing" (Pisano, 1996b)). Moreover, the Unit has the responsibility of sending engineers overseas (i.e. guest engineers) to collaborate with the carmakers and learn about new product design.

learning activities. As long as the firm strategies remained inward-focus and conservative, this "vicious cycle" continued.

9.1.3 Alignment between Firm Strategies, Learning Activities, and Learning Mechanisms: Implications on the Rate of Capability Accumulation

The thesis has explicitly explored the influence of key characteristics of firm strategies on its learning activities and mechanisms. In particular, the analysis in Chapter 8 suggested that the dynamic multiple alignment (firm strategies, learning activities, and learning mechanisms) had a significant influence on firms' differing rates of capability accumulation. In particular, the analysis suggested that within a dynamic industrial environment, firms must continuously align (and re-align) their competitive and learning strategies with the learning activities and mechanisms in accordance to the targeted rate of capability they wish to achieve (see Figure 8.6). In this regard, there are **four** conclusions from this analysis:

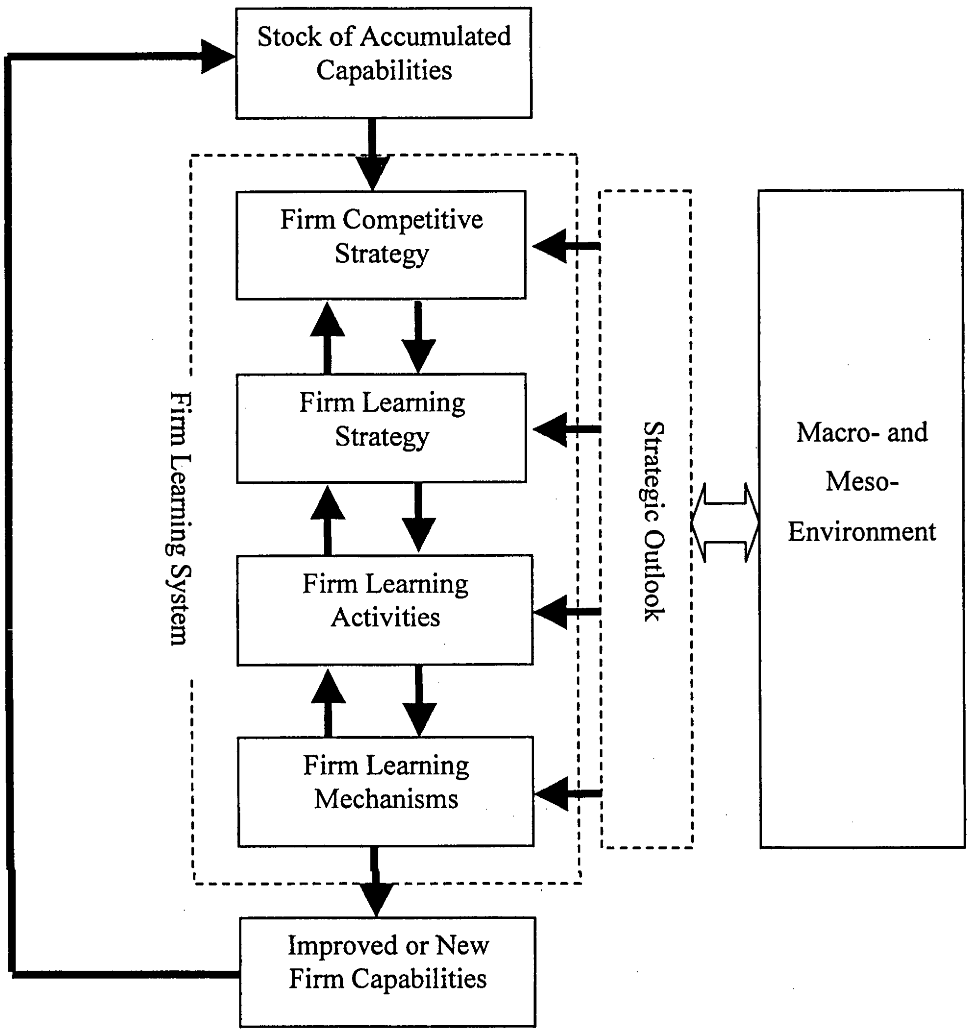
- Firm competitive and learning strategies played a key role in steering, shaping, and focusing both firms' learning activities and the learning mechanisms, and the combination of these factors had a significant impact on the rate of firm capability accumulation. These four elements (competitive strategy, learning strategy, learning activity, and learning mechanism) interacted with each other in an interdependent, systemic way, such that they form a firm's "learning system" (see Figure 9.1). The firm learning system could either perform poorly or adequately or somewhere in between. The implication derived from the quality of a firm's "learning system" is that each firm will have a differing systemic learning ability to steer the direction and accelerate the rate of capability development.
- Also important to note is that the analysis suggests *all* "strong learner" firms have a similar fundamental element which is the source of their ambitious strategies. This is their unique ability to nurture the long-term relationships with domestic and foreign partners (sometimes at a personal level) to enable them to "keep the network alive". Then they are able to leverage on such relationship to quickly sense the upcoming business opportunities, and in turn, learn to formulate ambitious strategies based on such process. It is argued here that this strategic

