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A study on the success factors for knowledge management in supply chains of electronics industry

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C H R O N I C L E

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A B S T R A C T

This research aimed to 1) study the success factors for knowledge management through electronics industry supply chains, and 2) study guidelines and recommendations regarding the success factors for knowledge management through electronics industry supply chains. The study employed the quantitative research methodology. The statistical devices used included frequency, percentage and Structure Equation Modeling (SEM). The population and sample group comprised executives of the electronics industry in the electronics and electrical appliances sector in Thailand. The results revealed that the factors regarding the information technology system, leadership support and knowledge management had positive effects on the success of the knowledge management through electronics industry supply chains with the statistical significance (β) of 0.519, 0.621 and 0.448, respectively. However, the factors regarding human resource management affected the success of the knowledge management negatively at the statistical significance of 0.323. As for the effects of variables on the success of the knowledge management, it was found that the factors with the most positive indirect effects (IE) and total effects (TE) were those regarding 1) leadership support (IE = 0.278, TE = 0.278), 2) information technology system (IE = 0.233, TE = 0.233), and 3) knowledge management, which had a positive direct effect (DE) at 0.448 and a total effect (TE) at 0.448. However, the factors regarding human resource management had a negative indirect effect (IE) on the success of the knowledge management at -0.145.

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1. Introduction

In the current economic climate, one way to prepare for changes and to encourage continual development for organizational survival is to create a workforce that is knowledgeable, skilled and capable of efficient operation through the implementation of knowledge management. Knowledge management constitutes a tool that supports workers to reach their full potential and to collect and process data accurately, efficiently and in easy-to-understand formats so that quick responses can be given to facilitate changes, increase customers' satisfaction and enhance future competitiveness in a sustainable manner. Thailand is an industrial base for the production and export of electronic products. It also serves as a major production base for down-stream products such as electrical appliances and communication devices that have seen a good level of growth in the global market. Consequently, the electronics industry catering for these products has attracted increasing investments (Karisorn Research Center, 2020). This shows that connecting the production supply chains is vital for the direction of the electronics industry in Thailand. Changes in technological development and in the demands for electronic goods of the global market have an impact on the overall operation of the electronics industry in Thailand, inevitably resulting in constant adjustments. Nevertheless, the electronics industry development in the country has not yet caught up with new changes and demands. Part of the problems holding Thailand's electronics industry back is from a lack of capable technology personnel (Kasikorn Research Center, 2020), a lack of personnel development as well as skill development, and a lack of human resource with skills in electronics necessary to meet the demands of possible changes. In addition, there is a risk from a changing trend in the world's demand structure for more advanced electronic parts. Since Thailand's electronic products are relatively technologically simple and uncomplicated, the products may soon lose their competitive edge in the future global market. It is, therefore,

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necessary to expedite the development of the personnel's knowledge and ability in this area (Economy, Business and Grassroots Economy Research Center, 2019). In order to achieve business success, New-Age entrepreneurs and high-level executives are required to have skills in communication to create commercial networks and allies, to have marketing knowledge and understanding and to have skills to operate modern technologies (Rose, Kumar & Yen, 2006).

The development of factors leading to the success of the personnel's knowledge management, therefore, is an important aspect of any organization. An organization's human resource can generate valuable assets for the workplace and also constitutes valuable resources for today's business competition. It is to the workplace's advantage that its personnel is given opportunities for continual development. Moreover, the aforementioned impediments to the electronics industry make a study of the success factors for knowledge management through electronic industry supply chains a necessity. The present study, thus, aimed to investigate factors leading to the success of knowledge management through electronics industry supply chains and to explore guidelines and recommendations for success factors for knowledge management through electronics industry supply chains. The findings would benefit the development of knowledge management in the electronics industry as well as in related industries as the personnel's knowledge management plays a key role in the development of their skills, both short-term and long-term.

