KNOWLEDGE MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE: A CASE OF THE ROYAL THAI AIR FORCE

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ABSTRACT

Title of Dissertation Knowledge Management Practices and Organizational Performance: A Case of the Royal Thai Air Force

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The objectives of the research were 1) to develop a model of knowledge management practices and organizational performance, 2) to validate the relationship of knowledge management practices and organizational performance in the model, and 3) to suggest for the improvement of knowledge management practices and organizational performance**.**

This study investigated one independent variable (knowledge management practices), one intervening variable (innovation) and one dependent variable (organizational performance). Both quantitative research and qualitative research were conducted to test the relationship of the variables in the proposed model and conceptual framework. In quantitative research, a questionnaire survey was conducted to collect the data from all 185 commanders and directors of Royal Thai Air Force (RTAF) organizations. And the number of returned questionnaires was 100%. In qualitative research, the population were six RTAF administrators who were responsible for knowledge management. The unit of analysis was organization.

The Path Analysis was employed to find out direct and indirect relationship of independent variable, the dependent variable and the intervening variable. The characteristics of sample were described by descriptive statistics. The findings from quantitative analysis proved the hypotheses of the proposed model. The findings were that knowledge management practices positively influenced the organizational performance, through innovation. The results of quantitative analysis were supported by the results of qualitative analysis.

The model in this study contributes to the body of knowledge of knowledge management practices, innovation and organizational performance. This study contributes to the literature by theoretically developing a conceptual model and then empirically examining the relationships among knowledge management practices, innovation and organizational performance. The findings in this study are valuable for manager's reference, especially for those whose circumstances are similar to the military organizations. The model provides useful information for managers to enhance organizational performance through knowledge management practices and innovation. Practitioners can use the findings to extend research on knowledge management and innovation. Further research should be conducted on the measurement of product innovation and other types of organization than the Royal Thai Air Force.

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Group Captain Pranee Mooklai

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SYMBOLS AND ABBREVIATIONS

Symbols	Equivalence
β	Standardized coefficient
χ^2	Chi-Square
χ^2/df	Relative Chi-Square
r	Correlation

Abbreviations	Equivalence
BSC	Balanced score card
CEO	Chief executive officer
CIO	Chief Information Officer
CKO	Chief knowledge officer
CNO	Chief Network Officer
CoP	Community of practice
CTO	Chief Technology Officer
DAF	Digital Air Force
E	Externalization
FMC	Fully mission capable
GPS	Global Positioning System
HRIS	Human Resource Information System
ICT	Information and communication technology
IT	Information technology
KM	Knowledge management
KMC	Knowledge management capability
KMPI	Knowledge management performance index
KMS	Knowledge management systems
LMIS	Logistics Management Information System
LO	Learning Organization
MKM	Marketing knowledge management
ML	Maximum Likelihood

MLU	Mid-Life Update
NCAF	Network Centric Air Force
NCAB	Network centric air base
NCO	Network Centric Operations
NCW	Network Centric Warfare
OJT	On- the- job training
UAV	Unmanned aerial vehicle
OP	Organizational performance
OPDC	The Office of the Public Sector Development Commission
PLS	Partial Least Squares procedure
PMQA	The Public sector Management Quality Award
QC	Quality control circle
R&D	Research and development
RFID	Radio Frequency Identification
RMSEA	Root Mean Square Error of Approximation
ROI	Returns on investment
RTAF	The Royal Thai Air Force
SEM	Structural Equation Model
SMEs	Small to medium-sized enterprises
SPSS	Statistical Package for Social Science

CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem and Significance of the Study

In the dynamic context of world village (O'Leary and Van Slyke, 2010), organizational leaders should follow a suitable philosophy and a global perspective paradigm to solve intangible and invisible root causes of problems in order to achieve high organizational performance in rapid global change. Since 1990, the global paradigm has been shifted to the governance paradigm (Nicholas, 2010) that focuses on globalization, international standards, innovations (Johnston, 2010), and flexibility of the organization which changes to a new organizational structure or form to become an information-oriented organization (Drucker, 1998) or/and an organization with knowledge management (Senge, 1990; Marquardt, 1996). At present the world society, however, has been changed to the knowledge society (Drucker, 1994, Markkula, 2006, Tippawan Lorsuwannarat, 2009).

Knowledge is now accepted as the base for high technology and communication (Marquardt, 1996). Knowledge is also the base for new global economy (Wriston, 1992). Knowledge, as an essential resource, is more important than other organizational resources such as human, land and capital (Drucker, 1993). Thus managers must know how to manage knowledge (Boon-Anan Phinaitrup and Palapun Kumpun, 2007). If an organization properly manages knowledge, the organizational performance will improve (Earl, 2001). Knowledge management (KM), altering operation processes by new knowledge to create innovations and value-added products and services, is required for an organization to be sustainable in the mobilizing context (Drucker, 1998) as well as the crisis environment. Knowledge management can lead to innovation of processes and products. Knowledge management also fosters organizational competency (Grant, 1996). Therefore, in a knowledge-based economy

(Organization for Economic Cooperation and Development, 1996a), organizations need to practice knowledge management for organizational development.

Since 1997, investigation of knowledge management has obviously increased (Serenko and Bontis, 2004). But measurement of the organizational KM value has not been widely studied. Most previous studies have focused on the effects of knowledge management in individual private organizations, especially on financial perspective (Moffet and McAdam, 2006; Wei, Choy and Yew, 2007; Ho, 2008; Khalifa, Yu and Shen, 2008; Zack, McKeen and Singh, 2009; Akroush, Al-Mohammad, 2010; Gharakhani and Mousakhani, 2011; Hsiao, Chen and Chang, 2011; Mills and Smith, 2011; Lee, Kim and Kim, 2012). However, only financial measures may not accurately indicate the whole organizational performance (Wei, Choy and Yew, 2007). Additionally, previous researches which examined private organizations in some geographic, economic and cultural settings, for example, Canada, USA, Australia (Zack, McKeen and Singh, 2009), Jamaica (Mills and Smith, 2011), Taiwan (Ho, 2008; Hsiao, Chen and Chang, 2011), Korea (Lee, Kim and Kim, 2011), China (Khalifa, Yu and Shen, 2008), Malaysia (Wei, Choy and Yew, 2007), Jordan (Akroush and Al-Mohammad, 2010), South Africa (Moffet and McAdam, 2006), Iran (Gharakhani and Mousakhani, 2011). The findings from the studies may not reflect KM practices in other settings.

Although many related researches have attempted to measure KM practices, and organizational performance (OP), of many private organizations, the findings are not applicable for public organizations. Furthermore, although some researchers attempted to study KM in public organizations (Cong, Li-Hua and Stonehouse, 2007; Monavvarian and Kasaei, 2007; Pietrantonio, 2007; Gomes, Yasin and Lisboa, 2008; Seba, Rowley and Delbridge, 2012), they hardly measured public OP.

It is widely accepted that KM is related to innovation (Drucker, 1998; Alegre, Sengupta and Lapiedra, 2011; Lungu, 2011; Gubbins and Dooley, 2013), but so far few empirical investigations were made to clarify the relationship of KM, innovation and OP. Previous research could not clearly explain how knowledge management practices and innovation affect the overall public organizational performance, nor could they indicate what the overall effects of knowledge management practices and innovation on organizational performance are. So there is a gap to fill up in this

matter, especially the measurement of organizational performance in public organizations. Thus, in this research, the researcher focused on the effects of knowledge management practices and innovation on organizational performance evaluation in Thai military organizations, which are public, hierarchical, and bureaucratic organizations. The researcher believed to make significance contribution to OP, KM and innovation theories.

In brief, this study analyzed knowledge management practices, innovation and public organizational performance, in order to explain how knowledge management practices and innovation effect on public organizational performance, and what the overall effects of knowledge management practices and innovation on public organizational performance are. Finally, the findings from this study contribute to the theoretical, managerial and practical suggestion for the improvement of organization and society.

1.2 Research Objective

1.2.1 To develop a model of knowledge management practices and organizational performance**.**

1.2.2 To validate the relationship of a model of knowledge management practices and organizational performance.

1.2.3 To suggest for the improvement of knowledge management practices and organizational performance**.**

1.3 Scope of the Study

This research was conducted from 2010 to 2014. Since the source of the data collected is in public military organization in Thailand. This study focuses on the effects of knowledge management practices and innovation on public organizational performance. Because of the convenient of collecting the data, the researcher chose the Royal Thai Air Force as the study site.

The population for quantitative research included 185 directors and commanders (Senior Group Captain) who were considered organizational representatives. In the qualitative research, the participants were six RTAF administrators who were responsible for knowledge management.

The enquiry concerned knowledge management practices (knowledge obtaining, knowledge organizing, and knowledge applying), innovation (new technologies, new equipment and/or services and new procedures) and organizational performance (efficiency, customer satisfaction and organizational effectiveness) of RTAF.

1.4 Benefits of the Study

This study is expected to fill up some theoretical gap in KM investigation and to bring practical knowledge to RTAF and other organizations with similar context.

1.4.1 Theoretical Benefits

This research emphasized how knowledge management practices enhanced organizational performance through innovation. Some theoretical implication could be made. This study investigated in all RTAF organizations which have various missions, so the measurement of all variables--KM practices, innovation, OP-- in the study was applicable.

This study was providing empirical evidence about the effects of KM practices, innovation on OP. As the researcher developed a conceptual model of the relationships of the KM practices, innovation and OP which had not been proposed before. The major contribution of this study was the integrated model that linked knowledge management practices, innovation and organizational performance. It revealed that KM practices had an intermediate effects on innovation which improved OP. The contribution of this study also contributes to the body of knowledge in KM, innovation and OP.

1.4.2 Practical Benefits

Practically, the empirical findings highlighted the significance of KM practices and innovation in OP. From related literature review, many organizations have been continuously spent numerous resources for knowledge management and innovation for a long period of time; however, research on the overall organizational performance affected by knowledge management and innovation has rarely been conducted. Thus, this research studied the overall performance of RTAF affected by knowledge management practices and innovation. Empirical evidence of the effects of knowledge management practices and innovation on public organizational performance from this study is valuable in providing the reasonable managerial suggestions for organizations to improve organizational performance in the dynamic context. The model from the study can supply constructive information for managers to foster OP through suitable KM practices and innovation strategies. Therefore, the research suggests what public organizations should do to allocate suitable resources and create conditions for OP enhancement. In brief, the findings will be useful for managers who wish to improve OP, mainly in public organizations of similar nature.

1.5 Definition

1.5.1 Organizational performance can be defined as organizational efficiency, customer's satisfaction, and 3) organizational effectiveness.

1.5.2 Knowledge management practices can be defined as knowledge obtaining, knowledge organizing, and knowledge applying.

1.5.3 Innovation can be defined as new technologies, new equipment and/or services and new procedures.

1.6 Organization of Dissertation

There are six chapters in this study. Chapter 1 introduces statement of the problem and significance of the study, research objectives, scope, limitation, and benefits of the study. Chapter 2 describes the organizational context of RTAF.

Chapter 3 reviews literature on related principles, approaches, concepts and theories for constructing the conceptual framework and hypotheses. Chapter 4 indicates research methodology by explaining the research design, data collection and data analysis. Chapter 5 presents sample characteristics using descriptive statistics, results of the proposed model testing, results of hypothesis testing, including research findings. The final chapter, Chapter 6, the conclusions of the study discussing the results of the study, the suggestions for organizational development are discussed to offer organizational development and for further study.

CHAPTER 2

ORGANIZATIONAL CONTEXT OF THE ROYAL THAI AIR FORCE

The dynamic context of the world society leads to changes in many countries for sustainable development. Without exception, public organizations in Thailand, have to suitably reform the bureaucratic system to reduce staff and increase efficiency. Thai public organizations have attempted to improve organizational performance by focusing on core functions and applying new management information systems and knowledge management to reduce operating processes and time. Most public organizations including RTAF determine organizational strategies, policy and vision with emphasis on knowledge management and innovation. RTAF practices knowledge management and develop innovations in order to achieve high organizational performance. However, RTAF has not conducted much research in this area.

2.1 Background of the Royal Thai Air Force

The book entitled *The Four Reigns of Chakri Dynastry, The Centennial of RTAF Founding Fathers' Aviation* (RTAF, 2012a), and traced back the history of RTAF from the event of flight testing of the Wright Brothers on December 17, 1903, which was the beginning of international aviation. Their success prompted many countries to be interested in this new world innovation and inspired them to have some airplanes of their own. Airplanes were first known in Thailand in 1911, in the reign of His Majesty King Vajiravudh (Rama VI), when a foreigner visited the country to perform an air show in front of Thai spectators. His Majesty King Vajiravudh pursued the vision with strong determination to create the nation's aviation capability. In July, 1962 Air Marshal Phraya Chalermakas, Group Captain Phraya Vehassayarnsilpsit, and Group Captain Phraya Tayarnpikard were sent to

France to attend a flying training course, this marked the giant step of Thai aviation. After founding fathers had completed the training and returned home, they built a solid ground of aviation in Thailand. Airplanes not only serve military purpose but also are an alternative mean of transportation. People's lifestyle has changed because airplanes are faster and more convenient in traveling and transporting goods. Thailand can be said to be one of the first few countries in the world that benefits from aviation.

2.2 RTAF's Mission, Vision, Strategy, Policy and Structure

To prepare and use air force power are RTAF's mission as prescribed by law is to be on alert for missions, and to exercise air force power. Its vision is to be "One of the Best Air Forces in ASEAN by the year 2019". This vision will be fulfilled by integrating the "Digital Air Force (DAF)" of the years 2008-2011, and "Network Centric Air Force (NCAF)" of the years 2008-2019. DAF provides RTAF with the capability of combat and non-combat operations to respond to present threats. RTAF has applied digital technology and integrated air power technology, network technology, and information technology to achieve RTAF's mission rapidly and suitably and to meet the requirements in all situations. Thus, DAF is the base for development of RTAF to become the new Network Centric Operations (NCO). Meanwhile, NCAF provides RTAF with the capability of combat and non-combat operations to response to present threats and future threats in the age of Network Centric Warfare (NCW). RTAF must completely apply the NCO concept, network technology and Tactical Data Link on self-dependent basis. By the year 2019, RTAF is expected to apply network technology and NCO concept in combat and non-combat operations to respond to all threats efficiently on mostly self-dependent basis (RTAF, 2009).

With regard to RTAF 's strategy and policy, RTAF Commander-in-Chief set a policy in the year 2013-2014, with focus on knowledge management (KM) and research and development (R&D) for creating innovation, body of knowledge and technology transfer.