relationship formed by the firms enables them to gauge their own existing capabilities and learning needs and to effectively assess "what should I learn next" issue. All this could be described as the firm's "strategic outlook" (see Figure 9.1 and Table 9.1). It is a systemic characteristic that assists these firms to learn at a higher level, i.e. learning about how to formulate the ambitious competitive and learning strategies.

- Though initially *all* the sampled firms engaged in conservative competitive and learning strategy formulation and conducted simple learning activities, the alignment pattern was very different between the "strong learner" and the "weak learner" firms. In particular, the "strong learners" quickly transitioned into more ambitious strategies, followed by complex learning activities, and thus operated at an upper-level alignment, whereas the "weak learners" remained at either a lower-level alignment or mis-alignment (see Figure 8.6).
- As the business opportunities (and challenges) opened up within the industrial context, the "strong learner" firms were the ones who were able to quickly shift themselves into an upper level ("balanced aggressive" firm strategies and complex combination of learning activities), see Figure 9.2 (outermost loop).
  On the other hand, the "weak learner" firms tended, in the long-run, to remain at a lower alignment level and at best temporarily transitioned into stages of either aggressive learning strategy or complex learning activities, but these firms were highly unlikely to transition to the upper-level alignment, and were thus not being able to achieve a fast rate of capability accumulation, see Figure 9.2 (innermost loop).

During their start-up phase, the "strong learner" firms implemented what were essentially conservative learning strategies with simple learning activities. This led to the ability to quickly develop basic production capabilities, required to run efficient plant operations, and capabilities to ensure effective coordination among the firm diverse learning activities. Later, during the early production expansion and adaptation phases, the "strong learner" firms promptly shifted to a more "balanced aggressive" strategies. In this mode, the firms were able to effectively complement their internal learning effort with outside sources of technical knowledge, combining an often diverse range of learning activities.

