CHAPTER 6

DISCUSSION AND CONCLUSION

This chapter presents the study's discussion of the findings, then followed by the implication of the results. The chapter also points out some limitations, provides a recommendation for future research, and conclusion.

6.1 DISCUSSIONS OF FINDINGS

Clean technology has become the very prominent approach since the late eighties in soliciting firms to behave with a more friendly manner to the environment. The clean technology concept has widely been well established in the more industrialized and developed countries and with various designs through policy instruments and institutional mechanisms. The crucial elements of such mechanisms include public awareness promotion, information exchange systems, technical assistance, clean technology research, and financial incentives in parallel with the strict enforcement of environmental laws and regulations. These more industrialized and developed economies nowadays have institutionalized and sustained the clean technology concept on the well developed foundation of a high environmental awareness level amongst their industries and communities. However, the advancement of clean technology in the developing countries, particularly in Asia Pacific region, is the different story. It was reported that these developing countries, which have been following the same path which relied heavily on the same institutional mechanisms, were disappointed to realized in the later time that this approach did not work so well. Despite the abundant resources and effort invested in these developing economies, the rate of clean technology adoption remains frustratingly slow. This study examined this phenomenon and found that the current approach for clean technology promotion has been based largely on the assumption that if the

environmental laws and regulations were properly enacted and strictly enforced, incentives and technical assistance relating to clean technology were made available, and industry leaders were shown directly how clean technology could help them, many others would soon seek the available resources and emulate the leaders. This study viewed that it was not sufficient enough to focus only on the institutional factors in order to create the legitimacy and isomorphic power, and argued that the organizational factors and the management factors, as well as some frequently overlooked institutional factors such as the awareness of stakeholders to demand firms to adopt clean technology and the awareness of the firms themselves about the widespread of clean technology, should be integrated into the approach for accelerating and broadening the adoption of principles of clean technology. This argument was based on the integration of the resource-based theory, the institutional theory, and the diffusion of innovation theory, which led to the development of a research model for describing the effects of institutional factors, the organizational factors, and the management factors on the adoption of clean technology by manufacturing firms in Thailand. Institutional theory provides the important insights why and how irrationality (e.g., myths, meaning, and values) and coercive process of isomorphism may be the forces behind the diffusion of clean technology. Therefore, certain institutional factors (i.e., regulatory pressures, stakeholder demands, incentives available to adopters of clean technology, and awareness of clean technology widespread) were used as proxies by this study to measure their effects on the adoption of clean technology. However, basing only on the institutional perspective is not enough because this theory tends to overlook the role of agency within organizations. Hence, this study has acquired the additional support from the diffusion of innovation theory for providing the complementary insights relating to the purposive actions and ambitions of individuals as the fundamental elements in the process of clean technology diffusion. As a consequence, some management factors (i.e., management's perception of clean technology advantages in terms of

competitive, economics, and social aspects; and the management's willing ness to adopt and develop clean technology) were used as proxies by this study as well. Despite the strengths of both institutional and diffusion of innovation theories, this study considered the resource-based theory as another crucial foundation because it best describes how firms themselves build their businesses from the resources and capabilities they currently possess or can realistically acquire. Using resources that are rare, valuable, hard to copy, and have no good substitutes in favorable industry conditions provides sustainable competitive advantage. Hence, some firms characteristics relating to resources and capabilities (i.e., firm size in terms of total assets and number of employees; firm capabilities in terms of technology intensive, technology development, and newer machines and equipments; and clean technology input from various outside sources) were chosen as proxies by this study to measure their effects on the adoption of clean technology. Eleven hypotheses grounded on these three theories were generated to reflect one objective of this study that the success of clean technology promotion in Thailand depends on the institutional factors, the organizational factors, and the management factors. Several significant findings from this study confirmed those hypotheses of the study that the adoption of clean technology by manufacturing firms in Thailand positively depends on the degree of the institutional factors, the organizational factors, and the management factors.