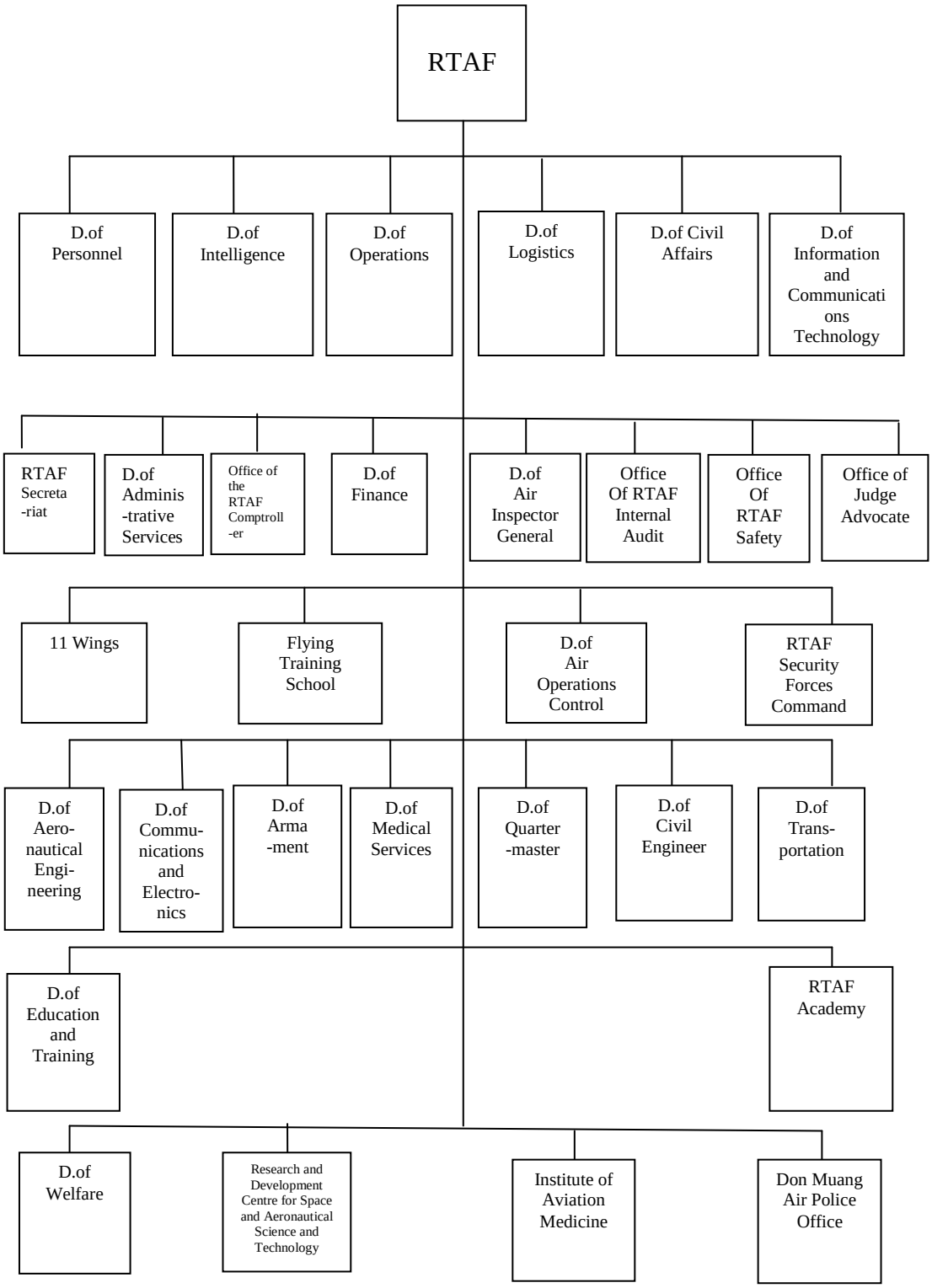

Figure 2.1 RTAF Organizational Structure

Note: D. = Directorate

In the RTAF structure shown by the organizational chart in Figure 2.1, RTAF - directed organizations are categorized into 5 groups: 1) command group (the first row and the second row), 2) combat group (the third row), 3) logistics group (the fourth row), 4) education and training group (the fifth row), 5) special services group (the sixth row).

2.3 RTAF's Knowledge Management Practices

This study investigated the KM practices in organizations under RTAF, which is a hierarchical, bureaucratic and large-sized organization in Thailand as described in Fig. 2.1. Knowledge Management practices in RTAF organizations are described as follows.

On June 12, 2014, Air Marshal Twidanes Angsusingha, Deputy Chief of the Air Staff (Personnel and Logistics) and President of the RTAF quality development activity group committee, talked about his past experience that "From the past until present, KM practices in RTAF organizations have been continuously performed in everyday working processes". And Air Vice Marshal Rit Ampansaeng, President of the RTAF quality development evaluation subcommittee, said on June 3, 2014 that "RTAF organizations have performed KM practices for a long time since RTAF was established, even before the term KM was coined". Wings of RTAF are the organizations which have had well-organized KM practices for a long time. But many years ago, such practices were not called "KM", perhaps because may not be clearly practiced or may not be obviously performed. To illustrate, some KM practices may not have been recorded in suitable any document forms. Moreover, some organizations had little interest in KM because KM and its benefit were not widely known by all the officers in RTAF organizations.

Since 1983, RTAF by Directorate of Personnel has continuously carried out quality development by using the quality control circle (QC). Up until now, QC has supported the organizations in problem solving, mission fulfillment, time and cost reduction. Other tools for organizational development are balanced score card (BSC), and community of practice (CoP).

Later in 2006, knowledge management (KM) was adopted as an effective tool for this purpose, too. At present, Directorate of Personnel is still in charge of KM in RTAF. RTAF by Directorate of Personnel began to do KM activity and KM lecturers were sent to RTAF organizations to continuously give the body of knowledge of KM.

RTAF's knowledge management is aimed at promoting RTAF strategy, and is evaluated by the Office of the Public Sector Development Commission (OPDC). Since the measurement and analysis of knowledge management is in the fourth element of the Public sector Management Quality Award (PMQA), RTAF has constructed to propose the two forms for OPDC evaluation. The first form evaluates the organizational knowledge that can response to organizational strategy, and the second form requires information about the knowledge management action plan which the chief executive officer (CEO), and the chief knowledge officer (CKO) have approved. Each RTAF organizations annually sends the completed forms for OPDC evaluation, and the report on the organizational performance to Directorate of Personnel, RTAF, which is responsible for RTAF quality control activities including knowledge management.

The policy of the Commander-in-Chief, RTAF promote RTAF to be Learning Organization (LO) by developing learning system to share, access and apply knowledge in the organization for effective work, creating Community of Practice (CoP) to practice KM. RTAF 's strategy and policy are focusing on learning organization (LO) by knowledge management (KM) including creating and developing Community of Practice (CoP) or KM team or KM group for organizational KM practices in the same direction to exchange work experiences. To fulfill RTAF vision, the RTAF quality development supporting committee was established in 2004 to foster organizational KM practices in both the RTAF-directed organizations in the combat group and the non- combat group by means of creating an organizational community of practices (CoP) (RTAF, 2013b).

Air Chief Marshal Prajin Juntong, Commander-in-Chief of the RTAF has commented on August 13, 2014 that "at present the direction of current KM practices is suitable and is really able to foster RTAF to achieve its vision". Thus, the direction for KM practices is satisfactory because KM practices are able to respond to RTAF activities and are also relevant to the present situation. However, there should

be continuous evaluation to adjust the KM processes to be suitable for the current situation at that time. As seen from Air Chief Marshal Prajin ’s policy in 2013, the personnel development has been the first priority for RTAF because every dimension of improvement requires that every person have correct knowledge and understanding, skills, and attitude and observe ethics and the code of conduct.

In order to achieve RTAF vision, RTAF organizations must obviously perform KM practices for personnel and organizational improvement to have competency in all aspects. Although an officer has to retire, the body of KM knowledge still remains and even increases in the organization. The Commander-in-Chief ‘s policy supports the RTAF strategic goal which is to strengthen of the competency and readiness for national defense and vision which is to be “One of the Best Air Forces in ASEAN by the year 2019” by developing RTAF to be LO and Knowledge-based Society. To illustrate, Air Marshal Yanyong Kanthasorn, Assistant Chief of the Air Staff for Personnel, RTAF, indicated on June 12, 2014 that “RTAF has vision to be Network Centric Operation (NCO), the learning organization (LO) has set the clear direction of RTAF to accomplish the vision as one of best air forces in ASEAN by the year 2019 and the main core body of knowledge has been selected to be primarily managed”. So RTAF vision will serve the direction for practicing KM in RTAF organizations. For example, the pilot projects of Directorate of Armament, RTAF and Wing 4 will be the template for another organization to practice KM in the same direction. RTAF ’s performance and vision may be achieved by proper ways and means including knowledge management of learning organization strategy.

RTAF quality development supporting committee established the RTAF quality development evaluation subcommittee whose responsibility is to give lectures and provide practices for promoting and evaluating RTAF quality development activities (RTAF. 2013c). In addition, it established the RTAF subcommittee for learning organization planning whose responsibility is to set knowledge management plans to promote RTAF to be a learning organization (RTAF. 2013d). These plans includes activities, responsible organizations, budget and key performance indicators. In August, 2013, the committee for fostering plan for RTAF to be a learning

organization was established. The members of these committee and subcommittee are selected from many RTAF organizations.

The RTAF subcommittee for learning organization planning has set the knowledge management master plan to promote RTAF to be a learning organization during the years 2013- 2017 (RTAF. 2013d). The master plan covers 4 tactics: 1) supporting knowledge and understanding of KM to be LO, 2) creating the leading team and promoting CoP, 3) creating the organization culture for LO, and 4) developing the ICT system for KM and LO.

Since RTAF is a large-sized and complex organization, the pilot projects should be selected. With the clear KM support of Air Chief Marshal Prajin, the pilot projects for KM were carried out in two initiated organizations or role model organizations, which were Wing 4 and Directorate of Armament. And the education was provided for KM practices. To illustrate, KM for F-16 MLU of Wing 4 has been practiced for accumulating the body of knowledge of F-16 MLU and for being a model of KM practicing for other organizations too. Still, KM lecturers and teams of experts teams have continuously provided the body of KM knowledge, and have increased the RTAF personnel's positive attitude to do KM willingly.

The RTAF quality development supporting board has been fostering organizational CoP creation for organizational KM practices in the same direction of RTAF vision by exchanging work experiences and creating up-to-date work manuals (RTAF. 2013b). Many supportive projects have been set and implemented. Each year a budget is given to each RTAF organization to implement the projects. The activities to support KM are, for example, seminars on RTAF quality development, the RTAF KM Network lecturer training project, the quality development tools learning project, etc. To illustrate, the RTAF quality development activity seminar was held at the RTAF headquarters in October 2010. The quality development educational and practicing field visit seminar was arranged by the RTAF quality development evaluation subcommittee during November-December 2010 for RTAF organizations (10 Wings and RTAF Flying School) in other provinces. The RTAF KM Network of training-the-trainer project was held at RTAF Personnel school from January to March 2011. The quality development tools learning project was held at the RTAF headquarters in July, 2011. In the fiscal year 2012, a budget was given to each RTAF

organization. The RTAF quality development activity seminar was held at the RTAF headquarters in December, 2011. The quality development tools learning project was held at RTAF headquarters in July, 2012.

The results of KM practices of RTAF organizations are evaluated in the KM contests. RTAF's staffs as well as staffs from the external organizations have the opportunity to share innovative work and participatory learning in the RTAF Quality Development Contest Symposiums. Such quality development activities also support RTAF cross-functional team work competency by applying information technology for effective knowledge systemization and transfer, and continuous self-directed learning, including innovative thinking. Commander-in-chief, RTAF 's Policy's speech in The RTAF Quality Development Contest Symposiums book. 2012 (RTAF. 2012b; RTAF. 2013a) suggested that as a result form value-added innovation, RTAF performance may be improved to foster the RTAF vision to be Network Centric Air Force.

Three contests a year are held to screen and choose the best practices for QC and KM groups. In the first contest of the year, during April-May, The first contest performs, the RTAF quality development evaluation subcommittee visits the RTAF organizations both in Bangkok and other provinces where the RTAF Air Force Bases exist, to evaluate the performance of QC, and KM groups. In the second contest usually held at the RTAF Library meeting hall during June-July, about 10-15 groups of QC and 10-15 groups of KM are selected for the last contest symposium usually held at the Kantarat meeting hall or RTAF Hall (Tongyai Hall) in August. The exhibiting boards of the CoPs are accessed to sum the scores in order to select the winner.

In the symposium, many KM groups submitted innovations for contest every year. In the RTAF Quality Development Contest Symposiums book by the year 2012, Commander-in-chief, RTAF stated that value-added innovation may help improve RTAF performance and fulfill the RTAF vision of becoming the Network Centric Air Force.

RTAF has realized the importance of RTAF Quality Development Contest Symposiums. The RTAF Commander-in-chief, or his representative, presides over the RTAF Quality Development Contest Symposium every year. Guest speakers come

from well-known educational institutions. Other organizations which have quality development work are also invited to join the Symposium and learn from each other. In addition, the quality development groups are selected by the RTAF quality development evaluation subcommittee to present their work in the Symposium. The awards for the winner groups are cash and also an opportunity to attend the international quality development meetings aboard.

The number of CoPs or KM groups from RTAF organizations that register for contest of KM work with innovations in the RTAF Quality Development Contest Symposium has increased every year. For example, in 2012, 54 KM groups presented the KM practices and innovation for best practices selection in the 29 th RTAF Quality Development Contest Symposium. In 2013, 94 KM groups presented the KM practices and innovation for best practices selection in the 30 th RTAF Quality Development Contest Symposium (the RTAF quality development evaluation subcommittee, 2013). In 2014, 100 KM groups presented the KM practices and innovation for best practices selection in the 31 th RTAF Quality Development Contest Symposium. The name of CoP, the name of organization, and the work that won the awards from 2008 to 2013 are also shown in Table 2.1.

An example of KM team or CoP is “Get Smart” , the KM team in Bhumibol Adulyadej Hospital . “Get Smart” invented the product innovation as new equipment called Posture Examination equipment instead of buying the “Digidoso” equipment for physical therapy. The cost of the new inventory equipment is only about 1,000 baht. On the contrary, the cost of the Digidoso equipment is about 11 million baht. Thus, the operational cost is reduced.

Another example is “The RTAF Medical Logistics Management Information System CoP”, Directorate of Medical Services, RTAF, that presents the process innovation as new operational processes by applying Logistics Management Information System (LMIS) of RTAF which reduces steps of issue processes (processes for medical supplies distribution) from 6 to 3 steps; thus the operational time is reduced. The old process required many processes and operational time and cost. At present, the amount of paper for each issue transaction is also reduced from 6 to 2 sheets of paper; thus the operational cost was reduced.