Figure 9.1 Firm Learning System

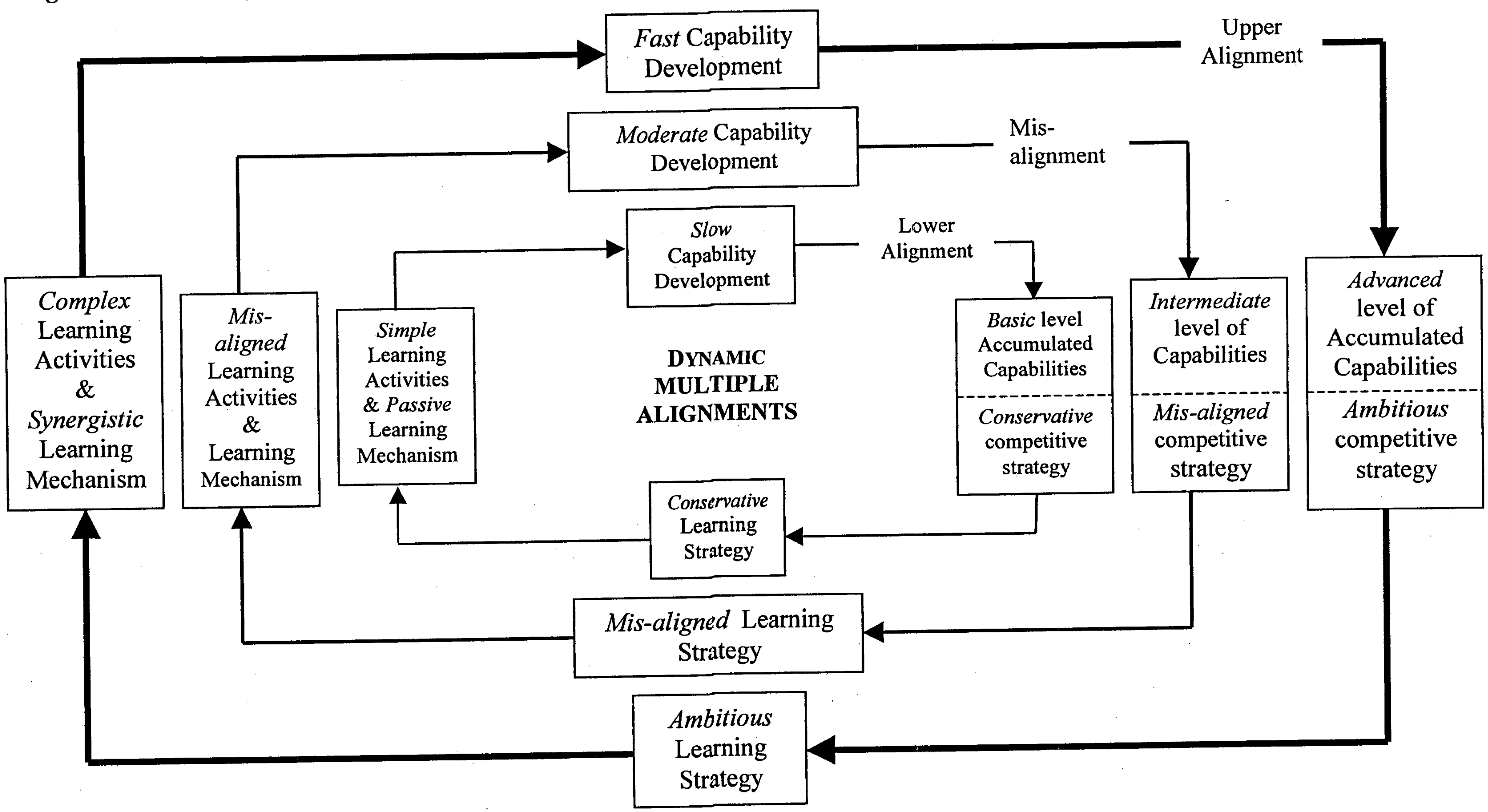


Source: own elaboration based on the research

This led both to a faster rate of accumulation of advanced capabilities, and to both the successful capture of existing business opportunities and the preparation for upcoming business opportunities and future expansion.

The "weak learner" firms' alignment pattern between strategies and learning activities was different from that in "strong learners", especially in the later phases of expansion and adaptation. Similar to the strong learners, during its start-up phase, the "weak learner" firms were able to implement conservative strategies in order to develop basic production capabilities. But in the expansion phase, these weak learners either had insufficient strategic direction to guide the complex set of learning activities, or where they had aggressive strategies they lacked the sufficient capability to carry out such strategies.

Figure 9.2 Summary of the Key Concepts Investigated



Sources: own elaboration based on the research findings, analysis, and Figure 3.3

As a result, these firms were basically stuck with the simple learning activities and the weak learners' capability level tended to remain at the basic routine production capability.

Weak (and average) learner firms may from time to time embark on more aggressive strategies or more complex learning activities. But with a lack of *both* continuity and alignment, it is *highly unlikely* that these firms will achieve a long-term, sustainable level of advanced innovative capability. The innovative capability sporadically acquired by these learning firms was only at best temporary. Lacking a sustained intensity of learning effort, and locked into conducting largely simple learning activities, any new high-level capability acquired by these weak learners will deteriorate as the industrial technology quickly changes. Relative to these changes, the level of acquired innovative capability will most likely revert back to just the basic production capability. For instance, the case study of Firm CPC, Firm TKT, and Firm SOM clearly illustrated this point (see Chapters 6 to 8 for details).

9.2 Implications for Corporate Management and Policy

The findings and analysis of this research can inform managerial decisions in a developing country context regarding **three** issues: 1) firm-level learning strategies, 2) learning activities and choice of learning mechanisms, and 3) the dynamic alignment within firm "learning systems". The implications toward the policy issue are also discussed.