2. Literature review

The literature review comprises literature regarding success factors for knowledge management, knowledge management and knowledge management success, as follows:

"Knowledge Management" is a tool employed by an organization to make use of the systematic knowledge within the organization and of the work experience and expertise of the organization's personnel. Knowledge management can be divided into 2 broad categories: explicit knowledge and tacit knowledge (Nonaka & Takeuchi, 1995). The knowledge process consists of the following: 1) identification, 2) acquisition, 3) creation, 4) storage, and 5) application.

According to the literature review, factors leading to the success of knowledge management are as follows:

1. Leadership Support: The success of knowledge management requires support from the organization's leaders. Vaquera and Kao (2005) have found that in knowledge management operations executives recognize the importance of the roles of leadership in their organizations and in the success of the organizations' knowledge management.

2. Human Resource Management: Human resources is a valuable asset for any organization. The development of human resource must focus on enhancing the personnel's potential. This is in accordance with Senge (1990, p.7) who states that man is a key element for learning both as an individual and as a team, and that the personnel's ability is a key factor influencing a learning organization and standardizing the skills of the organization's personnel.

3. Information Technology System: An organization must provide necessary technologies that facilitate communication and connection both within the organization and with outside organizations. According to Marquardt et al. (1994), information technology is now playing a vital role for individuals in a knowledge society that requires learning through technological media. Key sub-systems for technological implementation are essential elements in the creation of a learning organization.

According to Kaplan and Norton (1996), the success for knowledge management as a management tool to transform strategies into practice consists of 4 perspectives: financial perspective, customer perspective, internal process perspective, and learning and growth perspective. These perspectives have the organization's vision and strategies as their focal point.

2.1 Measurement – Success

The success factors for knowledge management through the balanced scorecard are in accordance with Kaplan and Norton (1996) as management tools assisting the strategy-to-practice implementations for the success of knowledge management which features 4 perspectives:

1) Customer Perspective comprises customer satisfaction and knowledge as a database to maintain the customer base and to search for new customers.

2) Process Perspective comprises knowledge management as a suitable method for keeping the intellectual property within the organization or among related organizations, the transfer of knowledge among employees and reliable knowledge of the knowledge management system within the organization and among related organizations.

3) Learning and Growth Perspective comprises the compatibility between the knowledge about knowledge management and the employees' needs and responsibilities, the sufficiency of the knowledge about knowledge management and the availability of the plans for activities to develop the employees and stakeholders.

4) Financial Perspective comprises the reduced operation costs within the organization and among related organizations, the increased operation efficiency such as time effectiveness and resource effectiveness within the organization and among related organizations, operation networks concerning the financial data of related organizations and perspectives with the organization's vision and strategies as their focus.

From the above review the researcher set the following research hypotheses and conceptual frameworks:

2.2 Hypotheses of the Study

The hypotheses of this study are as follows:

Hypothesis 1: Human resource management factors affect the success of knowledge management through electronics industry supply chains.

Hypothesis 2: Information technology system factors affect the success of knowledge management through electronics industry supply chains.

Hypothesis 3: Leadership support factors affect the success of knowledge management through electronics industry supply chains.

Hypothesis 4: Knowledge management factors affect the success of knowledge management through electronics industry supply chains.

2.3 Conceptual Framework

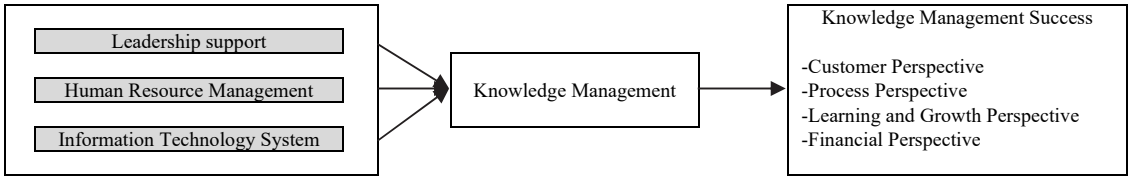

Fig. 1. Conceptual Framework for a Success Factors for Knowledge Management through Electronics Industry Supply Chains

3. Methodology

The Research method followed that of quantitative research and employed in this research was a questionnaire, A pilot questionnaire was tested by managers, academicians, and a practitioner in a small number of companies. After a few amendments, the final questionnaire was conducted and sent to the electronic companies.