Table 2.1 The List of the Winners in RTAF Quality Development Contest Symposium from 2008 to 2013

Year	Winner: Name of CoP and organization	Title of Awarded Work
2008	RTAF Medical Logistics Management Information System CoP, Directorate of Medical Services, RTAF	Knowledge management of RTAF Medical Logistics Management Information System CoP
2009	Moving Forward, Directorate of Civil Engineering, RTAF	Knowledge management system for construction
2010	LONG DO from Directorate of Aeronautical Engineering, RTAF	Development of checking and maintenance of BT-67 Fire Extinguisher
2011	The Power of Knowledge, Wing 6	Development of searching system for official documents through the internet network by constructionism
2012	Cobra Team Spirit, Wing 4	Data and Knowledge Management to MLU
2013	Gripen Team, Wing 7	Make Knowledge Visible

Source: RTAF, 2008-2013.

Also, "Cobra Team Spirit", the KM team of Wing 4 created technological innovation "Cobra Web" which provided data and knowledge management for Mid-Life Update of F-16 aircraft (F-16 MLU). F-16 is one of the fighter aircraft. KM for F-16 MLU of Wing 4 has been practiced to accumulate the body of knowledge of F-16 MLU.

"Gripen Team", the KM team of Wing 7 applied a software program with suitable knowledge protection to make knowledge "visible" or known and accessible for all RTAF pilots who fly "Gripen" aircraft. "Gripen" is the most modern type of

RTAF fighter aircraft. And such new information technology reduce time and steps of flight missions, such as flight plans, tests and knowledge transfer for pilots.

"The Nest", a CoP of Civil Engineer Directorate, RTAF has created a new practical program for sharing and access of information and knowledge of building or construction. By this program, administrators and other related workers are able to know and share the body of knowledge of construction and related information, such as whom the present process is and what status of work is. Private companies which supply building material and equipment can access to give details about their goods. Thus, the time for searching of essential information is reduced. And the budget to hire a programmer can be saved.

"Hercules", the KM team of Wing 6 has created an innovation for services through KM practices. C-130 or "Hercules" is an aircraft for military transportation. The new service maintenance system increases the fully mission capability (FMC) status of C-130 to meet the requirement of RTAF and customer satisfaction.

KM practices in RTAF organizations and the innovation lead to better OP and support the RTAF operations in the times of crises and disasters. As Air Marshal Yanyong put it, "KM practices of RTAF organizations and the resulted innovation certainly have a positive effect on the RTAF mission in crises or accidental conditions which are one of the core mission of RTAF". While Air Marshal Twidanes emphasized that "KM practices of RTAF organizations and the resulted innovation certainly and largely have a positive effect on the RTAF mission in times of crises or accidental conditions, such as the RTAF mission to assist people in disasters". To illustrate, at the beginning of August, 2014, RTAF established the RTAF disaster assistance center for readiness of real time responsive operations to assist people in the times of crises and disasters. Air Vice Marshal Chawarat Marungruang, Director of Personnel, RTAF, said on June13, 2014 that "KM practices in RTAF organizations will largely support the RTAF mission in the times of crises and accidental conditions. When the persons had direct well-managed experience in crises, and related the story to others, they shared their tacit knowledge from the learned lessons to be the explicit knowledge of the organization. Then if the crisis happens again, the organizational knowledge will be a guideline for success of new operations". Air Marshal Twidanes said that "If there is a plane crash or tsunami, the

knowledge of how to control the situation is required. So personnel should practice KM by testing and after-action-reviewing to gain essential knowledge to use in accidental conditions. KM practices in RTAF organizations will raise the readiness of personnel for operations in all conditions, whether it is a normal or critical condition". Many administrators also confirmed the usefulness of KM in the RTAF mission in response to disaster at all levels--local, national, and international level. For example, RTAF medical services support the combat mission and humanitarian assistance at all levels. However, an administrator argued that KM practices of RTAF organizations and the innovation do not really support the RTAF operations in crises and disasters.

Other organizational benefits of KM practices in RTAF organizations are transformation of organizational culture and good relations in informal society, systematic thinking, a better promotion system and quality of life, organizational benefits and social benefits. KM practices in RTAF organizations lead to change of organizational culture and good relations in informal society. Air Chief Marshal Prajin stated that "other results of KM practices are good relations in informal society or closed relations between the sender and the receiver of messages, resulted in a cooperation network, a faster cycle of coordination, more understanding of conveyed information, more informal words or statements for communication". Such a result of KM practices best fits the present work in a dynamic condition. Other result of KM practices in RTAF organizations is systematic thinking. Air Vice Marshal Chawarat said that "the other result of KM practices of RTAF organizations is systematic thinking in organizing the body of knowledge of staffs and groups in the organization". Additionally, Air Marshal Yanyong assumed that "KM practices in RTAF organizations also lead to transformation of organizational culture, organizational management, personnel development, welfare and promotion". The unity of personnel for organizational benefits and social benefits also results from KM practices in RTAF organizations. Air Marshal Twidanes stated that "KM practices in RTAF organizations certainly benefit the society, depending on the role of the organization, especially the organization which have great influence on its people, such as, Bhumibol Adulyadej hospital and Directorate of Civil Affair RTAF".

The researcher has been involved in many KM activities of RTAF for 8 years, and has until now been head of CoP, a lecturer, an evaluator and a member of related

subcommittees. The work of CoP won an excellent award in the RTAF Quality Development Contest Symposium in 2008. Since 2006, the researcher has been interested in KM because the lectures on KM delivered by Professor Tippawan Lorsuwananrat at National Institute of Development Administration have been applicable to RTAF work. In addition, the researcher investigated the KM of Directorate of Medical Services, RTAF for the fulfillment of Master of Public and Private Management and for certification of Air War College. In 2009, the KM research won a research award granted by Air War College.

Meanwhile, RTAF began to apply the Logistics Management Information System (LMIS) for all RTAF logistic organizations. The operators in the Directorate of Medical Services, RTAF had some operational problems in using a new program for medical logistics and asked the researcher for assistance. To solve the operational problems, the researcher established the "RTAF Medical Logistics Management Information System CoP". The experts from Logistic Center, RTAF and medical logistic operators of every RTAF organizations around the country have been invited to join the CoP's meetings. From 2006 to the present, the meetings have solved many operational problems through brain storming. In 2008, the researcher presented the work of CoP in the RTAF Quality Development Contest Symposium and won the excellent award. Then, the researcher had an opportunity to attend the international quality development meeting in China. Besides routine work, the researcher was invited to join the subcommittees of RTAF related to KM and to be a lecturer and an evaluator. Since 2009, the researcher has travelled around the country to give KM lectures and to evaluate KM works of RTAF organizations.

2.4 Knowledge Management Practices of Other Forces

In the military context, knowledge management practices including knowledge creation and knowledge conversion, knowledge content and assets suitable for operations are the requirements of knowledge management (McIntyre, Gauvin and Waruszynski, 2011). Lungu (2011) proposes the concept of knowledge management in the military context as an essential resource for military

organizations' full range of operations from combat to humanitarian assistance in environmental changes. Since knowledge management fostered knowledge flow into and within organizations, organizational performance resulting from knowledge management was composed of 1) improvement of decision-making processes, 2) improvement of quality and responsiveness, 3) improvement of efficiency and effectiveness, 4) operational sustainability, 5) common capabilities strengthening. And the success of knowledge management in military organizations was evaluated by 1) the capacity to sustain operations, 2) new capability development and application, and operational methods improvement.

In the United States of America, the military services have recognized the benefits of knowledge management from online knowledge portals, such as the Navy Knowledge Online portal. Knowledge is more rapidly accessible to the war fighter. Knowledge is shared in training contexts or communities of practice or discussion forums. Knowledge is exchanged via social media, internet videos and collaborative forums in the Army's networks, too. In the past, knowledge capturing was manually performed. But at present knowledge is captured by technological tools and knowledgebase. The success of knowledge management programs has resulted from organizational culture change by applying Virtual work environments, or virtual office or a collaborative workspace is the heart of successful knowledge management programs. Thus, the right knowledge goes to the right person at the right time and place. The chief knowledge officer (CKO) provides the overall guidance and direction for knowledge management in the Army to develop and deliver the operational and technical expertise for war fighting functions, requirements, future capabilities and training delivery. Thus, KM is a key success to achieve the organizational goals (Lamont, 2011).

The U.S. Air Force established KM centers Air-Force-wide to create innovations. Consultants, trainers and facilitators facilitate KM practices. One American pilot says that real innovation can happen when process improvement and technology are connected, new technology is applied to old processes, and the process itself is improved to enhance mission effectiveness. One pilot KM center reinvented a process for producing the letter of appointment by Microsoft Share Point capabilities, which can reduce time and resources (Jaggers, 2014).

Air Force Training Command, Ministry of Defense, Singapore, uses a training development system which is composed of KM, CoP and benchmarking and networking to support the Centre for Learning Excellence. Active learning pedagogies are adopted to improve knowledge and skills of air men (Singapore, Ministry of Defense, 2014).

Knowledge management of the Royal Thai Army is periodically evaluated. KM work entitled " Civil engineer bridge for disaster relief" won the excellent KM award. And KM work entitled " Application of a new water pump to reduce the cost of energy" won the KM innovation award. Information technology provides more rapid and efficient access, distribution and exchange of knowledge. At present, KM through ICT brings advantage to the network centric operation of the Royal Thai Army (Royal Thai Army, 2014).

The KM Naval Education Department is an example of knowledge management of the Royal Thai Navy. Core knowledge for supporting the strategic goal is identified and categorized in KM tree mapping. Naval KM Day was held in August, 2014 to present KM awards for innovative work. The examples of innovation are new bullet proof vests produced from X-ray films and a new software program for ship maintenance (Fleet Command, Royal Thai Navy, 2014).

2.5 Chapter Summary

In this chapter, RTAF's organizational context and history are described. Its mission, vision, strategy, policy, structure and knowledge management practices are presented. Knowledge management practices of other Forces in Thailand and other countries are also described.

CHAPTER 3

LITERATURE REVIEW

Related concepts and theories are reviewed in this chapter to clarify the constructs and then to formulate the conceptual framework, the model, and the hypotheses. The concepts and theories to be reviewed include the concepts of KM practices, innovation and OP.

3.1 Organizational Performance

An organization will be successful or not depends on its performance. Measuring its OP can help the organization in determining efficient competitive strategies (Zack, 1999). So the OP measurement is essential. Nicholas (2010) mentioned that the purposes of measurement are as follows: 1) to evaluate the organizational performance, 2) to make sure that subordinates are doing the right thing, 3) to do budgeting or to decide what programs or projects the public's money should be spent on, and 4) to motivate and promote the personnel. Five types of performance measures adapted from Nicholas (2010) are shown in Table 3.1.

The OP measurement varies depending on the organizational structure. The organizational performance evaluation of machinery-structured organizations focuses on efficiency and input. The organizational performance evaluation of organic organizations focuses on effectiveness. At present, many organizations include excellence, quality, continuous improvement, good governance, and corporate social responsibility in their OP measurement (Tippawan Lorsuwannarat, 2013). Sveiby (1998) measured OP by evaluating intangible assets or intellectual capital of the firm. In addition, Lee, Lee and Kang (2005) invented the customer satisfaction index to measure the past, present and future performance of the firm. OP can also be measured by the knowledge management performance index (KMPI) which includes

the financial indicators such as stock price, price earning ratio, and research and development expenditure **(**Lee et al., 2005**)**.

Table 3.1 Types of Performance Measure

Types	Details and Uses
Citizen Satisfaction Measures	The extent to which citizens feel that their needs have been met by a program
Outcomes, or Effectiveness Measures	The extent to which goals are attained, needs are met, and desired effects are produced
Service Quality Measures	Valued –based assessments of management's responsiveness to clients' needs or expectations, focus on timeliness, accuracy, and courtesy
Unit Cost, or Efficiency Measures	The monetary expense per unit of output or workload
Workload, or Output Measures	The amount of work performed or service provided

Source: Adapted from Nicholas, 2010.

OP are usually measured on the basis of the achievement of organizational objectives or goal-- how well an organization accomplishes organizational objectives or an organization's efficiency and effectiveness of profitability goal achievement (Venkatraman and Ramanujam, 1986; Robbins and Coulter, 2002; Anderson, 2006), or the quality and quantity of organizational work accomplishment (Schermerhorn, Hunt and Osborn, 2002).

In previous research, different dimensions of OP were measured. For example, Steer (1975) measured OP in three dimensions: financial performance, business performance and organizational effectiveness, while Tippins and Sohi (2003) divided OP into four dimensions: relative profitability, return on investment, customer retention, and total sales growth. In Ho's study (2008), two dimensions of OP--financial performance and market performance—were measured. OP also consists of three dimensions (Akroush and Al-Mohammad, 2010): market, customer (creating

satisfied and royal customers by organizational capabilities for new quality products), and financial performance. Market was measured by contribution to organizational non-financial assets, organizational ability to develop new services, and organizational image. Customer was measured by customer satisfaction, loyalty, and ability to attract new customers. Financial performance was measured by return on investment, profitability, market share, and contribution to organizational financial assets.

OP can be measured by market performance: organizational marketing ability, total growth in sale, and total profitability (Delaney and Huselid, 1996). Market performance refers to 'the extent to which the organization performs in market share, profit ratio, and customer satisfaction (Ho, 2008). According to Hsiao, Chen and Chang (2011), organizational performance is measured by profitability and sales growth, cash turnover, financial goal achievement, and risk management (Venkartraman and Ramanujan, 1986; Dyer and Reeves, 1995). Organizational performance is the measurement of how well a firm can achieve its organizational goals or objectives (Ho, 2008).

When OP is defined as quality and quantity of work achievement (Schermerhorn et al., 2002). Gharakhani and Mousakhani (2011), defined OP by using various dimensions.

OP can be measured by both financial and market measures, such as return on investment, market share, profit margins, growth of sales, return on assets and return on equity (Morales et al., 2011). OP can be measured by 'sale generation, logistics cost decrease, improved staff productivity, and improved customer service (Jin-Nan et al., 2011) and 'customer retention' (Tippins and Sohi, 2003). OP is measured by 'innovation, rate of new product development, customer satisfaction, customer retention, and operating costs' (Zack et al., 2009). OP may be measured by performance, productivity and competitiveness, decision making, responsiveness, innovation, product/service quality, learning curve, employee retention, flexibility and cost efficiency (Wei, Choy and Yew, 2007). Khalifa, Yu and Shen (2008) measured four IT-enabled organizational benefits of OP (DeLone and McLean, 1992, 2003) which were profitability, market shares, supply chain efficiency, and customer responsiveness.

However, when OP is defined as how well an organization accomplishes organizational objectives (Venkatraman and Ramanujam, 1986). It can be measured as 'an organization's efficiency and effectiveness of profitability goal achievement' (Robbins and Coulter, 2002; Anderson, 2006). OP also refers to the quality and quantity of organizational work accomplishment (Schermerhorn et al., 2002).