9.2.1 Firm Competitive and Learning Strategies

The key characteristics of a firm's competitive and learning strategies were critical in controlling the composition of the implemented learning activities, and in turn accelerating or slowing down the rate of firm capability accumulation. The research finding suggests that even though the "ambitious goals" characteristic was a crucial strategic component for firm capability building, ambitious goals per se were insufficient for effective firm learning strategy. Firms must also engage in balancing the other characteristics of the learning strategy by realizing the existence of capability gaps and planning the purposive search activities, with the objective of finding appropriate knowledge sources. In addition, the search space needed *not* be limited to within the firm (as was the case of "weak learner" who overly emphasized internal firm learning); it could be a search for an external expert (or long-term joint venture partner(s), as was the case of "strong learner" firms) who could supply the firm with the necessary knowledge. Here, the managers must not limit the firm to purely internal search, since they may not find the required knowledge needed by the firm.

Nevertheless, the "strong learner" firm's external search for knowledge was not an unbounded one; it had to be built on the basis of the existing capabilities and firm's current learning activities. The "strong learners" recognized that managers must realize that the business opportunities and challenges and firm internal learning activities and mechanisms are always changing. To formulate such dynamic strategies, managers must always take into account the current firm level of capability as well as the current external business opportunities. As in the "strong learner" firms, managers must anticipate future business opportunities and formulate their competitive and learning strategies accordingly.

This conclusion is consistent with the (varying) emphasis on latecomer firm's "dynamic capabilities" in the relevant literature from the LFL (for example, Abdulsomad (2003), Mukdapitak (1994), Bell and Pavitt (1995), Intarakumnerd and Virasa (2004), Kim (1998; 1997b), Amsden (2001), and (Rush et al., 2004)) and the SRBL (for example, Teece and Pisano (1994) and Teece et al. (1997) on dynamic capabilities, Arnold and Thuriaux (1997), Drejer and Riis (1999), Prahalad and Hamel (1990), Drejer (2002), Heene and Sanchez (1996), Sanchez and Heene (2004), and Augier and Teece (2006)). Although different in their focus (i.e. the LFL emphasizes learning process within a latecomer firm context and the SRBL emphasizes sustainability of competitive advantage and organizational/strategic learning within the industrialized firms), both literatures emphasize the ability to continuously integrate external and internal sources of knowledge (i.e. learning) effectively in order to enhance firm competitiveness. Both literatures (again to varying degrees) also emphasize how firms should prepare capabilities for future competition.

The interest here is in drawing on both of these sets of literature (i.e. LFL and SRBL), integrating them if that is possible, in order to develop a conceptual framework that can guide managerial decision-making. A "well-functioning competitive strategy" will allow firms to *sense* the upcoming business opportunity, while a "well-functioning learning strategy" will allow firms to *seize* such opportunity, through directing a focused set of strategic learning activities and mechanisms (recall Figure 3.2). Firms who were able to simultaneously exercise the "sensing" and "seizing" of upcoming opportunities are said to have "strategic learning capacity". Firm managers should attempt to do what they can to accumulate (and learn) such "learning about how to learn" capacity.

9.2.2 Firm Learning Activities and Mechanisms

If the learning strategy is a firm's learning plan, then the learning activities are the implementation of such a plan. To be successful in accelerating the capability accumulation process, firms must be able to conduct learning activities that are guided by the key characteristics of strong learners' strategies (ambitious goals, cognizant of capability gaps, balanced external knowledge sources with internal ones, and balanced focus on current and future business opportunities). In aiming at these strategy characteristics, the analysis suggested that firm learning activities must possess at least two important features: sustained high level of learning effort (supporting Kim's (1997a; 1998; 1997b) argument) and synergistically coordinated mechanisms to engage in the wide range of simple as well as complex learning activities. This coordination must ensure that the overall outcome of various learning activities will be synergistically combined to achieve the desired characteristics of firm capability development (supporting earlier findings by Bell (1984), Tran (1999), Techakanont (2002; 2004), and Abdulsomad (2003)).