The following discussion is organized into two sections: (1) the discussion of results from analysis of variance (ANOVA), and (2) the discussion of results from correlation analysis and stepwise multiple regression analysis.

6.1.1 Discussion of Results from ANOVA

Table 5.20 (page 82) shows that clean technology investment of foreign companies is significantly higher than that of Thai companies. This finding suggests that foreign companies are more advanced in terms of clean technology adoption than Thai companies. In fact, most of foreign companies from developed countries are the pioneers in clean technology adoption. From the literature review, clean technology concept emerged in western countries during 1980s and diffused to Thailand in 1990s. Therefore, this finding conforms with the actual situation in Thailand.

Table 5.21 (page 82) shows that clean technology investment of companies with secondary school employees as the majority is significantly higher than that of companies with primary school employees as the majority. This finding implies that educational level of employees is significantly related to the adoption of clean technology. Hence, any future research relating to clean technology should consider this issue.

Table 5.22 (page 82) shows that clean technology investment of companies with the U.S. or EU as major export markets are significantly higher than that of companies with no export or export to countries in Asia. This finding is in line with the current situation that these two regions are strongly enforcing the concept of clean technology to all stakeholders that have the business with them while countries in Asia are not.

Table 5.23 (page 83) shows that clean technology investment of companies with sales volume greater than 1,200 million baht are significantly higher than that of companies with sale volume equal to or lesser than 1,200 million baht. The implication from this finding is that the more sales volume the company

has, the higher the investment in clean technology. Therefore, any future research relating to clean technology should consider this issue.

Table 5.24 (page 83) shows that the management of companies with investment in clean technology have the perception towards competitive advantage and economic advantage enhanced by clean technology significantly higher than the management of companies with no investment in clean technology. Furthermore, it also shows that the management of companies with investment in clean technology from 1 million bath upward have the perception towards social advantage enhanced by clean technology significantly higher than the management of companies with no investment in clean technology. This finding implies that clean technology pays benefits to the adopters.

6.1.2 Discussion of Results from Bivariate Correlation Analysis

This study categorized the correlation coefficient between 0.300 and 0.400 as the rather weak level of correlation, between 0.200 and 0.300 as the weak level of correlation, and below 0.200 as the very weak level of correlation. Hence, correlation coefficients as shown in Table 5.27 between clean technology investment and the following factors: perceived regulatory pressures (r = 0.372), perceived stakeholder demands (r = 0.391), awareness and need for clean technology incentives (r = 0.362), firm size (r = 0.307), firm capabilities (r = 0.357), management's willingness to adopt and develop clean technology (r = 0.364), and economic advantage of clean technology perceived by the management (r =0.348), are in the category of rather low level of correlation; between clean technology investment and the following factors: competitive advantage of clean technology perceived by the management (r = 0.270), and social advantage of clean technology perceived by the management (r = 0.231), are in the category of low level of correlation; and between clean technology investment and the following factors: awareness of the clean technology widespread (r = 0.146), and clean technology input from organizations that promote the diffusion of clean technology (r = 0.168), are in the category of very low level of correlation

Objective number one of this study is to verify whether the success of clean technology promotion in Thailand depends on the institutional factors, the organizational factors, and the management factors. The results stated above, no matter of their correlation levels, have fulfilled this objective by supporting all of the eleven hypotheses of this study. However, it is worthwhile to discuss the causes of such variation in the level of correlation of each factor as follows:

i) Correlation between clean technology investment and perceived regulatory pressures is rather low (r = 0.372). The explanation for this finding is that governments and regulators are seen as a constraint on the improvement of companies' environmental performance (Sheng et al., 1995), as, in many countries, environmental regulations are too complex, relied on a command and control regulatory approach, and require a firm to commit huge resources to comply and introduce standards that are not always compatible with its operations. Table 5.8 shows that the effect of Thai laws, international laws, Thai government agencies, and foreign government agencies do not create or create little effects on 22%, 37%, 26%, and 48% of the respondents respectively. These ratings comply with what Sheng et al. (1995) remarked.