After knowledge management systems, organizational performance is measured by the improvement of 1) the capability to capture new business opportunities, 2) the capability to predict potential markets for products/services, 3) the capability to develop new products/services, 4) the capability to predict unexpected incidents and crises is, 5) the capability to rapidly adjust organizational objectives according to change in industry/markets, 6) the capability to respond to new information regarding industry/markets, 7) the capability to respond to new market demands (Lee, Kim and Kim, 2011).

OP is measured by innovation, rate of new product development, customer satisfaction, customer retention, and operating costs (Zack et al., 2009). Gharakhani and Mousakhani (2011) propose that OP can be measured by sales growth, quality improvement and customer satisfaction. Overall organizational performance is defined as the extent of product and service innovation, quality, customer satisfaction and retention, and operating efficiency (Zack, McKeen and Singh, 2009). Kruger and Johnson (2011) measured the OP by adapting the balanced scorecard and KM performance scorecard developed by De Gooijer (2000) and Lee et al. (2005) to measure eight dimensions of OP (profitability, liquidity, leverage, shareholder satisfaction, growth, intangible value, customer satisfaction, and employee satisfaction).

Since knowledge is an intangible asset which affects the OP or organizational success (Drucker, 1988), the financial measures may not accurately the OP.

Kaplan and Norton (1992) present the Balanced Scorecard (BSC) which can evaluate the organization in both financial and non financial dimensions. The BSC approach will balance the financial objective and the intangible assets (organizational learning and growth), outside organization dimension (stakeholders and customers) and the inside organization dimension (internal process). Of course, approximately 50-80% benefit of an organization is derived from intangible assets. BSC approach

appraises four dimensions: financial, customer, internal process and learning. First, how the organization response to stakeholders is accessed in the financial dimension. Second, the customers' evaluation is valued in customer dimension. Third, the best performance is evaluated in internal dimension. Fourth, the continuous development of the organization is valued in learning and growth dimension. The direct coherence of learning and operational processes is one of the advantages of the BSC approach. In a word, the BSC approach is accepted as an effective measure of organizational performance.

In the researcher's opinion, organizational performance evaluation has three dimensions: 1) internal process dimension measuring organizational efficiency (Robbins and Coulter, 2002; Anderson, 2006; Ho, 2008) or output which are resulted from operations by innovations, 2) customer dimension measuring the customer's satisfaction (Ho, 2008; Zack, McKeen and Singh, 2009) resulting from the responsiveness to new products or services that meet the customer's need, and 3) stakeholder dimension measuring organizational outcomes, or effectiveness (Robbins and Coulter, 2002; Anderson, 2006; Ho, 2008), or ultimate goal or vision achievement (Kaplan and Norton,1992; Lee et al., 2005), or the capability to respond to unexpected incidents and crises (Adapted from Lee, Kim and Kim, 2012).

3.2 Knowledge Management Practices

Polanyi (1966) states that knowledge can be divided into two types: theoretical (internal action, or tacit) and practical (external action, or explicit). Basic theory of organizational knowledge creation classifies knowledge into two categories or types (Nonaka, 1994).

Tacit knowledge is knowledge embedded in the human brain and based on action, practice, experience, skill and belief. Tacit knowledge is an individual's expertise (Stein, 1992), competence (Andreu and Ciborra, 1996) and job experience (Kirsch and Cummings, 1996). Because it is individual, subjective, and difficult to formalize, codify and communicate, transferring tacit knowledge requires high cost and long time (Nonaka, 1994; Grover and Davenport, 2001). Of course, tacit knowledge is the art of expertise, skill, and experience which is difficult to tell or

communicate, and unable to specify (Polanyi, 1966). As a result, tacit knowledge provides a sustainable competitive advantage for an organization and can be explained by the statement "we can know more than we can tell" (Polanyi, 1966: 4, 1968). Since tacit knowledge is subjective and intangible, it cannot be exactly evaluated (OECD, 1996a, 1996b). Knowing and solving difficult problems required tacit knowledge because tacit knowledge is essential for sensing the hidden reality behind the problems and also forecasting the future problems. Thus, tacit knowledge is the most valuable resource for organizations because it results in sustainable competitive advantage (Polanyi, 1966). In summary, tacit knowledge is beneficial for solving problem, guiding the sense of approach before finding the explicit solution or scientific knowledge, and forecasting the end of the finding (Polanyi,1966). Moreover, tacit knowledge cannot be substituted by explicit knowledge.

Explicit knowledge is codified knowledge or leaky knowledge which is objective and easy to formalize and communicate by formal languages (Polanyi, 1966). Explicit knowledge can be collected, systemized and transferred by information technology (Polanyi, 1966). To illustrate, explicit knowledge can be transferred to machines (Schultze and Leidner, 2002) as memory (Stein and Zwass, 1995; Wijnhoven, 1999) and information (Hightower and Sayeed, 1996). Western companies have concentrated on explicit knowledge (Nonaka, 1994; Grover and Davenport, 2001). Furthermore, explicit knowledge can be accurately evaluated. In a word, both categories of knowledge are essential for organization. Explicit knowledge is external knowledge shown as paper or electronic documentation, while tacit knowledge is internal knowledge (Nonaka, 1994).

Knowledge management is explained as a spiral of knowledge transforming between tacit and explicit knowledge (Nonaka, 1994). Explicit knowledge can be clearly shown, while tacit knowledge cannot be clearly shown. In the dynamic context, organizations require creative-based thinking of high quality human resources to respond to customer's needs and satisfaction. Such qualified human resources could integrate old knowledge with new knowledge by knowledge management to obtain more applicable knowledge (Teece, 1998). Thus, knowledge management can be defined as the ability of organization to create, transfer, assemble, integrate, and exploit knowledge assets (Teece, 1998). Nicholas (2010) defines

knowledge management as the managing of the public's information resource or knowledge to improve the efficiency and effectiveness of the organization such as governmental organization. In sum, transferring tacit knowledge to explicit knowledge and vice versa are essential for organization to create new knowledge for problem solving**.**

Effective knowledge management can achieve OP (Lee and Sukoco, 2007). According to Davenport and Prusak (1998), the objectives of knowledge management are to indicate the role of knowledge in organizations, to improve knowledge culture, to create knowledge infrastructure, and to formulate structural base of knowledge for recruitment, rotation and reward systems (Davenport and Prusak, 1998). In addition, the objectives of knowledge management also include 1) to realize the value of personal and organizational knowledge, and to utilize knowledge in order to maximize effectiveness (Bennett and Bennett, 2003), 2) to develop knowledge-intensive culture: knowledge sharing will and knowledge management engagement at all levels of organization (Tippawan Lorsuwannarat, 2006), and 3) to manage knowledge systematically by using information technology (Tippawan Lorsuwannarat, 2005).

Knowledge and action are key success factors of organizations due to appropriate penetration of knowledge management into many different functions and processes of organization. The results of knowledge management are indicated in previous research. Networking knowledge from the process of organizational knowledge creation results in organizational development (Nonaka, 1994). And organizational ability to create and transfer knowledge can lead to the advantage of organization (Ghosal and Moran, 1996), similarly, knowledge management may lead organization to obtain more applicable knowledge (Teece, 1998), and organizational competitiveness (Grover and Davenport, 2001; von Krogh, 1998).

Many organizations realize the effective management of intellectual resources or the management of knowledge leads to the competitiveness of many organizations (Grover and Davenport, 2001). And knowledge management should penetrate into many different functions and processes of the organization (Grover and Davenport, 2001).

In conclusion, knowledge management can be defined as the management of information resource or knowledge resource to improve the organizational performance. Knowledge management may improve organizational processes, and both individual and organizational performances (Lungu, 2011).

Grover and Davenport (2001) indicate knowledge management tools such as: 1) best practices, 2) lesson learned, 3) learning histories, 4) knowledge "yellow pages" to contact knowledgeable persons. "Yellow pages" may be the gateway to reach tacit knowledge of experts or experienced persons who can advise, consult or exchange knowledge (Earl, 2001). "People finder" for consultants database benefits by "person-to-person communication" (Hansen, Nohria and Kierney, 1999) or people connection (Earl, 2001). "Knowledge mapping" or "knowledge directories" or "on-line directory of expertise" which may be updated by experts themselves offers the sources of experts or knowledge possessors in different fields (Earl, 2001). Knowledge sources can be accessed through the extranet, intranet and internet which connect together people who are interested in the same field of knowledge (Earl, 2001). Having access to expertise and facilities leads to organizational ability to build and strengthen skills and knowledge needed to advance new technologies (Patthareeya Lakpetch, 2010).

Community of Practice (CoP) is also a tool for knowledge management. CoP is a group of individuals from inside and outside organizations attempting to solve organizational problems by providing links among individuals to support useful information for achieving knowledge, innovation, and vision (Nonaka, 1994). CoP also plays significant roles in organizational knowledge creation processes (Brown and Dugaid, 1991) and leads to short term benefits of CoP, which is the stimulation of knowledge sharing and feedback for decisions and long-term benefits of CoP, which is the development of organizational capability (Bennet and Bennet, 2003). Members of a knowledge community also provide and maintain knowledge (Earl, 2001). Furthermore, learning movement of CoP is beneficial for knowledge flowing through networks of persons in the organization who have the same interest in the same or different organizations (Grover and Davenport, 2001). Knowledge is a property of communities of practice (Brown and Daguid, 2001) or networks of collaborating organizations (Powell and Brantley, 1992). In other words, an

important source of knowledge creation may be networks of collaborating organizations. Thus, communities of practice, both inside and outside the organization, perform creative work to serve customer's needs and lighten the world with wisdom (Marquardt and Reynolds, 1994). When challenges are questioned through a forum, the experts or the other persons in the forum solve the problem through that forum. The success of selecting knowledge management tools is contingent, depending on the affordable structure of organization, information technology, and prepared staffs. To conclude, community of practice is a group of persons from inside or outside the organization who have the same interest in solving the operational problems by using knowledge forums to create and share knowledge for decisions and actions.

The strategic management of a firm can be explained by knowledge-based perspective (Penrose, 1959; Barney, 1991; Corner, 1991; Nonaka and Takeuchi, 1995). Organizations will take action to obtain essential knowledge (Pfeffer and Salancik, 1978). As a consequence, they require a strategy which is best fit them and their environment (Barney, 1991).

Strategic alliances and joint ventures are inter-organizational initiatives for sharing technologies and knowledge (Betz, 1996). Strategic organizational learning requires the performance of knowledge management to update the strategy and to support the satisfaction of customers and stakeholders (Sveiby, 1998). Top management must have the direction or shared corporate vision (Quinn, 1992) for joint knowledge-creating activities to be done by the employees. To sum, knowledge management can link strategic, tactic and operational management which manage knowledge to address the operational challenges, support the objective of tactic management and achieve organizational vision of strategic management**.**

A good example of creating organizational knowledge is innovation (Nonaka, 1994). Innovation is a process to create new knowledge for organizational problem-solving. Thus, the organization should investigate organizational knowledge and information creation process. While individuals create new knowledge, organizational supports foster the knowledge creation. Knowledge of an organization is created by four patterns of continuous transformation between tacit and explicit knowledge (Nonaka, 1994). Four processes of knowledge management are socialization,

externalization, combination and internalization. The spiral model of continuous knowledge creation (SECI Model) is shown in Figure 3.15 and Table 3.3. To sum up, knowledge transforming between tacit and explicit knowledge creates knowledge (Nonaka, 1994).

SECI Model (Takeuchi and Nonaka, 2004; Nonaka,1994) explains the dynamic transfer between tacit knowledge and explicit knowledge, as shown in Table 3.2. Nonaka (1994) indicates a spiral model of continuous knowledge creation by dynamic transformation process between tacit and explicit knowledge. There are four continuous modes of the spiral model.

Socialization (S) is to converse from individual tacit knowledge (or implicit knowledge such as experience, technical skills, vision, values and guidelines) to individual tacit knowledge by communication (conversation or training) or languages (Nonaka,1994; Takeuchi and Nonaka, 2004).

Externalization (E) is to transfer individual tacit knowledge to explicit knowledge by documentation, books, electronic media or visualization aids (Nonaka,1994; Nonaka and Konno, 1998).

Combination (C) is to change from explicit knowledge to new refined and systematized explicit knowledge available for all organizational units by utilizing tools such as information technology (Nonaka,1994).

Internalization (I) is to convert from organizational explicit knowledge to individual tacit knowledge.

Individual tacit knowledge will be shared by socialization as the first step of four spiral processes of knowledge management. In the next loop of four continuous modes of knowledge creation, interactions of tacit and explicit knowledge become stronger and faster than the previous loop (Nonaka,1994). Then, networking knowledge from the process of organizational knowledge creation is continuously created and is beneficial for organizational development (Nonaka, 1994). Knowledge creation is essential for organizational development, specifically industrial and business development (Nonaka, 1994).

A common place or space for knowledge creation is called " ba" (Nonaka and Konno, 1998). Four types of "ba" are originating"ba", interacting"ba", cyber "ba" (virtual space for combination), and exercising "ba" which are corresponding to four

modes of knowledge creation (socialization, externalization, combination, and internalization (Nonaka and Konno, 1998).

Table 3.2 SECI Model

Socialization (S) converses individual tacit knowledge to individual tacit knowledge by communication (conversation or training) or language.	Externalization (E) transfers individual tacit knowledge to explicit knowledge by documentation, books, electronic media or visualization aids.
Internalization (I) converts from organizational explicit knowledge to individual tacit knowledge.	Combination (C) changes from explicit knowledge to new refined and systematized explicit knowledge available for all organizational units by utilizing tools such as information technology

Source: Adapted from Nonaka, 1994: 14-37; Nonaka and Konno, 1998: 40-55.

Knowledge management is a process of knowledge generation, knowledge capturing and codification, and knowledge transfer (Tippawan Lorsuwannarat, 2005, 2006).

Knowledge creation and acquisition or knowledge generation (Tippawan Lorsuwannarat, 2005) building relationships between persons or groups or networks (Holsapple and Joshi, 2001; Brown and Dugaid, 1998; Davenport and Prusak, 1998) includes: 1) members of problem solving team who have different points of view, 2) search for operators who have a drive for learning new things, 3) formulation of informal or formal organizational knowledge networks to share knowledge rapidly and widely, 4) trial and error, 5) research and development, 6) shared problem solving or improvement through network.

Knowledge storing in suitable forms and knowledge easily accessed by information technology. This process may be called knowledge capturing and codification (Tippawan Lorsuwannarat, 2005).

Knowledge sharing inside and outside organizations (Laudon and Laudon, 2002). This process can be called knowledge transfer (Tippawan Lorsuwannarat, 2005). Networks enhance knowledge to transfer among members.

Knowledge utilization which suit the organizational context (Fahey and Prusak, 1998) or "Think Globally, Act Locally" (Drucker, 1998a, 1998b). Thus, the organization should first realize, understand new universal knowledge and then apply it in the organization.