The learning activities must be shaped by a firm's existing stock of capabilities (i.e. absorptive capacity (Cohen and Levinthal, 1990)) as well as the direction provided by the firm's learning strategy. At any given time, certain learning activities are feasible, although some may be quite challenging and required the firm to exert an extra amount of learning effort (and more extensive search activities). However, some learning activities may simply be infeasible due to insufficient absorptive capacity. Consequently, managers must assess firm learning goal(s), along with existing/future capability gaps, and determine the feasible learning activities.

A manager's task is to focus on managing the firm's "learning system" (Bontis et al., 2002; Garvin, 1994; Senge, 1990) (see Figure 9.1), ensuring that the implementation of firm strategies leads to sufficient learning effort and that resources are expended in relation to the aligned components for upgrading. In addition, managers must ensure that each learning activity (within the diverse set of learning activities) serves its purpose of closing a particular capability gap, fulfilling the desired learning strategy, and moving the firm closer to achieving its ambitious goals. Managers should be wary of prematurely limiting themselves to only a single learning activity (Figueiredo, 2001; Tran, 1999). Often times, they must keep an open mind and implement a sufficient diversity of learning activities, since relying on only one learning activity, no matter how effective it is, is unlikely to yield any effective learning outcome.

While the LFL literature recognizes the important role played by the latecomer firm's "extended learning processes" (Bell and Pavitt, 1993; 1995; Cohen and Levinthal, 1990; Kim, 1997a; 1998; Lall, 1987; 1992; Rush et al., 2004). This analysis stresses the key role of a firm's competitive and learning strategies in guiding the firm's learning activities and coordinating firm learning mechanisms (i.e. the strategies steer the firm's "extended learning processes").

9.2.3 The Dynamic Multiple Alignment and the Rate of Capability Accumulation

This study concludes that a firm must achieve multiple alignments between its strategies, learning activities, and learning mechanisms in order to accelerate the rate of firm capability building. The alignment issue was a complex one, and managers must deliberately manipulate the key characteristics of competitive and learning strategies as well as the composition of firm learning activities. The combination of firm learning activities must be properly aligned (and continually re-aligned) to the learning strategy characteristics, and this alignment has to be dynamic. That is, this alignment must also change with the firm competitive strategy and the industrial evolution, which offers the opening-up or closing-down of future business opportunities and challenges. When such delicate and dynamic alignment between competitive strategy, learning strategy and learning activities is achieved, firms have a higher chance of speeding up the process of capability accumulation (see Figure 9.2). This study also stresses the extent to which the effective alignment of the components of a firm's "learning system" at a high level of focus and intensity can lead to a "virtuous cycle", which incrementally upgrades both capability and firm's "capacity to learn".

Consequently, the role of managers must start with **two** things: 1) sensing the external business opportunities and threats and 2) properly managing firm competitive and learning strategies to seize such opportunities (and/or neutralize threats). Managers (or firm owners) must ensure that the organizational goals are realistically ambitious; that is, future learning goals must be ambitious and at the same time realizable. Managers must also recognize that ambitious goals often come with challenging capability (and knowledge) gaps, which the firms must attempt to fill. Facing widening gaps, the managers must effectively direct the strategic search procedures to find (as well as select) the appropriate knowledge sources (both internal and external) to support the firm's existing and future learning activities. Managers must have the confidence and ability to manage the higher level of short-term risk that will be involved in ambitious goals and investment of resources in learning and change.

Next, the managers must oversee the direction of the complex combination of learning activities, ensuring that they effectively tap into the appropriate knowledge sources and are properly integrated into the firm existing knowledge base, which in turn further shapes the firm future learning strategy characteristics. All these require the managers to carefully monitor the dynamism that occurs, in particular, the dynamic alignments between firm competitive and learning strategies and the associated learning activities. Managers must realize that this alignment is dynamic and the evolution in the industrial environment requires further changes in the firm learning strategy, and thus a re-alignment is likely to be inevitable. Consequently, in a highly turbulent business environment, the dynamic alignment task facing the managers is a continuous and highly challenging one.

This study develops the "learning system" concept for the LFL, focusing on the issue of dynamic multiple alignments (Beer et al., 2005; Bontis et al., 2002; Hung and Lien, 2005; Lin et al., 2001; Ward et al., 1996). It also extends the SRBL firm's dynamic capability framework (Teece, 2000; Teece and Pisano, 1994; Teece et al., 1997) to the context of latecomer firm capability development (see Section 8.4). It argues that the "capacity to learn" in latecomer firms is related to the alignment of the components of the "learning system" in the context of ambitious goals, level of learning focus and intensity, and degree of synergy in implementing the learning mechanisms.

