CHAPTER 6

SUMMARY

6.1 Summary of Main Findings

The aim of this study is to provide understanding about inter-firm technology transfers in the Thai automotive industry. Its importance lies in the fact that Japanese automakers rely on local parts procurement in assembling automobiles, which creates backward linkages with local parts suppliers. As a result, Japanese automakers have transferred technology to them to improve their production processes. Consequently, this study adds to the literature on inter-firm technology transfers by yielding significant findings, which can be summarized as follows:

1. Inter-firm technology transfers between Japanese automakers and first-tier suppliers place emphasis on product development, process engineering, and production stages. According to previous literature (Techakanont and Terdudomtham; 2004), technology transfer in these three production stages occur in the form of a bilateral relationship under close supervision and with technical guidance from the Japanese experts. However, this study finds that one Japanese automaker, Toyota, has improved the efficiency of inter-firm technology transfer involved in the production stage. More precisely, technology transfer in the Toyota network has been introduced to members under a voluntary program, the Toyota Co-operation Club (TCC) (see chapter 4). This study finds that the leader of the network, Toyota Motor Asia Pacific Engineering and Manufacturing (TMAP-EM) has not only transferred technology to its first-tier suppliers through training visits to their plants (bilateral relationship), but it has also encouraged its first-tier suppliers to play a more active role in the learning process by sharing knowledge among members as a network in TCC meetings (multilateral relationship).

In addition, this study also considers the unexplored area of inter-firm technology transfer between first-tier and lower tier suppliers. Technology transfer at this level emphasizes only on the production stage, including in-house production and

plant management. In addition, the pattern of technology transfer in this level occurs in the form of a bilateral relationship, wherein technology is only transferred by first-tier suppliers. The study reveals that first-tier suppliers deal with a limited amount of suppliers and lower tier suppliers produce simple components, which are mainly concerned with simple techniques in stamping and casting processes. As a result, the necessity of having a network facilitating technological transfer to lower tier suppliers is slight.

2. The study finds that a competitive environment is the key factor influencing inter-firm technology transfers, specifically tacit knowledge to lower tier suppliers. According to previous literature (Dyer and Nobeoka; 2000), "explicit knowledge" is commonly shared with local suppliers in a bilateral relationship (see figure 2.5). However, this study shows that it also includes "tacit knowledge" because automakers need to gain a competitive advantage in assembling automobiles and their stringent requirements, such as high quality, cost effectiveness, and on-time delivery, are passed on to lower tier suppliers. Consequently, it automatically encourages first-tier suppliers to build long-term relationships with lower tier suppliers. Thus, technology transfers, specifically tacit knowledge, are essentially provided to improve the performance of lower tier suppliers (see the milk run case in section 5.1).

In addition, the type of products manufactured by lower tier suppliers is another factor influencing inter-firm technology transfers to lower tier suppliers. Even though lower tier suppliers are employed by first-tier suppliers to co-operate in simple part production, it does not mean every lower tier supplier involved will be transferred technology. As can be seen from this study, it is only the group of lower tier suppliers producing and transforming raw materials into simple finished parts, used specifically for the automotive industry that will receive technology from first-tier suppliers (see discussions in section 5.1).

3. Inter-firm technology transfers between first-tier and lower tier suppliers are based on three channels, which are sending technicians on training visits to lower tier supplier's plants, organizing seminars at first-tier supplier's plants, and sending manuals. However, in transferring tacit knowledge (difficult to be codified) to lower

tier suppliers, first-tier suppliers have to put more effort in employing a channel wherein technicians are sent on training visits to enable them to provide lower tier suppliers with close supervision and technical advice (socialization). In addition, each lower tier supplier has a different technological capability, which is considered as a barrier to technology transfers[1]. Therefore, relying on this channel allows first-tier suppliers to solve the problems of lower tier suppliers on a case-by-case basis (see discussion in section 5.4).

4. The study shows that there are three main barriers to technology transfer to lower tier suppliers. These are a lack of motivation in joining supplier development programs with lower tier suppliers, the difference in technological capabilities of lower tier suppliers, and the absorptive capacity of the workforce of lower tier suppliers.

In order to eliminate the lack of motivation in joining supplier development programs with lower tier suppliers, the study finds that first-tier suppliers eliminate this barrier by having supplier evaluations benchmarks which lower tier suppliers have to achieve. Supplier evaluation is mostly in the form of giving scores. If any lower tier supplier fails to achieve a minimum score, they have to improve their performance; otherwise they will not be given new orders. This is the way that first-tier suppliers motivate lower tier suppliers to eagerly join the development program and emphasize the learning processes.

In addition, in order to eliminate differences in the technological capability of lower tier suppliers and the absorptive capacity of the workforce in lower tier suppliers, relying on sending technicians on training visits to lower tier plants is the preferred solution because it allows first-tier supplier's technicians to provide lower tier suppliers close supervision and technical guidance on a case-by-case basis.

In conclusion, Japanese automakers relying on local parts procurement creates backward linkages with first-tier suppliers and inter-firm technology transfer from the

[1]According to Reddy (1996), difference in technological capability is considered as a barrier to technology transfer. Therefore, technological modification fitting into a transferee is needed.

automakers is very important because it improves the production processes of first-tier suppliers. In addition, first-tier suppliers are not the only parties who enjoy the benefits of technology transfer. A competitive environment and stringent requirements from the Japanese automakers encourage them to provide technology, e.g. close supervision and guidance, to lower tier suppliers. Consequently, being a lower tier supplier does not mean receiving no technological benefits whenever they produce parts used specifically in the automotive industry.

6.2 Suggestion for Further Study

Even though this study aims to contribute to the literature of inter-firm technology transfers with significant findings in section 6.1, there are some unexplored areas, which could be considered for further study as follows:

1. Due to limitations in accessing information about the inter-firm technology transfers of other automakers, this study could only encompass the technology transfers of the Toyota network. However, valuable new additions to the literature of inter-firm technology transfer could be made by the investigating knowledge-sharing networks of other automakers. The benefit accrued would be to allow people involved in the automotive industry to derive more effective patterns of technology transfer as a result of being able to assess the strengths, weaknesses, and problems of other enterprises.

2. In order to investigate inter-firm technology transfers between first-tier and lower tier suppliers, this study was only able to access 22 first-tier respondents. As a result, there might be some other aspects that could be added to the literature of inter-firm technology transfers e.g. factors, channels, and problems of technology transfers to lower tier suppliers.