The Population and Sample group comprised 608 executives in the electronics industry from the electronics and electrical appliances sector. Each executive represented one organization.

The Data Collection comprised 2 parts:

1. The secondary data were acquired from reviewing related literature, research studies and research articles in order to study key theories, concepts and information for the data analysis.

2. The primary data were acquired using a questionnaire.

The Validity and Reliability *of the Research Instruments* were checked as follows:

1. The validity of the questionnaire was checked by 3 experts to assess its item-objective congruence and content validity.
2. The reliability of the questionnaire was checked by piloting the questionnaire in a small number of companies, not included in the sample group.

4. Data analysis

The Statistical Devices used in the study included frequency, percentage and Structure Equation Modeling (SEM). To conduct an analysis of the correlations of measurable statistical variables, the researcher sent 608 copies of the questionnaire to executives at the level of unit head and above in the electronics industry, 308 of which (50.66 %) were completed and returned.

This number agreed with the framework of Comery and Lee (1992) which suggests that a sample group size of 300 is a good size. To assess the questionnaire's validity, the quality of the questionnaire was checked by 3 experts and received the validity values between 0.6 and 1.00. For the reliability value, the 308 returned questionnaires had the reliability value at 0.952. To determine the sampling adequacy of data to be used for Factor Analysis, the data were measured using a KMO test and received the value of 0.875.

5. Results

The study of success factors for knowledge management through electronics industry supply chains revealed the frequencies and percentages of the questionnaire respondents according to age groups as follows: Most respondents (109 respondents or 35.40 %) were in the age group of 41-50 years, followed by that of 31-40 years (89 respondents or 28.90 %), that of 51-60 years (76 respondents or 24.70 %), that of 21-30 years (23 respondents or 7.50 %), and that of 61 years and older (11 respondents or 3.50 %) respectively. The sampling adequacy of data to be used for Factor Analysis was determined by KMO and Bartlett's Test. The KMO value for suitable data must be higher than 0.5 and close to 1.0 (Bandalos, 2018). The data from the sample group received the KMO value of 0.875, meaning that they were suitable to be used for Factor Analysis. The result of the KMO and Bartlett's Test in the Exploratory Factor Analysis (EFA) revealed the KMO value of 0.892, meaning that the data were acceptable according to the criterion requiring the KMO value for suitable data to be higher than 0.5 (Bandalos, 2018). The Bartlett Test Statistic was approximated with a Chi-Square distribution with the value of 9296.233 and p- value < 0.001, meaning that the variables used for the analysis were correlated.

Table 1
The Reliability of Questionnaire Items

Latent Variable	Observed Variable	Corrected Item-Total Correlation	Cronbach's alpha
Factors Influencing Knowledge Management in Electronics Industry Supply Chains			
Human Resource Management			
	Hrm1	0.801	0.890
	Hrm2	0.792	
	Hrm3	0.818	
	Hrm4	0.632	
Information Technology System			
	It1	0.727	0.892
	It2	0.753	
	It3	0.774	
	It4	0.799	
Leadership Support			
	Lea1	0.520	0.879
	Lea2	0.801	
	Lea3	0.837	
	Lea4	0.812	
Knowledge Management			
	In1	0.689	0.886
	In2	0.693	
	Ac1	0.776	
	Ac2	0.781	
	Cre1	0.797	
	Cre2	0.796	
	Sto1	0.321	
	Sto2	0.433	
	App1	0.474	
	App2	0.364	
Success in Knowledge Management of Supply Chains			
	Cus1	0.565	0.914
	Cus2	0.522	
	Cus3	0.517	
	Cus4	0.717	
	Cus5	0.695	
	Pro1	0.721	
	Pro2	0.698	
	Pro3	0.740	
	Pro4	0.743	
	Pro5	0.657	
	Lea1	0.689	
	Lea2	0.605	