ii) Correlation between clean technology investment and perceived stakeholder demands is rather low (r = 0.391). The reason for this phenomenon is that the stakeholders themselves show little environmental awareness. For example, most part of employees are not provided with sufficient clean technology knowledge. Table 5.7 reveals that the majority of the respondents' employees (60%) received no CT training. In addition, Table 5.9 shows that employees impose no or little demand for CT adoption on 35% of the respondents. Another good example is customers. While Table 5.9 exhibits that customers are perceived as a variable with high effect by nearly half of the respondents (44%), but they do not widely accept a premium price for environmentally friendly products (Dionisio, 1994). Martinson et al. (1997) reported that price, function, and durability continued to dominate purchasing decisions of Hong Kong people, although they perceived the importance of environmental impact. This paradox discourages firms to adopt clean technology in the long run.

iii) Correlation between clean technology investment and awareness and need for clean technology incentives is rather low (r = 0.362). The cause of this event originates from the fact that nearly half respondents (45% - see Table 5.10) admit that they do not aware of the incentives available for the adopters of clean technology.

iv) Correlation between clean technology investment and awareness and the awareness of the clean technology widespread is very low (r = 0.146). According to the diffusion of innovation theory, the force that drives the late movers to adopt innovation is the isomorphism (DiMaggio, 1988; Meyer & Rowan, 1977; Pfeffer 1982). Therefore, the reason that the widespread of clean technology has the very low effect on the manufacturing firms in Thailand to adopt clean technology is that clean technology has not yet well institutionalized in Thailand. In other words, the isomorphic power for the fashion of clean technology adoption does not progress very much in Thailand.

v) Correlation between clean technology investment and firm size is rather low (r = 0.307). To find out the cause of this event, the assumption of the hypothesis that firm size correlates with clean technology adoption has to be reconsidered. Ullmann (1985) argued that large firms have the greater ability to purchase the equipment. The implication is that larger firms have higher financial strength to support their activities relating to environmental management. However, large firms with poor business performance are the outliers of this assumption. Ma (1997) reports that unprofitable enterprises in China are less likely to be in compliance with environmental regulations than profitable ones. This study found that while 41.6% and 51.6% of the respondents were large companies in terms of total assets and employees number respectively, but the majority of

them (51.6%) had sales volume lesser than 400 million baht. Hence, the poor sales performance of large companies deteriorate the correlation between clean technology investment and firm size. Table 5.18 shows that one third of large firms in terms of total assets (32%) have no clean technology investment.

vi) Correlation between clean technology investment and firm capabilities is rather low (r = 0.357). To investigate the cause of this event, one should observe the CT investment behaviors of various respondents with respect to their capability. Table 5.18 reveals that the majority of respondents, no matter with their capabilities, have CT investment not more than one million baht. Hofman and Koottatep (2001) report that most of CT programs in Thailand during the last decade were heavily subsidized from many donors from developed countries and international organizations. It seems that most factories agree that the programs are useful and could save a lot of money, but they are waiting for the next supporting project so that they can apply for subsidy from the donor agencies.

vii) Correlation between clean technology investment and clean technology input from organizations that promote the diffusion of clean technology is very low (r = 0.168). The reason is that few organizations relating to the promotion of clean technology have the significant effect on clean technology investment. This fact was found in the first round of correlation analysis in this study. Only clean technology input from consultants, suppliers, print media, and Internet that have the significant positive correlation with clean technology investment while clean technology input from government agencies, NGOs, academic institutes, customers, and Federation of Thai industries do not have the significant positive correlation with clean technology investment.