Grover and Davenport (2001) introduce a cycle of three processes of knowledge management: 1) knowledge generation to obtain and develop knowledge, 2) knowledge codification to convert knowledge into the accessible and applicable knowledge. In addition, knowledge codification is the validation to convert knowledge into the official knowledge or the validation by coworkers or experts (Earl, 2001), 3) knowledge transfer and realization.

However, Teece (1998) indicates various processes of knowledge management, such as knowledge sharing, knowledge embedding and knowledge transferring across organizations. According to Sveiby (1998), knowledge management processes for performance consists of five processes: knowledge creation, knowledge accumulation, knowledge sharing, knowledge utilization, and knowledge internalization. Continuous processes create powerful knowledge helixes. However, in another research **(**Lee, Lee and Kang, 2005), knowledge management consists of five processes: knowledge creation, knowledge accumulation, knowledge sharing, knowledge utilization, and knowledge internalization. Other research studies indicate that a knowledge management process covers the knowledge creation, knowledge representation, knowledge storage, knowledge transfer, knowledge alteration, knowledge use, knowledge embedding, and knowledge protecting (Hedlund, 1994; Pentland, 1995; Alavi and Leidner, 2001; Schultze and Leidner, 2002).

Furthermore, knowledge management practices can be divided into three stages which are knowledge obtaining, knowledge organizing and knowledge applying (Niu, 2010);

1) Knowledge obtaining is constructed by knowledge acquisition and knowledge creation. The key notion of knowledge acquisition is an organization's

attempt to obtain information and/or knowledge from external sources (Cohen and Levinthal, 1990; Huber, 1991; Levinthal, 1991; March, 1991; McDermott, 1999; Crossan, Lane and White, 1999; Duffy, 2000; Niu, 2010). On the other hand, the key notion of knowledge creation is an organization's attempt to create information and/or knowledge from internal sources (Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998; Crossan et al., 1999; March, 1991; Niu, 2010).

2) Knowledge organizing is constructed by knowledge refining, knowledge storing, and knowledge distributing. The key notion of knowledge refining is an organization's adding a value to newly obtained information and/or knowledge by filtering, categorizing, integrating, codifying, and indexing for easy examination and access (Huber, 1991; March, 1991; Crossan et al., 1999; Zack, 1999; Niu, 2010). The key notion of knowledge storing is an organization's attempt to store and save information and/or knowledge after refining for future use/reuse (Huber, 1991; Crossan et al., 1999; Zack, 1999; Duffy, 2000; Niu, 2010). The key notion of knowledge distributing is an organization's internal information and/or knowledge sharing across functional units (Huber, 1991; Crossan et al., 1999; Zack, 1999; Pfeffer and Sutton, 2000; Niu, 2010).

3) Knowledge Applying. The key notion of knowledge applying is an organization's value creating activity by using information and/or knowledge (Tushman and Romanelli, 1985; Pfeffer and Sutton, 2000; Wong and Radcliffe, 2000; Gold et al., 2001; Niu, 2010).

However, there are 7 processes of knowledge management in Thai government organizations including RTAF (RTAF, 2013c), Office of the Public Sector Development Commission (OPDC, 2013).

1) Knowledge identification can be defined as the identification and selection of essential and proper knowledge for the organization to manage and evaluate whether the organization has that essential and proper knowledge

2) Knowledge creation and search can be defined as the search for the sources of the knowledge and the ways to collect the knowledge.

3) Knowledge systemization can be defined as the summarization or classifying the knowledge into groups and subgroups by manual or applying program for conveniently knowledge access.

4) Knowledge codification and refinement can be defined as the arrangement of knowledge into suitable forms for the organization and the correction of knowledge by experts.

5) Knowledge access can be defined as the rapid access of the acquired knowledge by the proper media or multi - channels.

6) Knowledge sharing can be defined as the distribution of knowledge through many activities of community of practice (CoP), the mentoring system, after action review, etc.

7) Knowledge utilization can be defined as the application of the knowledge to create useful effects for organization and the knowledge network enlargement.

Knowledge is 'information combined with experience, context, interpretation and reflection that is ready to apply to decisions and actions' (Davenport et al., 1998). It is the most strategic resource of the organization (Zack, 1999). Then KM, which is concentrated on processes, mechanism and the ability to locate and share internal best practices, is essential for overall organizational performance (Szulanski, 1996; Davenport and Prusak, 1998). And KM is also focused on utilizing external knowledge for new product innovation (von Hippel, 1994) and organizational performance (Sher and Lee, 2004). Organizational culture, the most important factor for fostering or inhibiting KM (Davenport, De Long and Beers, 1998; Lee and Choi, 2003), is what the organization values for what the employees know and rewards for knowledge sharing.

KM capability of a firm is composed of knowledge infrastructure capability and knowledge process capability. Both knowledge infrastructure capability and knowledge process capability are positively related to organizational performance (Gold, Malhotra and Segars, 2001). Knowledge infrastructure capability includes technology infrastructure, organizational structure and organizational culture (Davenport and Volpel, 2001; Paisittanand, Digman and Lee, 2001), whereas knowledge process capability includes knowledge acquisition, knowledge conversion, knowledge application and knowledge protection (Alavi and Leidner, 2001; Gold et al., 2001).

According to Marquardt (1996), four components measuring KM capability (KMC) are knowledge acquisition, knowledge creation, knowledge storage, and

knowledge transfer and application. Similarly, four components of KMC are proposed as knowledge acquisition, refinement, storage, and retrieval (Zack, 1999). Four-step process of KM are also indicated by Tanriverdi (2005) as knowledge creation, knowledge transfer, knowledge integration, knowledge leverage. Also, four categories of KMC is suggested by Cepeda and Vera (2007) as knowledge creation, knowledge transfer, knowledge retention, knowledge utilization. KM in organizations is also d as knowledge creating, storing, retrieving, transferring and applying (Alavi and Leidner, 2001). Five measures of KMC also presented by Gottschalk (2006) as knowledge sharing, knowledge distributing, knowledge creating, knowledge capturing, and knowledge understanding. Furthermore, a multi-business firm concept divides KMC into KM within the business unit and KM across the business units (Tanriverdi, 2005). Ho (2008) classifies KMC into three factors: learning and obtaining, knowledge sharing, knowledge creation and improvement.

A KM process refers to 'something that can be done with knowledge in an organization' (Johannsen, 2000). However, two dimensions for measuring KM as reviewed by Kruger and Johnson (2011) which are activities (knowledge creation and innovation, knowledge exchange, knowledge capture, knowledge re-use, and knowledge internalization), and the enable or supporting knowledge creation activities (strategy, measurement, policy, content, process, technology, and culture.

Additionally, knowledge management, which is 'the processes and mechanisms for acquiring and disseminating knowledge within organization or from its external stakeholders' (Davenport and Prusak, 1998), can enhance organizational effectiveness (Scarbrough, 2003). In the same way, knowledge management capacity may lead to firm performance. Hsiao, Chen and Chang (2011) focus on two mechanisms of knowledge management which are knowledge acquisition and knowledge dissemination. Knowledge acquisition refers to 'the activities of acquiring knowledge from external environment to create new knowledge' (Holsapple and Singh, 2001) and it leads to organizational performance (Chen, 2004). And knowledge dissemination refers to 'the mechanism related to the diffusion of knowledge within an organization' (Yang et al., 2006) and knowledge dissemination leads to organizational performance (Darroch, 2005). KM are composed of

knowledge acquisition, knowledge sharing and knowledge application (Gharakhani and Mousakhani, 2012).

Knowledge acquisition is the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities (Quinstas et al., 1997). Knowledge acquisition is also defined by Huber (1991) as 'the process by which knowledge is obtained'. Two ways of knowledge collection are 1) to seek and acquire new knowledge, or 2) to create new knowledge out of old knowledge through cooperation between business alliances and individuals (Nonaka and Takeuchi, 1995; Leonard, 1995). Collaboration among other organizations supports knowledge acquisition (Grant, 1996; Matusik and Hill, 1998). External sources of knowledge supply information and foster innovation (Assimakopoulos and Yan, 2006) through many channels: the internet, personnel networks and professional associations (Brown and Dugaid, 2001), external training, and recruiting other companies' staffs (Gharakhani and Mousakhani, 2012). Both external and internal sources of knowledge, e.g., outside marketplace and inside employees, lead to new knowledge creation (Yli –Renko, Autio and Sapienza, 2001).

Knowledge sharing is a social interaction or shared understanding for exchanging knowledge of both personnel or virtual networks within the organizations and in formal or informal face-to-face meetings (Hogel et al., 2003; Davenport and Prusak, 1998). Reid (2003) states that organizational knowledge sharing is the knowledge capture, organization, reuse, and transfer within the organization.

Knowledge application is the employee's knowledge usage for solving organizational problems or challenges that lead to fewer mistakes or efficiency improvement (Grant, 1996; Gold et al., 2001).

Related studies reveals that knowledge management practices have been measured by several dimensions which are integrated and classified for further clearer and more suitable definitions and measurement. A KM process or practice refers to 'something that can be done with knowledge in an organization' (Johannsen, 2000). In the study conducted by Mills and Smith (2011), the four dimensions of knowledge process capability are 1) knowledge acquisition, 2) knowledge conversion, 3) Knowledge application and 4) Knowledge protection.

However, knowledge management capability consists of three factors: learning and obtaining, knowledge sharing, knowledge creating and improving (Ho, 2008) classifies. Knowledge management practices are composed of learning and obtaining, knowledge sharing, and knowledge creating and improving (Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008). Lee, Kim and Kim (2012) state that knowledge process capabilities are categorized into 1) acquisition to enable knowledge retention, 2) conversion to allow the present knowledge to be more useful, 3) application to enable the realization of the practical values of knowledge and 4) protection to prevent the abuse of knowledge. Khalifa, Yu and Shen (2008) mention that knowledge management practices are composed of knowledge acquisition, creation, integration, transfer and application (Alavi and Leidner, 2001). Wei, Choy and Yew (2007) mention that KM process refers to three activities: construction, embodiment, and deployment. Additionally, Davenport and Prusak (1998) define knowledge management as the processes and mechanisms for acquiring and disseminating knowledge within organization or from its external stakeholders. Hsiao, Chen and Chang (2011) point out two mechanisms of knowledge management which are knowledge acquisition and knowledge dissemination. From Gharakhani and Mousakhani (2011), KM capabilities are composed of knowledge acquisition, knowledge sharing and knowledge application. Knowledge management processes are summarized in Table 3.3.

Table 3.3 Knowledge Management Process

Knowledge Management Processes	Source
-Knowledge creation and acquisition or knowledge generation -Knowledge storage or knowledge capture and codification -Knowledge sharing or knowledge transfer -Knowledge utilization	Brown and Dugaid, 1998; Davenport and Prusak, 1998; Drucker, 1998; Fahey and Prusak, 1998; Holsapple and Joshi, 2001; Laudon and Laudon, 2002; Tippawan, 2005
-Knowledge generation -Knowledge codification -Knowledge transfer and realization to use	Grover and Davenport, 2001
-Knowledge sharing -Knowledge embedding - Knowledge transferring across organizations	Teece, 1998
-Knowledge creation -Knowledge conversion -Knowledge content and assets	McIntyre, Gauvin and Waruszynski, 2011
-Knowledge creation -Knowledge accumulation -Knowledge sharing -Knowledge utilization -Knowledge internalization	Lee, Lee and Kang, 2005

To conclude, knowledge management practices can be classified into 3 processes: knowledge obtaining, knowledge organizing, and knowledge applying (Niu, 2010).

1) Knowledge obtaining is composed of knowledge acquisition, and knowledge creation

(1) Knowledge Acquisition

Knowledge acquisition refers to an organization's attempt to obtain information and/or knowledge from external sources (Cohen and Levinthal, 1990; Huber, 1991; Levinthal, 1991; March, 1991; McDermott, 1999; Crossan et al., 1999; Duffy, 2000; Niu, 2010) to fulfill organizational mission and vision. According to Lim et al. (1999), Gottschalk (2006), Cepeda and Vera (2007), and Ho (2008), knowledge obtaining means the ability of the members in the organization to understand and acquire knowledge from external and internal sources. According to Hsiao, Chen and Chang (2011), knowledge acquisition refers to "the activities of acquiring knowledge from external environment to create new knowledge" (Holsapple and Singh, 2001). Knowledge acquisition is a firm capability for knowledge identifying, acquiring, and accumulating, from both internal and external sources, for organizational operations (Gold et al., 2001). Knowledge acquisition is the critical knowledge management process to meet existing needs, to identify knowledge assets and acquire (Quinstas et al., 1997). Knowledge acquisition is also defined as the obtaining knowledge process (Huber, 1991). Two ways of knowledge collection or obtaining are to seek and acquire new knowledge, or to create new knowledge out of old knowledge through cooperation between business alliances and individuals (Leonard, 1995; Nonaka and Takeuchi, 1995). Collaboration among other organizations supports knowledge acquisition (Grant, 1996; Matusik and Hill, 1998). External sources of knowledge supply information and foster innovation (Assimakopoulos and Yan, 2006) through many channels: the internet, personnel networks and professional associations (Brown and Dugaid, 2001), external training, recruiting other companies' staffs (Gharakhani and Mousakhani, 2011). Both external and internal source of knowledge, (e.g.,: outside marketplace and inside employees) lead to new knowledge creation (Yli –Renko et al., 2001).

From the past researches (Cohen and Levinthal, 1990; Huber, 1991; Levinthal, 1991; March, 1991; Leonard, 1995; Nonaka and Takeuchi, 1995; Grant, 1996; Quinstas et al., 1997; Matusik and Hill, 1998; Crossan et al., 1999; Lim et al., 1999; McDermott, 1999; Duffy, 2000; Brown and Dugaid, 2001; Gold et al., 2001;

Holsapple and Singh, 2001; Yli –Renko et al., 2001; Assimakopoulos and Yan, 2006; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008; Niu, 2010; Hsiao, Chen and Chang, 2011; Gharakhani and Mousakhani, 2011), it can be concluded that knowledge acquisition is composed of knowledge identification, knowledge searching. Knowledge identification can be defined as the evaluation, and selection of the essential knowledge to be managed for organizational core functional mission and vision. The key notion of knowledge searching is an organization's activity to obtain information and/or knowledge for the organization's core functional mission and vision from internal and/or external sources, from tacit and/or explicit knowledge, and from personnel and/or virtual networks.

(2) Knowledge Creation

Knowledge creation means "to the extent to which the members in the organization are able to create new knowledge and enhance work behavior" (Lim et al., 1999; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008). The key notion of knowledge creation is an organization's attempt to create information and/or knowledge from internal sources (March, 1991; Nonaka and Takeuchi, 1995; Nonaka, 1998; Crossan et al., 1998; Niu, 2010).

In brief, the key notion of knowledge creation is an organization's attempt to create new knowledge (March, 1991; Nonaka and Takeuchi, 1995; Nonaka and Konno, 1998; Crossan et al., 1998; Lim et al., 1999; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008; Niu, 2010) from obtained knowledge.