Table 1 shows the reliability values from the data provided by 308 questionnaire respondents and reveals that the Cronbach's alpha values were at $0.879 - 0.914$, that the discriminating power and the reliability values according to the Corrected Item Total Correlation values were higher than 0.30, and that the Cronbach's alpha values were higher than 0.70, meaning that the results were acceptable.

Table 2
A Statistical Comparison of the Model Before and After the Model Modification

Statistics	CMIN/DF	GFI	RMSEA
Criteria	< 3.00	> 0.90	< 0.08
Before the Modification	2.177	0.730	0.073
After the Modification	1.625	0.900	0.045

Source : Adapted from Huizingh (2007)

According to Table 2, all the statistical values after the model modification passed the standard criteria and were congruent with empirical data.

Hypothesis Testing Results

The model analysis yielded key statistics used to check the model's Goodness of Fit according to the empirical data as follows:

Hypothesis 1: Human resource management factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.05, with the path coefficient value of -0.323 (β = -0.323, t = -3.034).

Hypothesis 2: Information technology system factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.01, with the path coefficient value of 0.519 (β = 0.519, t = 4.477).

Hypothesis 3: Leadership support factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.01, with the path coefficient value of 0.621 (β = 0.621, t = 9.738).

Hypothesis 4: Knowledge management factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.01, with the path coefficient value of 0.448 (β = 0.448, t = 6.796).

The results of the analysis of the effects of the antecedent variables are shown in Table 3.

Table 3
The Effects of the Antecedents

Latent Variable	R^2	Effect	Effects of Antecedents				
			Human Resource Management	Information Technology	Leadership Support	Knowledge Management	Knowledge Management Success
Knowledge Management	0.689	DE	-0.323	0.519	0.621	0.000	0.000
		IE	0.000	0.000	0.000	0.000	0.000
		TE	-0.323	0.519	0.621	0.000	0.000
Knowledge Management Success	0.476	DE	0.000	0.000	0.000	0.448	0.000
		IE	-0.145	0.233	0.278	0.000	0.000
		TE	-0.145	0.233	0.278	0.448	0.000

Table 3 shows the effects of the antecedents, the findings are as follows: 1) The antecedents with the highest positive direct effects (DE) on the latent variable of Knowledge Management were Leadership Support (DE = 0.621) and Information Technology (DE = 0.519) respectively. However, Human Resource Management had a negative effect on Knowledge Management. All the factors could predict Knowledge Management at 69.00 % (R^2 = 0.689); and 2) The antecedents with the highest positive indirect effects (IE) on the latent variable of Knowledge Management were Leadership Support (IE = 0.278) and Information Technology (IE = 0.233) respectively. In addition, Knowledge Management had a positive direct effect on Knowledge Management Success (DE = 0.448). Nevertheless, Human Resource Management had a negative direct effect on Knowledge Management (IE = -0.145). All the factors could predict Knowledge Management at 48.00 % (R^2 = 0.476).