9.2.4 Policy Implications

The thesis was not designed to address issues of public policy related to capability development. Automotive industry policies were considered, but not examined in details, as they were relevant to firm strategies (see Chapter 5). The presented evidence in Chapter 5 does highlight the importance of policy (both national-level and meso-level) in shaping the firm-level strategies and learning activities.

Based on the evidence of the "strong learner", "average learner", and "weak learner" firms, the findings and analysis suggest that government should design industrial policy based upon the level of capability achieved by the firms. Certain incentives, such as research and development (R&D) promotions and tax privileges, should be granted based upon the rates and levels of capability achieved by the firms. Firms that were "strong learner" are highly likely to be interested in further developing their higher-value product design engineering and development activities and to further secure their domestic first-tier supplier status, or even move up to become regional or even international auto-part suppliers.

In contrast, firms who are still struggling to accumulate the basic production capabilities (the "weak learner" or the "average learner" firms) are highly unlikely to respond to such incentives. The firms with the basic level of capabilities would require an industrial policy that would encourage further upgrading as well as provide sufficient linkages to the multinational carmakers, in order to expose these firms to the international competitive pressures. A useful exercise for the government would be to conduct a large-scale, industry specific survey, in collaboration with the public research institutes as well as the non-firm organizations (for example, Thailand Automotive Institute, National Science and Technology Development Agency), to determine the appropriate incentives as well as the upgrading programs suitable for the different groups of firms with differing levels of capability. The result of such study could be used for the industrial policy design purposes.

9.3 Suggestions for Future Research

This thesis has argued that issues of firm competitive and learning strategies, the interaction with firm learning activities (and mechanisms), and the rate of firm capability development is complex. The analysis comprised the detailed evolution of the Thai automotive industry as well as the evolution of the firms' competitive and learning strategies, the learning activities, and the rates as well as types of capability accumulation. Other factors that could affect firm learning strategy and rate of capability accumulation were the policy at the national and at the global levels. While acknowledging the existence of such influence, this study did not systematically analyze the role of these factors.

This study has shown that the studies in the LFL did not explicitly link the issues of firm competitive and learning strategies with the differing rates of firm capability accumulation. In particular, the literature has not explored the details of how learning strategy, acting as mediating variable, can assist the latecomer firms in controlling the effectiveness as well as coordination of the diverse learning activities. While this study has explored the relationships among firm strategies, learning activities, and rates of capability accumulation, it could not address all the relevant factors that lead to faster rates of capability accumulation, and some interesting, unanswered questions remain.

For example, while the thesis established an important linkage between firm competitive and learning strategies and the rate of capability accumulation, it did not analyze how this relationship could link into the policy issue, particularly in terms of industrial policies at the national level. Similarly, even though the study recognized the existence of policy changes within the wider automotive industry context, the impact of these policy changes on the rate of capability accumulation of the automotive firms was not systematically analyzed. Consequently, future research could incorporate an analysis of the interaction among the impact of changes in the global automotive industry, the national policy, and the Thai automotive industry policy on the firms' rate of capability accumulation. It would also be useful for future research to explore the relationship between overall national-level industry policy and the sectoral-level automotive industry policy. The outcome of such research would permit a greater understanding on how global automotive changes and the choice of national-level policy influence firm learning strategies, firm learning activities, and finally, the rates and types of capability accumulation.

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Appendix

Contents

A: Ethics Committee – Written Consent Form

Name of Researcher: Mr. Chaiwat Chitravas (PhD Student)
Researcher Address: The Australian National University
The Sir Roland Wilson Building (120)
Acton, ACT 0200
AUSTRALIA

E-mail: chaiwat.chitravas@anu.edu.au
Telephone: +61 2 6125 9837
Facsimile: +61 2 6125 4895

Thank you for your participation in this research.

Brief Project Description:

The research would focus on technological capability building in Thai firms with an emphasis on two industries, automotive parts and food. The purpose is to examine the strategies used by Thai firms in undertaking activities leading to the accumulation in technological capabilities. One of the important activities is the technological learning processes and associated learning mechanisms; thus research would analyze the interactions between technological capabilities and learning processes.