viii) Correlation between clean technology investment and management's willingness to adopt and develop clean technology is rather low (r = 0.364). The result conforms to the study of Hofman and Koottatep (2001) about the bottlenecks in clean technology projects in Thailand. They found that even though the top management is willing to work on the project as he / she realizes the benefit in clean technology, the companies finds it is difficult to invest in something which is neither forced by regulations nor customers' needs. As a consequence, all options relating to clean technology projects will be put as a low priority in the factory.

ix) Correlation between clean technology investment and competitive advantage of clean technology perceived by the management is low (r = 0.270). Again, this finding can be explained by the study of Hoftman and Koottatep (2001). They found that clean technology projects often only lead to a limited kind of foundation for the continuous process, which is the necessary basis for proceeding to the more comprehensive types of clean technology projects. For a lot of companies, according to Hoftman and Koottatep (2001), the pollution prevention project is a one time experience directed to the generation and implementation of options, but only limited learning effects have been created. Consequently, not much has changed or improved in production processes of most companies with regard to environmental management and organization. Companies may stay busy with the development and implementation of new options, but this does not imply changes within the organization. It is a limited process of change and not the start of an on-going learning process. In other words, companies that adopt clean technology still lack of the learning process to extend new technology to create competitive advantage of their own accords.

x) Correlation between clean technology investment and economic advantage of clean technology perceived by the management is rather low (r = 0.348). The plausible reason for explaining this phenomenon is that the low-hanging fruits of CT economic benefit have already been picked (easy options have been implemented). The next CT economic benefit is more difficult to take and required more effort and investment. According to Hoftman and Koottatep (2001), they reported that most of the clean technology programs in Thailand involved rather high consulting fees as the program itself involves many experts and time for implementation. With limited amount of financial support, and human resources, the multiplying of CT programs is quite low.

xi) Correlation between clean technology investment and social advantage of clean technology perceived by the management is low (r = 0.231). This finding can be explained by the fact that clean technology concept is not quite well known in Thailand compared to other fads, such as ISO 9000. When companies are accredited with ISO 9000 standards, they spend a lot of money via various media for a good deal of propaganda of such accomplishment. This celebration rarely happened when any project relating to the clean technology is successfully implemented.

6.1.3 Discussion of Results from Stepwise Multiple Regression Analysis

Table 5.25 presents the results of stepwise multiple regression analysis. The overall model is significant ($p < 0.001$) with an adjusted R square of 0.436 and perceived regulatory pressures, perceived stakeholder demands, awareness and need for clean technology incentives, firm size, and firm capability are positively and significantly associated with the amount of clean technology investment ($p < 0.001$). Table 5.25 also shows that management's willingness to adopt and develop clean technology is positively significant ($P < 0.01$). Therefore, objective number two of this study to identify the extent to which the attribute of each factor contributes to the adoption of clean technology by the manufacturing firms in the food processing industry and the electrical / electronics industry in Thailand can be fulfilled by this model. The model reveals the value of standardized beta coefficients of those five predictor variables which will be discussed as follows:

i) Perceived Regulatory Pressures

This independent variable is the forth helpful (standardized beta = 0.210) in predicting the dependent variable (i.e., the amount of CT investment). The implication from this finding is that the conventional approach by focus heavily on environmental laws and regulations will create the relatively moderate effect on the adoption of clean technology. In order to improve the effectiveness of this factor, Porter and van der Linde (1995) suggest three regulatory reforms as follows:

1. Regulations should be designed to create maximum opportunity for innovation.
2. Regulations should foster continuous improvement and reward innovation.
3. Regulations should, whenever possible, reduce uncertainty.

ii) Perceived Stakeholder Demands

This independent variable is the most helpful (standardized beta = 0.279) in predicting the dependent variable. The implication of this finding is that this frequently overlooked institutional factors creates the highest effect in demanding firms to adopt clean technology. Klassen and Whybark (1999a) found that firms, with its more proactive management orientation, had more interaction and awareness of external stakeholders. They also observed that plant management with a more proactive orientation did not invest exclusively in clean technology, as might predicted from the literature. Instead, they invested in a balance fashion in both clean technology and pollution control technology, partly depending on the acceptance of public input. Hence, the organizations with responsibility of promoting the diffusion of clean technology should approach these stakeholders to overcome their limited awareness of clean technology and help them effectively demanding firms to adopt clean technology approach. Firms themselves should revise their relationships with stakeholders for the following benefits (Bianchi & Noci, 1998):