2) Knowledge Organizing

Knowledge organizing is composed of knowledge refining, knowledge storing, and knowledge distributing or sharing (Niu, 2010).

(1) Knowledge Refining

The key notion of knowledge refining is an organization's value-adding process to newly obtained information and/or knowledge by filtering, categorizing, integrating, codifying, and indexing (Huber, 1991; March, 1991; Crossan et al., 1999; Zack, 1999; Niu, 2010) for easy examination and access. Grover and Davenport (2001) explains that knowledge codification is to convert knowledge into the accessible and applicable knowledge. In addition, knowledge codification may be the

conversion of knowledge into the official knowledge or the validation by coworkers or experts (Earl, 2001).

From past researches (Huber, 1991; March, 1991; Crossan et al., 1999; Zack, 1999; Earl, 2001; Grover and Davenport, 2001; Niu, 2010), knowledge refining is composed of knowledge systemizing, and knowledge integration and validation. The key notion of knowledge systemizing is an organization's value-adding process to newly obtained information and/or knowledge by categorizing, and indexing by human or information technology software for easily examination and access. The key notion of knowledge integration and validation is an organization's value-adding process to newly obtained information and/or knowledge by integration, and validation.

(2) Knowledge Storing

The key notion of knowledge storing is an organization's attempt to store and save information and/or knowledge after refining it for future use/reuse (Huber, 1991; Crossan et al., 1999; Zack, 1999; Duffy, 2000; Niu, 2010) to get rapid access to the acquired knowledge by the proper media or multi - channels. Knowledge protection includes the use of copyright and patents, user name, password, sharing protocols through information technology systems that allow knowledge to be secured (Lee and Yang, 2000). Lee, Kim and Kim, (2012: 183-203) add that knowledge protection prevent the abuse of knowledge.

From past researches (Huber, 1991; Crossan et al., 1999; Zack, 1999; Duffy, 2000; Lee, Lee and Yang, 2005; Niu, 2010; Lee, Kim and Kim, 2011), knowledge storing is an organization's attempt to store and save information and/or knowledge after refining it manual or by IT with suitable protection for knowledge access.

(3) Knowledge Sharing

Knowledge sharing means to the extent to which the organizational members use various formal and informal communication tools for knowledge sharing (Lim et al.,1999; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008). Knowledge dissemination or sharing refers to the mechanism of the diffusion of knowledge within an organization (Yang et al., 2006). Knowledge sharing is a social interaction or shared understanding for exchanging knowledge by applying both

personnel or virtual networks within the organizations, and formal or informal face-to-face meetings (Davenport and Prusak, 1998; Hogel et al., 2003). Organizational knowledge sharing is the knowledge capturing, organizing, reusing, and transferring within the organization (Reid, 2003). The key notion of knowledge distributing is an organization's internal information and/or knowledge sharing across functional units (Huber, 1991; Buckman, 1998; Crossan et al., 1999; Zack, 1999; Pfeffer and Sutton, 2000; Niu, 2010).

To conclude, the key notion of knowledge sharing is the sharing or exchanging of new knowledge in both formal or informal face-to-face meetings, through virtual networks, and between internal and external organizations (Adapted from Davenport and Prusak, 1998; Hogel et al., 2003).

3) Knowledge Applying

Knowledge application or applying is to make knowledge more active and appropriate for the organization in creating value by new products and services (Bhatt, 2001). Knowledge application or applying is the employee's knowledge usage for solving organizational problems or challenges that leads to fewer mistakes or efficiency improvement (Grant, 1996; Gold et al., 2001). The key notion of knowledge applying is an organization's value-creating activity by using information and/or knowledge (Tushman and Romanelli, 1985; Pfeffer and Sutton, 2000; Wong and Radcliffe, 2000; Gold et al., 2001; Niu, 2010).

From past researches (Tushman and Romanelli, 1985; Grant, 1996; Pfeffer and Sutton, 2000; Wong and Radcliffe, 2000; Bhatt, 2001; Gold et al., 2001; Niu, 2010), it can be concluded that knowledge applying is an organization's value-creating activity by using new knowledge.

3.3 Innovation

In the world of globalization, innovation, which is the development of new products and processes, is the fostering power for the organization (Harmaakorpi and Mutanen, 2008). In business, innovation is defined as a continuous process for new products and services or habits (Harmaakorpi and Mutanen, 2008). Knowledge is essential for learning, solving problems, and creating innovations too (Polanyi, 1966).

The ability of the firm to recognize, understand, and utilize external information and knowledge leads to its innovation of new commercial goods and services (Cohen and Levinthal, 1990). Knowledge in practice-based processes also affects the innovation (Harmaakorpi and Mutanen, 2008). Likewise, new combinations of organizational knowledge and other sources lead to new knowledge and innovation (Cohen and Levinthal, 1990; Kogut and Zander, 1992).

Innovation forms can be classified as mechanical innovation (engines and tools), new management practices, technological innovation and information innovation which depend on computer technologies. Another classification of innovation based on form is process innovation and product innovation. Innovation is also classified by the economic effects of the innovation which include cost reduction, quality enhancement and risk reduction (Sunding and Zilberman, 2000).

Schumpeter (1943) suggests that innovations can be classified in five types: product (new goods and services), process (new way or technology of production), organizational management structure or governance), input (new way of raw material sourcing) and market innovation (new market opportunities). Palangkalaya et al.(2010) also suggest five types of innovation, which are product, process, organizational, new to firm and new to world. Characteristics and types of innovation as described by OECD and European Community (2005) are of four main types: 1) product innovation, 2) marketing innovation, 3) process innovation and 4) organizational innovation. A product innovation is a new good or service of which the characteristics depend on significant improvement in software, functional characteristics, specification and/or material. An example is Global Positioning System (GPS). A marketing innovation is a new marketing method. A process innovation is a new production or delivery method of which the characteristics have changes in terms of technique, software, technology and/or equipment. An example is Radio Frequency Identification (RFID) for the goods tracking system. An organizational innovation is a new organizational method in practices, office and/or relations of which the characteristics have changes in terms of reduction of organizational cost (administrative, transaction, and/or supply stock cost), workplace satisfaction improvement, such as quality management systems, supply chain management systems (OECD and European Community, 2005). Characteristics of

innovation include advantage (a new advantage way of performing the same work) (Moore and Benbasat, 1991), ease of use and compatibility (Rogers, 1983).

Organizations develop new products, processes and services as innovations (Tether, 2002). Innovation is a new form of organizational production (processes and products). The measurement of innovation includes expenditure costs and number of new products (Palangkalaya et al., 2010).

Private organizations mostly invest in research and development for creation of innovation which is in the form of products or goods. Public organizations mostly focus on generation of innovation in other forms such as management scheme (Sunding and Zilberman, 2000).

The creation of innovation consists of three stages: 1) discovery of innovation, 2) development of innovation, and 3) production and sale of product innovation, or education, demonstration and sale innovation in the form of process innovation (Sunding and Zilberman, 2000). The phases for creating a product innovation includes research phase, development phase and commercialized phase. The phases for creating a process innovation includes research phase, development phase and application phase (Palangkalaya et al., 2010).

Knowledge sources of innovation are 1) internal source--by R&D, 2) external source--by knowledge transfer and collaboration or cooperation among organizations (Frenz and Ietto-Gillies, 2009). Knowledge creates innovation, such as new technologies. New innovations are produced in the scientific laboratory, research and development (R&D), experimentation, and field experience. Public R&D attempts to produce innovation with public-good nature (Sunding and Zilberman, 2000).

In the past, it seemed that only science and technology generated innovation (Harmaakorpi and Mutanen, 2008). Knowledge was generated and then applied for problem solving in practical operations, then innovations may happen (Harmaakorpi and Mutanen, 2008). At present, other sources of innovation has been searched. For example, social relationships and economic co-operations are also the sources of innovation. In social and economic contexts, the innovation processes create something new or innovation (Harmaakorpi and Mutanen, 2008; Howells, 2000). Since innovative processes are co-operative, networked processes, networking such

as dialogues of co-operators will enhance the environment for innovation (Harmaakorpi and Mutanen, 2008). Innovative processes are composed of many types of interactions and continuously social and organizational development which is different from the radical laboratory scientific work, and the actors in networks are from different backgrounds (education, work experience, etc.). Thus, the factors for successful sources of innovation are interacting ability, collective learning, and trust relations among partners which are different from one individual scientist's innovation (Harmaakorpi and Mutanen, 2008).

Community of Practices also contribute power for knowledge creation to produce new product and service (Marquardt, 1996). People in the organization learn, share knowledge, and create innovations and new knowledge from the internal and the external environments to support open problem solving methods and feedback analysis (Garvin 1993; Argyris and Schon 1978; Senge 1990; Marquardt and Reynolds, 1994; Marquardt 1996; Tippawan Lorsuwannarat, 2006). Groups of individuals from inside and outside organizations attempting to solve organizational problems by providing links among individuals and supporting each other with useful information for achieving knowledge, innovation, and vision (Nonaka, 1994). Organizational members may have a more rapid means of gaining access to know-how and offer a highly feasible means of utilizing and enhancing knowledge and technological innovation by inter-organizational relations (Rogers, 1983; Ebadie and Utterback, 1984; Powell, 1990). The external relationships (for example, buyers and suppliers or network of relationships), and closed linkages among cross-functional team also result in innovation performance (Clark and Fujimoto, 1987; von Hippel, 1988). Likewise, the openness and richness of networks such as meetings, or conversations, or seminars, or study visits, or other activities, quantity of information and knowledge inter-organizational sharing will lead to a suitable environment for new knowledge creation and innovation (Nonaka, 1994; Seufert and Seufert, 1999). Successful innovations may result from the co-operation of interactive operators and experts in the gradually learning processes (Harmaakorpi and Mutanen, 2008). Innovation systems may have technology transfer among organizations for example: organization for universities and research centers (Burt, 1997). Innovation is defined as cooperation for knowledge production by different background people within the

same interest network (Harmaakorpi and Mutanen, 2008), people in innovative networks who have unique or shared characters (such as language, dialogue and goal), try to harmonized different points of view to create innovation (Harmaakorpi and Mutanen, 2008). Inter-organizational relations also give organizational members a more rapid means of gaining access to know-how and offer a highly feasible means of utilizing and enhancing knowledge and technological innovation (Rogers, 1983; Ebadie and Utterback, 1984).

Gubbins and Dooley (2013) propose that knowledge is a key factor of innovation and innovation is created by integrating knowledge (Tidd, Bessant and Pavitt, 2005) from diverse sources (Rothwell, 1992), for example, a social network which can be defined as a group of people which have informal interactions or link between them (Cross and Parker, 2004). An innovation network may be a group of people which have informal or un-hierarchical interactions for innovation. Network actors' roles and characteristics affect the innovation. Indeed, dynamic social networks play important roles in the innovation process. Organizational KM within social networks from external sources may result in commercially new products and services or innovation (Balconi, Breschi and Lissoni, 2004).

Factors fostering innovation are top management requirement, the development of a new business unit, customer relationship (Meissner and Sprenger, 2010). There is a link between an organizational decision to innovate, organizational innovative processes, output and OP (Palangkalaya et al., 2010). Output of innovation process is measured by the number and type of new products and processes (Jensen and Webster, 2009).

Effects of innovation on OP are examined (Palangkalaya et al., 2010). Product innovation (new goods or services) leads to the increase of employment. Process innovation (new machines or new technology) leads to the reduction of labor requirements.

Acceptance outcome of innovation is current utilization of innovation and future intention to use innovation (Agarwal and Prasad, 1997). Long-term competitive advantages of an organization are achieved by the organizational ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). And the capability of an organization to create and

utilize intangible assets and creative-based innovation contributes to fulfillment of the customer's satisfaction and need (Nicholas, 2010). In brief, the flow of knowledge into and within organizations is facilitated by knowledge management to improve organizational processes by innovation creation, thus improving individual and organizational performance (Lungu, 2011).

To conclude, innovation is new technologies, new equipment and/or services and new procedures (Adapted from Damanpour, 1991; Ibarra, 1993; Zack, McKeen and Singh, 2009; Chen, Huang and Hsiao, 2010) and services (Lee, Kim and Kim, 2012). New technologies are an innovative organization's technologies or systems derived from new knowledge for operations and/or communication. New equipment/services are an organization's innovative equipment and/ or services derived from new knowledge from internal and/or external sources aimed at customer satisfaction. And new procedures are an organization's innovative procedures from new knowledge aimed at effective operations.

3.4 Related Past Research

Related past research investigating knowledge management (KM) practices, innovation and organizational performance (OP) are reviewed to learn related theories, methodology, and variables before the model construction and to see the strong points and the gap of the previous research for further investigation.

However, only a few studies empirically examined the relationship between knowledge management and organizational performance (OP), so Zack, McKeen and Singh (2009) quantitatively studied the organizational performance of knowledge management. The research model by Zack, McKeen and Singh (2009) (as shown in Figure 3.1) proposes that KM practices will be positively associated with organizational performance, and organizational performance will be positively associated with financial performance. The first construct, KM practices, are defined as observable organizational activities related to KM and are divided into four dimensions: 1) the ability to locate and share existing knowledge; 2) the ability to create new knowledge; 3) a culture that encourages knowledge creation and sharing; and 4) the strategic value of knowledge and learning. The second construct, overall

organizational performance, is defined as the extent of product and service innovation, quality, customer satisfaction and retention, and operating efficiency. The third construct, financial performance, is defined as the organizational return on assets and the other profitability. The fourth construct, contextual influences, are defined as the rate of industry growth, competitive change and intensity, technology change and predictability, and other factors, i.e., age of organization, size of organization, revenue relative to industry, share of market relative to industry, organization structure. A survey of business organizations which were ten different industry sectors in Canada, USA, and Australia was conducted. The respondents which were 1,500 executives or KM managers were asked by using a five-point Likert-type scale e-questionnaire to describe their organizational involvement in KM practices, the strategic concentration of their KM projects, performance evaluation aligned with their strategies (Treacy and Wiersema, 1995), and financial performance. The 12 items for measuring KM practices were included to measure the organizational ability to identify internal sources of expertise, transfer best practices throughout the organization, and use external knowledge of stakeholders, such as customers. The overall organizational performance was formed by combining innovation, rate of new product development, customer satisfaction, customer retention and operating costs. And the financial performance was measured by return on asset/return on equity. The partial least squares approach was applied to test the model. The findings showed that KM practices were positively related to organizational performance and financial performance. One strong point of the research is that the overall performance and KM practices constructs which can be used for future measurement were clarified, especially overall performance measurement besides financial or profit indicators. However, the gap of the research is that the research investigated in business industries or private organizations and mostly focused on financial performance. Although the overall OP was measured, some significant dimensions of OP (such as organizational effectiveness) were not mentioned. Additionally, the findings based on organizations from North America and Australia may not reflect KM practices in other geographic, economic and cultural settings (Zack, McKeen and Singh, 2009). This research decided to study investigate the Thai military organizations which are public,

hierarchical, and bureaucratic organizations in Asia's geographic setting to fill the gap of the body of knowledge in this area.