Detailed Statement Regarding Consent and Confidentiality:

I (the participant) understand that I am being briefed on the research purpose and methods. The researcher had informed me that his doctoral thesis will include the information provided by me with the possibility of quotations of this information. I (the participant) understand that participation in this research is voluntary. I (the participant) am aware that I have the rights to choose not to participate and that by choosing to participate (i.e. to answer the questions put forth by the researcher in an interview) I do so willfully and that no coercion, inducement or influence is involved. In addition, there is nothing that impairs my decision to participate in this interview. I (the participant) also understood that I could withdraw from this at any time.

The researcher had briefed to me that the confidential information provided by me shall be treated to the best of researcher's ability as confidential and that no one will have access to this information (both in raw data and published formats). Moreover, the raw confidential data will be stored in a locked file cabinet and if they are stored in a computer, they will be password protected. If it is necessary, all names and other confidential information are mentioned using a generic symbol that is totally unrelated and untraceable to the readers. As the researcher has assured me of these measures; I have willingly provided him with the confidential information and allowed the researcher to tape-record the interview sessions. The researcher guarantees that the following conditions will be met:

1. My real name or the name of the firm will not be used in the written report, unless written permission is given.
2. If granted permission to audiotape the interview, the tapes will be used for purpose of this research only. The tape record of the interview will be kept secure and only the researcher will have access.
3. I (the participant) will receive access to a copy of the final report of the interview prior to thesis submission, so there is the opportunity to offer any changes to the report, if necessary.
4. Regarding the intellectual property issue, no portion of the research shall be directed towards the purposes of commercial exploitation.

(Participant) Sign .... Date ....
(Researcher: Chaiwat Chitravas) Sign .... Date.........

B: Letter of Request for an Interview

Subject: Request for interview
To: Executive Director

Mr. Chaiwat Chitravas is currently a Ph.D. Candidate at The Australian National University. He is conducting research on Thai automotive industry. His particular focus is on capability development and learning activities; different categories of firm capability are production processes, products, organization management, linkages (cooperation between firms and other institutions), and marketing activities.

This research will most certainly benefit the development of public policy planning process, ensuring that the policies and incentives are meeting the private firms' needs. In addition, the research result will benefit learning at educational institutes and the national economic development. Due to these benefits, the Board of Investment (BOI) endorses this research and requests your company to please kindly provide Mr. Chaiwat the opportunity to interview you and your relevant staff.

On behalf of the BOI and Mr. Chaiwat, I sincerely appreciate your kind assistance.

Sincerely Yours,

Senior Executive Advisor
Office of the Board of Investment (Thailand)

C: Fieldwork Interview Questions

C1. For Business Firms

General Information: (for both C1.1 and C1.2 below)
Name, contact, education background, job responsibilities, job position
Please briefly describe the history of the firm
Please describe the initial ownership structure and subsequent changes
Operational characteristics – what are the annual production capacity, annual turnover, export sales/volume)? Who were/are the main customers?
What were significant achievements and challenges in the past?
What were achieved in terms of the quality system standards, automotive industry standards (QS 9000/ TS16949)?

C1.1 Top Management Personnel: CEOs, firm owners, and General Managers

1) Environmental/External Factors:
How do you perceive the impacts of: oil crisis during 1970s? increased local content requirement? 1997 Asian financial crisis? free trade agreements? economies/diseconomies of scale? fragmented markets? local content abandonment (2000) ? How do these changes affect your firm's goals and objectives? and your competitive positions?
Which of the above factors lead you to upgrade your: production process? products? linkages? human resources? marketing activities (export)? Why?
How do you perceive the changes in government policies? For e.g. BOI tax incentives? Or other government industrial promotion scheme? How do these changes affect your firm's goals and objectives? and your competitive positions?
What are other factors that influence your decision to learn/upgrade? Why?