1. To collect significant information both on the expected evolution of the external context and on the possibility of adopting operational solutions already implemented in other firms.
2. To carry out clean technology program effectively through co-operation with external stakeholders. Recycling-based programs may, for instance, require (a) the identification of a market for the recycled raw materials and (b) the definition of effective relationships with industrial partners in other firms, in order to recover and re-use end-of-life products.
3. Environmental communication is of growing importance in improving the firm's green image and responding to the increasing demand from the market for clear details on environmental programs and performance.

iii) Awareness and Need of Clean Technology Incentives

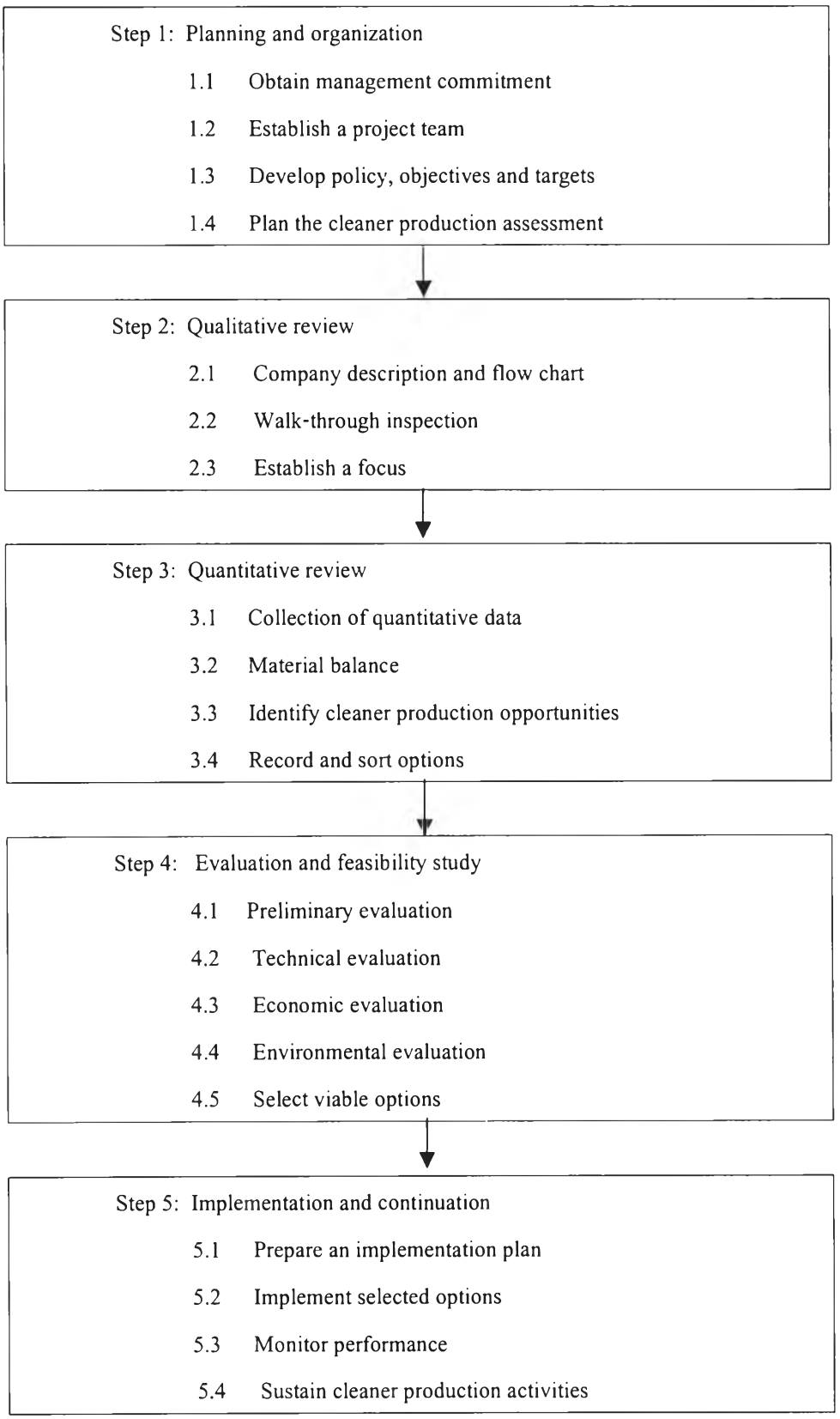
This independent variable is the second helpful (standardized beta = 0.279) in predicting the dependent variable. This finding is in line with the study of Hoftman and Koottatep (2000) which report that firms, especially small and medium enterprises, are waiting supporting project so they can apply for subsidy from the donor agencies. However, the problem is not concerned only the availability of incentives, but also the aware ness of their existence. This study found that 45% of respondents did not aware that incentives were available for the adopters of clean technology. Hence, this constraint to the multiplication of clean technology has to be eliminate as soon as possible.