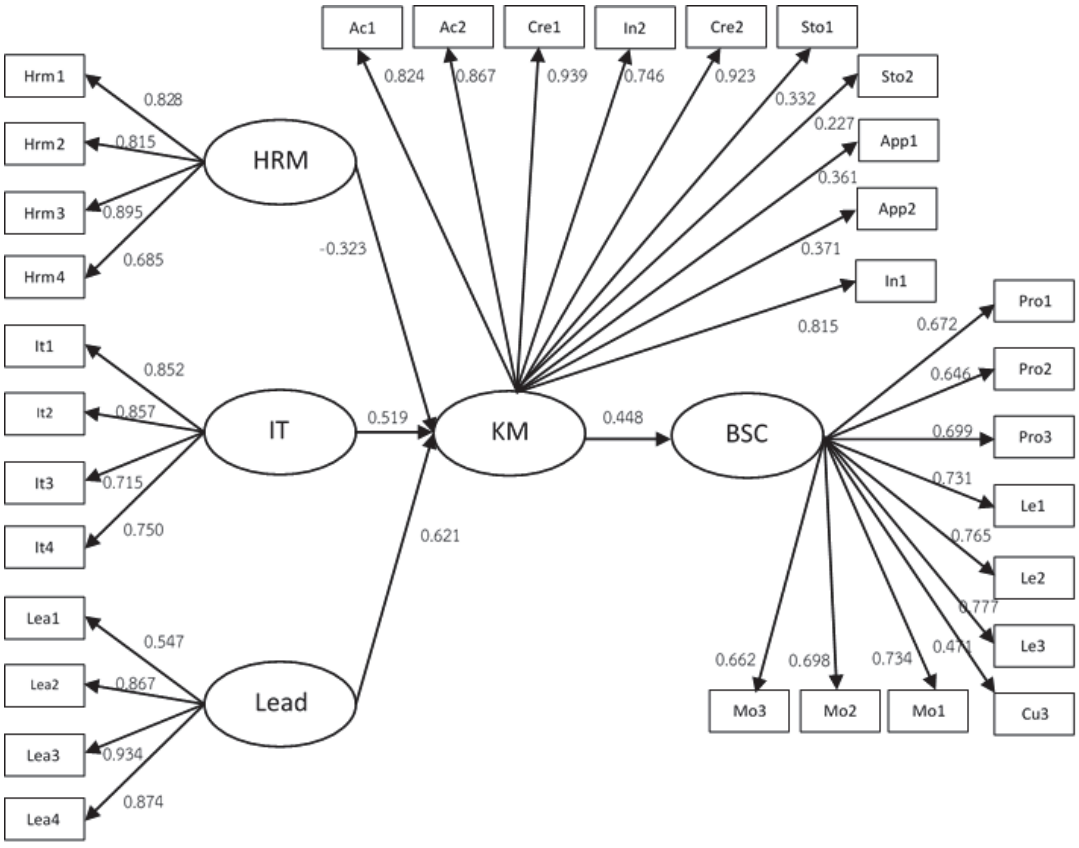

Fig. 2. Structural Equation Model (SEM) of the Study of Success Factors for Knowledge Management through Electronics Industry Supply Chains

Fig. 2 shows the Structural Equation Model (SEM) of the study of success factors for knowledge management through electronics industry supply chains. It was found that the factors concerning Information Technology, Leadership Support and Knowledge Management positively affected the success of knowledge management through electronics industry supply chains at the statistically significant level, with the path coefficient values of 0.519, 0.621 and 0.448 respectively. However, the factors concerning Human Resource Management negatively affected the success of knowledge management through electronics industry supply chains, with the path coefficient value of -0.323.

6. Conclusion and Discussion

The results of the study of success factors for knowledge management through electronics industry supply chains could be discussed according to the hypotheses of the study as follows:

Hypothesis 1: Human resource management factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.05, with the path coefficient value of -0.323. The study of the human resource management in the electronics sector showed that the organizations had recruitment methods that could select candidates with skills compatible to the organizational needs, categorized their personnel according to abilities, skills and expertise, and had plans for human resource knowledge management. However, these organizations had high turnover rates of temporary staff. In overall, the production staff of the electronics industry were lacking in knowledge development and knowledge management. The permanent staff, on the other hand, were catered for by the process of training, knowledge development and knowledge management. This practice agreed with Senge's concept (1990) which states that people are key components of a learning organization and must be facilitated by their executives to develop their professional knowledge and skills and to be independent in their decision making. The finding also corresponded with the study by Chuang et al. (2000) which found key components in human resource management in personnel training, personnel participation, teamwork and personnel facilitation.