2) Firm Strategies and Learning:
What are your firm's: market goals? product development goals? production process improvement goals (e.g. percentage reduction in defect rates)?
How important are the following to your company's future?: becoming the first to market, meeting customers needs, having products exported overseas, achieving world-class quality, training the local engineers and technicians, collaborating with public organizations, collaborating with customers on design activities, improving products, and improving production processes. Why?
What are your firm's learning goals? Which of the following did you engage during the learning/improvement activities?: organizational restructuring, on-the-job training, off-the-job training, in-house research, expert consultancy and collaboration with universities. How important is each of the above? Did each of these activities contribute to: improvement in competitive positions? and/or closing the capability gaps? If so, how? If not, why?
What are your future learning plans? Any other factors related to firm learning strategy/upgrading?

C1.2 Operational-level Personnel: middle managers, engineers and technicians

What are your job position and primary responsibilities? How long have you been working for the firm?

1) Investment Activities:

Feasibility study, plant expansion, site selection, search for sources of technology and equipment, detailed plant layout, basic engineering design, recruitment and training of new personnel, project outline and management, plant start-up and debugging, and overseas investment.
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before)?

2) Routine Production Activities:

What have been the past and current production process technology improvements? Procurement of raw materials, quality management (ISO 9000, QS 9000, and TS 16949), production problem-solving (debugging plant), routine equipment maintenance, capacity stretching, production organization and supply chain management (JIT, etc.), applied research and improved process design methods (for e.g. automation, robots, etc.), and continuous improvement programs.
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before?)

3) Product-related Activities:
What have been the past and current product improvements?
Basic product design, product quality management, minor/major product adaptation, product testing, product design improvements, reverse engineering, advanced product design (CAD/CAM), new product development (i.e. own design manufacture, ODM), and strategic alliance for product technologies.
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before)?

4) Linkage-related Activities:
What have been the past and current linkages with other firms and/or organizations? Procurement of knowledge from local/foreign experts and external organizations (for e.g. Thailand Automotive Institute, Productivity Institute, Thai-German Institutes, public universities), technology transfer from OEMs or firms in the OEM group, coordination

within the supply chain, ability to link internally among the business groups (for firms that are corporations), and networking in public seminars, conferences and business associations.
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before)?

5) Marketing Activities:
What have been the past and current marketing activities?
Market research, management of logistics and distribution systems, systematic monitoring of market trends, brand creation and management (i.e. own brand manufacture, OBM), product differentiation, coordination with retailers and customers, export market, links with domestic/overseas buyers and strategic alliance/networks.
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before)?

6) Outcome of Learning:
Over time, is your firm able to: design better products? operate advanced production processes? form stronger linkages with foreign firms? expand operation overseas? directly export products? engage in more complex technological activity?
If so, how? If not, why?
Improvements in quality performance (e.g. reduction in parts per million, ppm), cost performance (e.g. percentage year-to-year), on-time delivery (e.g. percentage delayed), engineering and management capability (i.e. does it support the production of better products in lesser time and lower costs).
For each of the item listed above, the following questions were asked:

- What were done?
- How was it done? (for e.g. doing on-the-job training, doing in-house R&D/experimentation, hiring foreign expert assistance, searching for collaboration with others, hiring/training new personnel, visiting overseas plant, etc.)
- Any obstacles? What are they?
- What can your firm do now (that cannot be done before)?

C2. For Non-firm Organizations

1) General Information:
Name, contact, education background, job responsibilities, job position
Please briefly describe the history of your organization and the main responsibilities
Who are the main clients?
What were significant achievements and challenges in the past?

2) Impact of External Factors on Firms:
How does your organization perceive the impact of the following factors on Thai auto-part firms? Positive/Negative? Why?
Investment promotion policy, import substitution policy, export-oriented policy, free trade agreements, Automotive Master Plans, "Detroit of Asia" plan, BOI policies, MOI policies, the 1997 financial crisis, local content abandonment, and OEM sourcing strategies/decisions
Does your organization think any of the above factors lead firms to upgrade their production process, product engineering, technology linkage, and marketing activities? Why?
What do you think are the other factors affecting Thai suppliers? Why?

3) Strategies for Assistance to Thai firms:
Does your organization have conscious plans to assist Thai firms with development of capabilities? If so, what are the assistance programs? If not, why?
How did your organization implement such assistance programs? When was it started? Why do think such programs were appropriated?
Which activities do you think Thai firms rely on most from foreigners? Investment, production, product, linkage, and/or marketing activities? Why?
What are the main obstacles facing firm learning/upgrading? Why?