iv) Firm Size

This independent variable is the third helpful (standardized beta = 0.279) in predicting the dependent variable. The implication of this finding is that firm size is still one of the major determinants of the company's clean technology adoption. Bianchi and Noci (1998) point out that SMEs, unlike large corporations, generally adopt a re-active environmental strategy. They focus their actions on those processes which make them economically viable (typically production and sales), prefer short-term investments which yield a high return, and concentrate most of their efforts on maters of day-to-day survival, thus neglecting aggressive environmental programs which require long-term planning. As a consequent, plan for approaching manufacturing firms for the purpose of clean technology diffusion should be tailored to match with their size.

v) Firm Capabilities

This independent variable is the fifth helpful (standardized beta = 0.192) in predicting the dependent variable. The implication of this finding is that firm characteristics in terms of technology intensive, technology development, and newer machines and equipment are the vital capabilities that firms have to possess for adopting and implementing clean technology project. Figure 6.1 shows the process of clean technology adoption (step 1 to 4) and implementation (step 5). Identifying cleaner production opportunities (step 3.3) is a critical step because it depends on the knowledge, experience, and creativity accumulated in the form of specific capabilities of the firm. Evaluation and feasibility study (step 4.1 to 4.4) are the key steps. All opportunities selected during step 3 have to be evaluated according to their technical, economic, and environmental merit. Feasibility of each opportunity partly depends on the resources and capabilities of the firm. In other words, some opportunities are accompanied with certain constraints which could be overcome by the appropriate level of resources and capabilities. All of these criteria are considered during selecting viable options (step 4.5) which is the last step of clean technology adoption. Then, the selected options are implemented which involve modifications to operating procedures and / or processes, and may require new equipment, as well as staff training. It can be observed that there are many bottlenecks along these steps particularly during implementation steps. Hofman and Koottatep (2000) report that the immediate implementation of clean technology options during the last decade in Thailand are rare especially with those involving in a significant sum of investment. Besides, the economic situation does not allow them to act promptly, due to cash flow problem. As a consequence, those options are delayed to a later state.



SOURCE : UNEP (1996)

Figure 6.1 Process of Clean Technology Adoption and Implementation

vi) Management's Willingness

This independent variable is the relatively least helpful (standardized beta = 0.157) in predicting the dependent variable. This finding is conformed to the study of Hoftman and Koottatep (2000). They found that, for CT program which implemented and supported mainly on consulting fees by local organization in Thailand, the outcome of the project depends a lot on the willingness of the factories involved. Since they have to pay every thing themselves in implementing the generated options from the program, they will need to take their priority in the company for consideration. The willingness of top management is a crucial issue in implementing CT program in this case. Hence, the implication from this finding is that plan for approaching manufacturing firms for the purpose of clean technology diffusion should reach directly to the top management from the very first to obtain their commitment (step 1.1 in Figure 6.1).