In short, human resource management factors had a negative effect on the success of knowledge management through electronics industry supply chains. The production staff of the electronics industry in general lacked the development of knowledge and knowledge management while the permanent staff received training and the development of knowledge and

knowledge management. The high turnover rates and working multiple tasks, however, resulted in the staff' missing out in the process of knowledge management.

Hypothesis 2: Information technology system factors affected the success of knowledge management through electronics industry supply chains at the statistically significant level of 0.01, with the path coefficient value of 0.519. In addition, the information technology system had a positive direct effect on the success of knowledge management through knowledge management. Information technology plays an important role in a knowledge society where learning is conducted through technological media. Information technology, therefore, is a key ingredient in the creation of a learning organization and helps make the knowledge, information exchange and learning accessible to the personnel, as in the concept projected by Marquardt et al. (1994) that nowadays information technology plays a vital role in the life of an individual as a member of a knowledge society where learning is done through technological media. Moreover, the findings in this study supported those who indicate that the application of information technology as tools for knowledge management increases operational efficiency, reduces operational mistakes, generates work satisfaction among staff and enables the continual development of new machineries and products.

Hypothesis 3: Leadership support factors affected the success of knowledge management through electronics industry supply chains and had the highest positive direct effect on knowledge management (DE = 0.621). This is because leaders have an important role as policy makers. Furthermore, leaders are models for their organizational culture that reflects in the behavioral patterns to be followed by other employees and in the manners in which various forms of knowledge management are conducted. Balian (2005) states that implementing strategic management creates work transparency and enhances operations. The support of high-ranking executives in terms of information technology structure, budget, vision, mission, knowledge management strategies and activities helps make knowledge management a success. This corresponds with Vaquera & Kao (2005) who says that leaders and the implementation of knowledge management both focus on the roles of leadership in making knowledge management successful. This line of thought is also in accordance with Prasart Niyom (2012) who points out that an organization's leader has an important role in promoting the use of knowledge in the organization to attain the organization's goals.

Hypothesis 4: Knowledge management factors affected the success of knowledge management through electronics industry supply chains and had a positive direct effect on the success of knowledge management through electronics industry supply chains. The success of knowledge management through electronics industry supply chains using Balanced Scorecard (BSC) is a process of indicating knowledge management success. Kaplan and Norton (1996) states that BSC is a management tool that facilitates the strategy-to-practice implementation based on the evaluation of the alignment of the organization's success and the staff's performance. BSC focuses on the success of the organization in collecting data and knowledge, accessing knowledge bases, providing a convenient access to the fast-processing knowledge management system for all related employees so that they can make effective use of the data, save time accessing the data and apply the knowledge management in various other aspects.

7. Recommendations from the present study

1. The knowledge management currently implemented in the industry is necessary for the success of knowledge management and for the industry to keep pace with the ever-changing industrial currents. The formats of the knowledge management, however, should be made more structured.
2. The leaders have a great influence on the success of knowledge management through electronics industry supply chains. It is recommended that they provide more knowledge management activities on necessary topics and on technological learning through training, apprenticeships, mentoring systems, operational manuals, etc. These activities can be integrated into the employees' routine work.

3. The knowledge and understanding of the application of modern technological systems and computer programs take time to develop but will result in better performances.

4. The selection and recruitment of personnel for various jobs and in various positions to prepare for organizational growth will benefit from a continual implementation of the knowledge process.

8. Limitation and future research

This research collected data from only one industry in Thailand, which has the same geographical and cultural context. The limitation of the research could restrict the generalizability of the findings for other contexts. Future research should study the levels of knowledge management in organizations of various sizes and in various industries is recommended in order to gain a clearer picture of knowledge management in industries of different sizes. Moreover, a comparative study of the results of knowledge management using other concepts is recommended in order to gain an understanding of the real value of applying knowledge management at work.

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