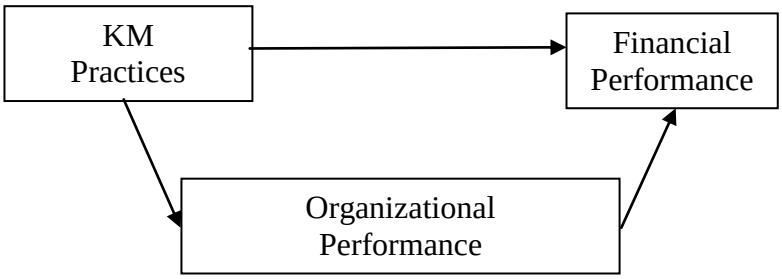

Figure 3.1 Previous Research Model (1)
Source: Zack, McKeen and Singh, 2009: 396.

In addition, knowledge management and organizational performance have been studied in a decomposed view (Mills and Smith, 2011) to evaluate the effects of KM resources --KM enablers and processes-- on organizational performance. The related theories and approaches concerning with the knowledge management practices and organizational performance were reviewed. The effective KM leads to organizational improvement (Lee and Sukuco, 2007) and knowledge capability fosters the effective management and internal flow of information and knowledge in the firm. So investments in KM increase continuously and dramatically, especially in business. However, there is a gap in the study of the relationship of individual dimensions of knowledge infrastructure capability, knowledge process capability and organizational performance. So the decomposed model was proposed by Mills and Smith (2011) as shown in Figure 3.2. Knowledge infrastructure capability had three dimensions which were technology infrastructure, organizational culture and organizational structure. Technology infrastructure includes the information technology (IT) systems that supports the information and knowledge integration in the firm, which are knowledge creation, knowledge transfer, knowledge storage, and knowledge safe-keeping. IT combined with knowledge will improve organizational performance; however, only IT may not directly lead to high organizational performance (Seleim and Khalil, 2007). Organizational culture which is a complex set of values (such as consumer orientation,

service quality, informality and innovation (Sin and Tse, 2000), beliefs, symbols and behaviors can affect the organizational KM (Ho, 2009). Culture which is knowledge-friendly is the most impacting factor for KM (Davenport et al., 1998; Alavi, Kayworth and Leidner, 2005-2006; Ho, 2009). And cultural dimensions are also related to organizational performance (Aydin and Ceylan, 2009). So positive changes in culture can impact organizational performance (Richert, 1999). Organizational structure is comprised of organizational hierarchy, regulations and rules, and reporting relationships (Herath, 2007) for co-ordination and control. Changes in an organizational structure from hierarchical to flatter networked structure are important for knowledge transfer and creation in the organization (Nonaka and Takeuchi, 1995; Grant, 1996; Gold et al., 2001; Beveren, 2003). Knowledge process capability had four dimensions (knowledge acquisition, knowledge conversion, knowledge application, and knowledge protection). Knowledge acquisition is a firm capability for knowledge identifying, acquiring, and accumulating, from both internal and external sources, for organizational operations (Gold et al., 2001; Zahra and George, 2002). There is a link between knowledge acquisition and organizational performance (Lyles and Salk, 1996; Seleim and Khalil, 2007; Song, 2008). Knowledge conversion is a conversion process from captured knowledge to organizational knowledge for business utilization (Lee and Suh, 2003). Knowledge application is to make knowledge more active and suitable for the organization in creating value (Bhatt, 2001) by creating new products and services. Knowledge protection includes the use of copyright and patents, user name, password, sharing protocols along information technology systems that allow knowledge to be secured (Lee and Yang, 2000). Mills and Smith (2011) conducted a quantitative survey of 500 students enrolled in graduate MBA and MSc in Jamaica. PLS-Graph 3.0 (Build 1130) and SPSS version 17.0 were applied for assessment of the links between KM capabilities and organization effectiveness. The results indicated that only organizational structure and knowledge application were directly related to organizational performance. The strong point of the research was that the study focused on the decomposed view of KM affecting the organizational performance, not the composite measure of KM as in previous research. And the knowledge protection which is one of the knowledge management practice is defined differently from other related researches. However, the gap of the research

was that there was no clarification of the public or private organizations for which the sample students work and the research also did not provide in-depth insight of the individual firms. Furthermore, how to measure organizational performance was not clearly shown in the study so the OP measurement might not be applicable for further OP study. Thus, the gap of the research of KM and organizational performance needs to be filled by studying public, hierarchical organizations, clarifying of the sample organization, and describing the clear measurement of OP.

The linking of KM and other factors related to the organizational performance was also studied by Ho (2008) who proposed a conceptual structural equation model. The related theory and approach are discussed. Since in knowledge-based society, business organizations have to compete for survival by continuous improvement and innovation, knowledge is considered a strategic asset in the organization (Jantunen, 2005). Additionally, previous studies show that many organizations have practiced KM for the goal of organizational performance improvement (Davenport et al., 1998; Gold et al., 2001). And that strategic planning, organizational infrastructure and diffusion process affects the value of KM. The variables in Ho's study (2008) are self-directed learning, organizational learning, knowledge management capability and organizational performance. According to Ho (2008), knowledge management capability is measured by 1) learning and obtaining which means that the members in the organization are able to understand and acquire knowledge from external and internal sources, 2) knowledge sharing which means that the members in the organization use various formal and informal communication tools for knowledge sharing, and 3) knowledge creating and improving which means that the members in the organization are able to create new knowledge and enhance work behavior.

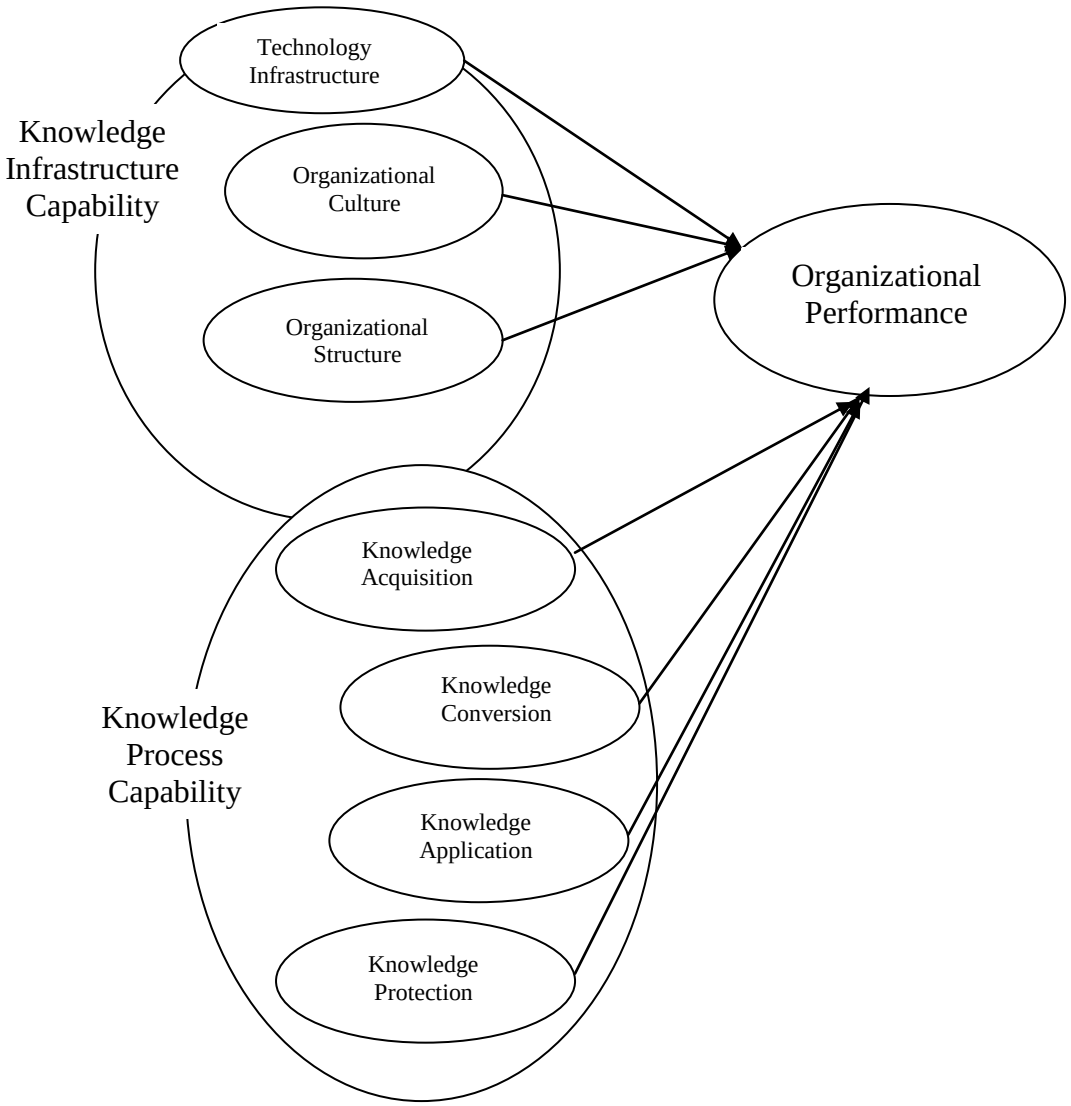

Figure 3.2 Previous Research Model (2)
Source: Mills and Smith, 2011: 165.

In Ho's study (Ho, 2008), OP is measured by two dimensions: financial performance and market performance. Financial performance refers to the relative profitability, return on investment, and total sales growth of the organization. Market performance refers to the market share, profit ratio, and customer satisfaction of the organization. The Ho's model was adapted to focus only knowledge management capability and organizational performance (Figure 3.3). The participants of Ho's study which were the middle and the top management personnel from 21 electronic

industrial listed and over-the-counter listed technological companies in Taiwan. They were asked to fill in a five-point Likert scale questionnaire. The criteria for company selection, the reliability and validity tests are demonstrated. The analysis of the model was conducted using LISREL 8.52. The findings were that KMC had direct and significant influences on OP. The strength of the research is that the study included factors related to OP, namely self- directed learning, organizational learning, and knowledge management capability. However, the weakness of the study was that there was a gap in OP measurement because the OP measurement may be applicable to only private organizations. Thus, the researcher decided to measure KM and OP in public organizations to fulfill the gap of OP measurement.

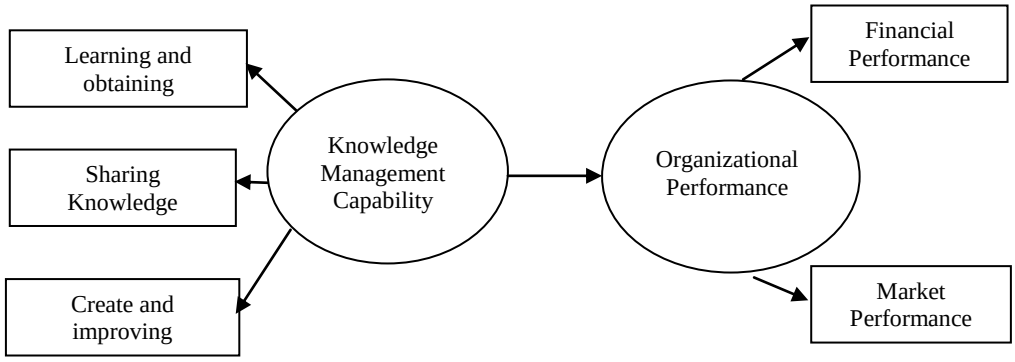

Figure 3.3 Previous Research Model (3)
Source: Adapted from Ho, 2008: 1239.

Gold et al. (2001) found that KM infrastructures capabilities (cultural, structural and technology factors), knowledge process capabilities (acquisition, conversion, application, protection) directly affected the organizational effectiveness. However, the relationship between KM infrastructures capabilities and knowledge process capabilities was not shown. And although Lee and Choi (2003) suggested that there is the integrated relationship between KM enablers, knowledge creation process, KM intermediate outcomes, and OP; however, management which is the important related factor was missing from the reviewed studies. And because of the complex and dynamic characteristics of KM, which require the holistic view for understanding,

Lee, Kim and Kim (2011) filled the gap by studying an integrated view of knowledge management for performance, and analyzing the relationship between KM infrastructures capabilities, knowledge process capabilities, creative organizational learning, and organizational performance. The adapted model of Lee, Kim and Kim (2011) focusing only knowledge process capability and organizational performance are shown in Figure 3.4. In the study of Lee, Kim and Kim (2011), knowledge process capabilities were categorized into 1) acquisition, 2) conversion knowledge to be more useful, 3) application and 4) protection. And organizational performance was measured after knowledge management systems by Lee, Kim and Kim (2011) in terms of 1) the capability to capture new business opportunities, 2) the capability to predict potential markets for products/services, 3) the capability to develop new products/services, 4) the capability to predict unexpected incidents and crises, 5) the capability to adjust organizational objectives rapidly in accordance with the change in industry/markets is improved, 6) the capability to respond to new information regarding industry/markets, 7) the capability to respond to new market demands. The unit of analysis was the company that had adopted a knowledge management system. The sample was the chief knowledge officers (CKO) or chief information officers from 800 firms in Korea. A mail survey and internet-based survey were used for data collection. The sample consisted of 120 respondents. The partial least squares were applied for assessing the structural relationship among variables. The findings showed that knowledge process capabilities mediated the relationship between KM infrastructure and organizational performance. The strong points of the study were that holistic view of KM and related factors on OP were clearly shown by the complex relationships among variables. However, the weak point of the study was that the OP measurement in this study focused only on private organizations. So there was a gap in the OP measurement of public organizations. Thus, researcher decided to fill up the gap by studying the relationships of KM practices and OP in public organizations.

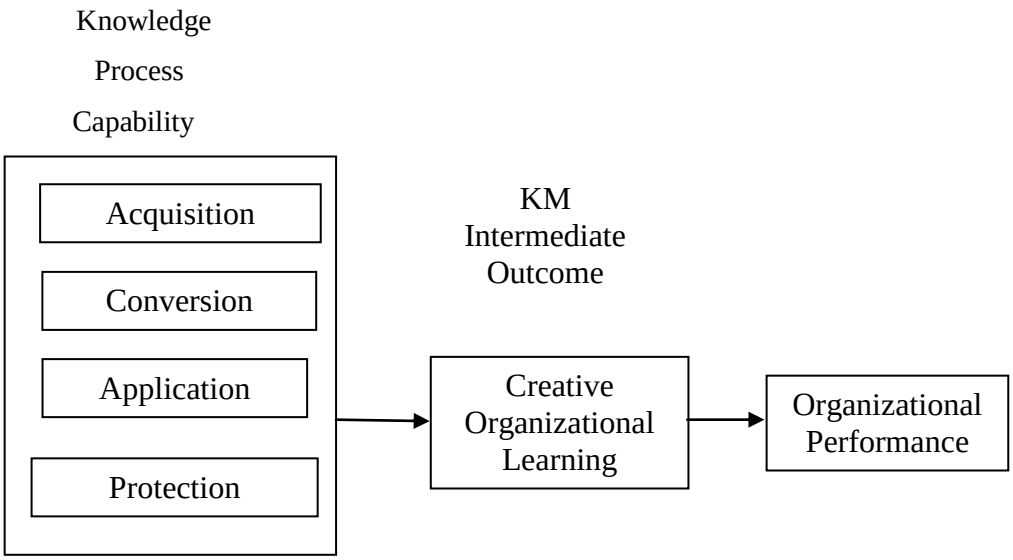

Figure 3.4 Previous Research Model (4)
Source: Adapted from Lee, Kim and Kim, 2011: 185.