6.2 IMPLICATIONS

Clean technology is now widely accepted that it enhances competitive advantage, economic advantage, and social advantage for the adopter. Many manufacturing firms are alerted to capitalize these benefits offered by clean technology. Thai government and CT promoting organizations are eager to dissipate the CT concept to all manufacturing industries in Thailand. However, it is not guaranteed that every one will have the satisfactory results from clean technology adoption. The following implications are presented to share some findings of this study.

6.2.1 Implications for Manufacturing Firms

1. The study found that Thai manufacturing firms, by average, are the lowest investors in clean technology as compared to foreign firms. This means that Thai firms do not take benefits from CT to enhance their ability to compete with foreign rivals. In fact, adopting clean technology is not so difficult as someone may imagine. Thai government agencies, NGOs who promote CT, and foreign organizations are out there ready to give a hand to any manufacturing firms who want to begin CT programs in their organizations. In addition, many kinds of incentives are provided to help the new CT starters to achieve CT adoption with the lighter financial burden.

2. Although most clean technology projects have achieved in realizing improvements in efficiency and reductions in waste and emissions for the participating companies, it was found that clean technology does not necessarily lead to profound changes or improvements in production processes, which is the essential foundation of the continuous approach of pollution prevention. Consequently, the continuation of pollution prevention after a CT program (initiated from outside the company) ends becomes the main problem. If this kind of situation goes on, CT activities of these manufacturing firms may face the stagnant situation when all the lower

hanging fruits are picked. Therefore, top management should integrate the clean technology into a company's strategy in order to use clean technology as a concept for environmental management.

3. Firms should revise their relationships with stakeholders by establishing trust-based collaborative relationships with a wide variety of stakeholders, which include customers, employees, shareholders, suppliers, contractors, local communities, environmental groups, regulators, NGOs, federation of Thai industries, media, etc. The trust and credibility developed by firms with a variety of stakeholder groups is a path-dependent strategic capability that can not be easily imitated by competitors (Sharma & Vredenburg, 1998). This capability is an asset, based upon over a decade of consistent flow of actions (Dierickx & Cool, 1989) by the companies to reduce their impact on the natural environment in consultation with a diversity of stakeholder groups.

6.2.2 Implications for Government Agencies

Government agencies, which relate directly to CT promotion, are the Department of Industrial Work of the Ministry of Industry and the Pollution Control Department of Ministry of Science, Technology, and Environment. The following implications concern these two agencies:

1. Thai environmental laws create a higher effect to foreign firms to adopt CT than Thai firms. This means that coercion only laws is not a promised solution for promoting CT in Thailand. Other schemes such as incentives for CT adopters should received a strong campaign.

2. Most respondents express their interest on incentives available for CT adopters. However, few of them know the detail of those incentives. Therefore, the government agencies have to increase their focus on setting public relations strategy to overcome this obstacle.

3. The study reveals that the effect of government agencies to the CT adoption is quite low. Therefore, Ministry of Industry and Ministry of Science, Technology, and Environment have to set a plan to educate and improve their officers who deal directly with manufacturing firms to be able to convince those firms to the direction of CT adoption.

4. The study also finds that 18% of the respondents have never been audited by the government agencies and 65% of them were audited only one time per year (see Table 5.11, page 71). This frequency is very low to enforce the manufacturing firms to change their behaviors in a more environmentally friendly direction. According to Cairncross (1993), probably the most important incentives of the spread of clean technology are government measures to check pollution. Therefore, the government agencies have to improve frequency of environmental audition to increase regulatory pressure on the manufacturing firms.

6.2.3 Implications for Stakeholders

The results show that stakeholders are the one of other key factors that exert the higher influence on the manufacturing firms to adopt clean technology. This finding encourages the author to express the following implications.

1. The study found that CT demands from employees, customers, shareholders, competitors, and community create the moderate or higher effects on the majority of respondents. Therefore, CT organizations should approach these stakeholders to help them demanding CT more effectively.

2. It was disappointed to find that almost half of respondents (49 %, see Table 5.9 in page 70) perceived little or no effect from the Federation of Thai Industries relating to the demand for clean technology adoption. The Federation should encourage its Clean Technology Center to play a more active role in promoting the diffusion of clean technology.

3. This study found that NGOs were viewed by the respondents as the clean technology enforcers rather than clean technology demanders. In addition, NGOs are perceived by the respondents as the most inactive organizations among all CT promoters in Thailand (see Table 5.12). This situation happens because there are few NGOs with resources and capability to promote CT compared to the huge number of manufacturing firms in Thailand.

6.3 LIMITATIONS

Some obvious limitations are valuable to be discussed here.

1. This study collect data from manufacturing firms in Thailand via questionnaire. Hence, the accuracy and non-bias of the data are questionable. Sensitive data, such as the number of warnings from government agents and the penalty experienced by the respondents' companies may not be frankly disclosed.

2. This survey was conducted only in two industries, i.e., food and electrical/electronics, that operate in Thailand. Caution should be taken if the results from this study are used beyond those industries and outside Thailand context.

3. The study found that foreign environmental regulations, i.e., WEEE and HACCP, were not significantly related to CT adoption level. This outcome may originate from the fact that most of the respondents are involved mainly with the production activities and not exposed directly to the pressure from foreign environmental regulations. The results might be better if another questionnaires were sent to the export managers or international marketing managers.

6.4 FUTURE RESEARCH

Future research can be extended from this study in the following ways:

1. Apply this model to other key industries of Thailand. Tourism is becoming the strategic industry as the new cash cow of Thailand. However, this industry creates the significant impact on the natural environment. Therefore, application of clean technology to this industry is worthwhile for the future study.

2. Extend the study to cover some other countries in Asian in order to compare and generalize the results. Some important insights may be gained from this comparative approach of the future study.

3. From the correlation analysis, this study found that there was a significant positive correlation between sales volume and clean technology investment (r = .382**). Further more, from the multiple regression analysis, sales volume is statistically significant to explain the variation of clean technology investment (standardized beta = .245**). Therefore, future research may put more attention on sales volume to improve the predictability of the research model proposed in this study.

4. Improve the accuracy and non-bias quality of the collected data by using the direct interview approach with key members of the management team who have the closed relationship with the CT adoption process.

6.5 CONCLUSION

This study has proposed to develop and test a theoretical framework for verifying that the success of clean technology promotion in Thailand depends on the institutional factors, the organizational factors, and the management factors. This study has also proposed to identify the extent to which the attribute of each factor contributes to the adoption of clean technology in Thailand. In order to achieve these two objectives, this study employs the concept of legitimacy and isomorphic power in the institutional theory, the concept of firms' specific resources and capabilities in the resource-based theory, and the concept of agencies and communication networks in the diffusion of innovation theory to explain the effects of those factors on the adoption of clean technology.

The findings from bivariate correlation analysis indicate that the institutional factors, the organizational factors, and the management factors significantly and positively correlate with the adoption of clean technology. The findings from the stepwise multiple regression analysis reveal that perceived regulatory pressures, perceived stakeholder demands, awareness and need for clean technology incentives, firm size, firm capability, and management's willingness to adopt and develop clean technology are positively and significantly associated with the adoption of clean technology. Within these five independent variables, perceived stakeholder demands was the most influential predictor while management's willingness to adopt and develop clean technology was the least influential predictor.