The direct and indirect effects of knowledge management systems (KMS) on OP are explained by the resource-based view and the knowledge-based view (Khalifa, Yu and Shen, 2008). The success of a firm can result from knowledge, which is an important resource, and organizational KM capabilities (Spender and Grant, 1996). General Information technology (IT) and specific KMS support the KM capabilities. KMS is defined as a class of IT for knowledge acquisition, creation, integration, transfer and application (Alavi and Leidner, 2001). And KMS is composed of the database, the intranet, the groupware, the search engine, etc. for applications in different business processes and managements to enhance flexibility and adaptability for firm's survival and long-term competitiveness (Gold et al., 2001; Holsapple and Singh, 2001). Although a large investment in KMS was made (Poston and Speier, 2005) for positive effect of KMS usage on OP (Feng, Chen and Liou, 2004; Lee, Lee and Kang, 2005), most KM initiatives did not achieve the organizational goals. So a contingency theory is applied by Khalifa, Yu and Shen (2008) for explaining the condition for successful KMS. Khalifa, Yu and Shen (2008) measured OP by four IT-enabled organizational benefits (De Lone and Mc Lean, 1992, 2003) which were profitability, market shares, supply chain efficiency, and customer responsiveness.

Innovativeness was measured by the business ability to effectively implement innovative activities. The model of Khalifa, Yu and Shen (2008) was proposed; however, the sub concepts of KMS which were not shown (Figure 3.5). A survey study involving over 100 Chinese firms was conducted by Khalifa, Yu and Shen (2008) to test the model. The structural equation modeling and the Partial Least Squares procedure (PLS) were applied for the data analysis. The results showed that KMS usage had both direct and indirect effects on OP. The strong point of the study was that the research clearly proved the effects of KMS in private firms on OP, and that the research model stated that the innovativeness influenced the OP. However, the weak point of the study was that there was a gap in OP measurement in public organizations and the innovation was not measured. Therefore, the researcher decided to investigate the relationship of KM practices and innovation on public organizations.

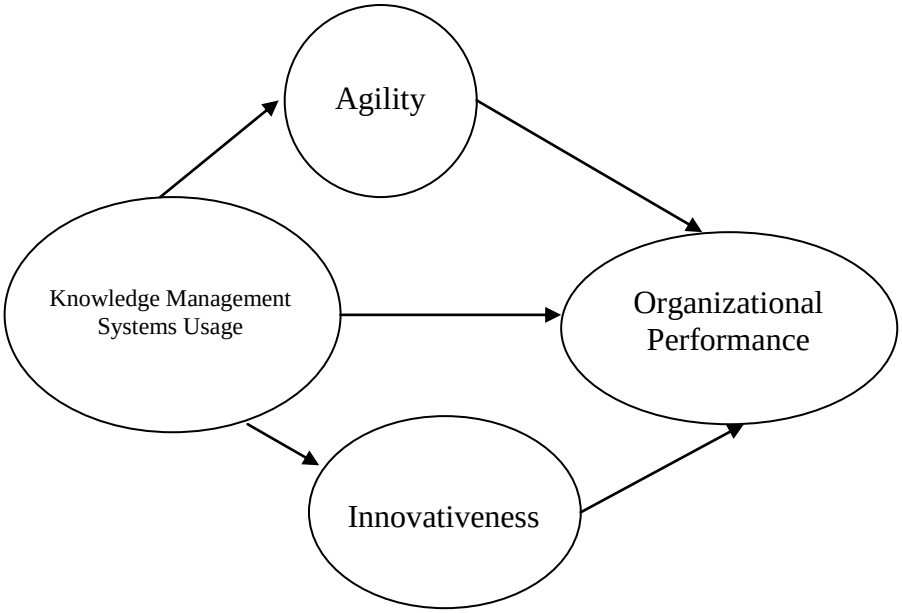

Figure 3.5 Previous Research Model (5)
Source: Adapted from Khalifa, Yu and Shen, 2008: 121.

Wei, Choy and Yew (2007) investigated the assessment of OP resulted from KM preliminary success factors, KM strategies and KM processes. Knowledge assets

may lead to organizational competitive advantage (Mayo and Lank, 1994). The Organization for Economic Co-operation and Development (OECD) suggested a knowledge-based economy (OECD, 1996b) be suitable for a competitive world. And many countries cannot ignore knowledge-based economy. KM and related strategies concepts are important for many organizations including telecommunications to survive in the knowledge-based economy. However, many organizations may be not ready for practicing KM effectively because of low investment in KM (Chong, Wong and Lin, 2006). The study by Wei, Choy and Yew (2007) made great contributions to the OP outcomes and the factors for successful KM implementation. They constructed a model is as shown in Figure 3.6. In their study, KM process referred to activities: construction, embodiment, and deployment. Construction referred to a set of activities such as development, discovery, and capture. Embodiment or codification referred to translating organizational knowledge into an accessible form, including storing, categorizing and mapping of knowledge. Deployment refers to knowledge transfer and access. Since intangible assets affect the OP, thus OP should be measured by performance, productivity and competitiveness, decision making, responsiveness, innovation, product/service quality, learning curve, employee retention, flexibility and cost efficiency (Wei, Choy and Yew, 2007). Questionnaires were sent to 800 middle managers from the Malaysian telecommunication companies and the response rate was 36 percent. Statistical Package for Social Science (SPSS) was used for data analysis. The results indicated that the KM preliminary success factor, i.e., strategies and process are essential for OP improvement. And there is a gap between the perceived importance and actual implementation of the following variables: knowledge audit, knowledge map, leadership, measurement, construction and embodiment. For perceived importance, only culture was significantly associated with OP. However, for actual implementation, both business strategy and construction process was significantly associated with OP. The strong point of the study was the examination of KM preliminary success factor, strategies and process that affect the implementation of KM. Still, the weak points of the study were that the focus of the study was on only telecommunication firms private sector, and the definition and measurement of innovation were not given. Thus, leaving a gap in studying KM

practices, innovation and OP in public organization. That is why this research decided to fill in the gap by studying KM practices, innovation and OP in public organizations.

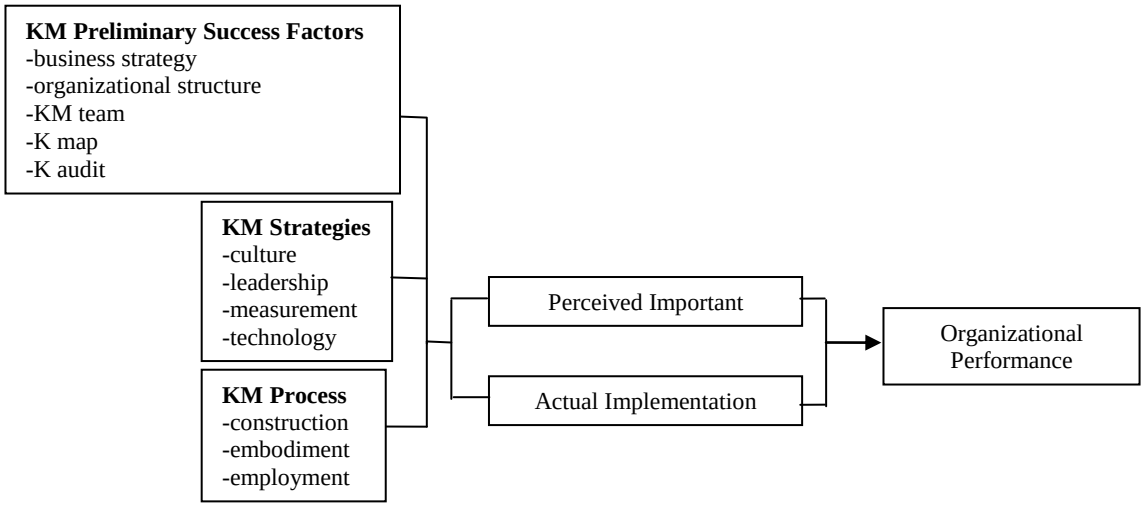

Figure 3.6 Previous Research Model (6)
Source: Wei, Choy and Yew, 2007: 74.

The study of the relationship between marketing knowledge management (MKM) and OP was made in telecommunication industries in Jordan (Akroush and Al-Mohammad, 2010). A model was proposed as shown in Figure 3.7. MKM consisted of four components: build-in marketing assets, such as reputation and image; invested-in marketing assets, internal marketing capabilities; and external marketing capabilities. And OP consisted of three dimensions: market, customer (creating satisfied and royal customers by organizational capabilities for new quality products), and financial performance. Market was measured by considering contributions to the organization's non-financial assets, the organizational ability to develop new services, and the organizational image. Customer was measured in terms of customer satisfaction and loyalty, and the ability to attract new customers. Financial performance was measured by looking at returns on investment, profitability, market share, and contributions to organizational financial assets. The population was 42 Jordanian telecommunications companies. The unit of analysis was the manager. EFA and CFA were used to analyze the data and to test the hypotheses. The findings

showed that MKM assets and capabilities had a positive effect on the overall OP in all dimensions. The strong point of the study were the investigation of MKM assets on OP in developing countries, and the measurement of OP by considering customer dimension, which may be applicable for public OP measurement. The weak point of the study was the measurement of OP in telecommunication companies which might not appropriate for public OP measurement in general. This research decided to study KM practices on public OP measurement to fill up the gap in KM practices on public OP measurement.

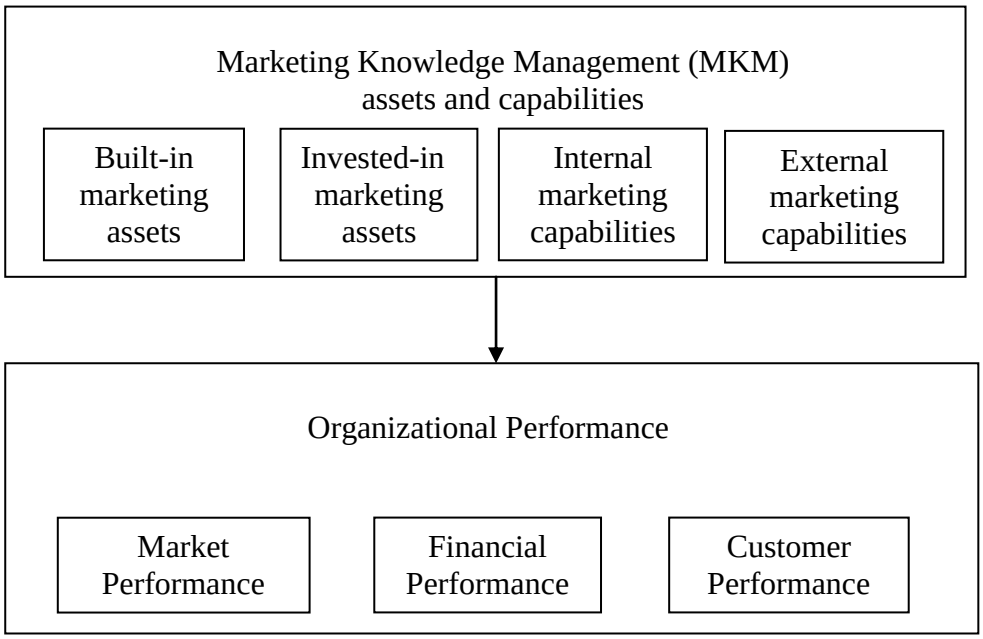

Figure 3.7 Previous Research Model (7)
Source: Akroush and Al-Mohammad, 2010: 47.

The effects of knowledge management on organizational performance in large business organizations in developed economies with plenty resources available for implementation have been largely studied (Moffet and McAdam, 2006). To get wide acceptance and deep understanding of KM, the studies in organizations of different sizes and in different economic sectors should be made (Beijerse, 2000; Lee et al., 2005; Sanghani, 2008). So Kruger and Johnson (2011) examined the correlation between successful institutionalization of KM and OP in a developing economy.

However, the value perception of KM has been differently perceived by each organization (Dove, 1999; Jennex and Olfman, 2005). For example, KM is value if KM supports business value by either decreasing the cost or increasing the revenue (Ndlela and du Toit, 2001). However, there may be no specific measurement for the value of organizational KM. Lee et al. (2005) proposed that the value of KM should be measured in relation to organizational performance as measured by returns on investment (ROI). KM success comes from the right knowledge capturing, getting the right knowledge to the right user, and using the right knowledge to improve individual and /or organizational performance (Jennex et al., 2007). Clark and Detore (2000) indicated the common measurements of KM in an organization are returns on investment (ROI), and the balanced scorecard (Kaplan and Norton, 1992; Lee et al., 2005). Similarly, Jennex et al. (2007) explained that KM should be measured by the impact on business process, strategy, leadership, the efficiency and effectiveness of KM system, organizational culture, and knowledge content. Kruger and Snyman (2007) indicated that KM maturity could be measured by ICT management, information management, KM issues, implementation, unique knowledge, and assessment of KM growth. The balanced scorecard and KM performance scorecard developed by De Gooijer (2000) and Lee et al. (2005) were adapted to measure eight sections of OP (namely profitability, liquidity, leverage, shareholder satisfaction, growth, intangible value, customer satisfaction, and employee satisfaction). Nine large companies of South Africa from financial, basic resources, and ICT industries were selected as samples for data collection. The data were analyzed by both statistical techniques (SAS version 8) and qualitative methods. The research findings were that, from five of the nine organizations, there was a relationship between KM maturity and OP. And six from eight companies that recorded a positive growth in KM maturity also recorded positive growth in OP. Likewise, company that recorded a negative growth in KM maturity also recorded a negative growth in OP (Kruger and Johnson (2011). The strong points of the research were the assessment of KM in developing country and the measurement of OP in financial and nonfinancial dimensions. However, the weak point of the research was the measurement of OP in the business section might not be able to use for the measurement of OP in public

organizations. Thus, the researcher decided to study the OP measurement of public organizations.

Although there have been many research studies on knowledge management, little research made investigation from the social interactive perspective (Kogut and Zander, 1996; Tsai, 2002). Hsiao, Chen and Chang (2011) studied investigating the relationship between knowledge management capacity and organizational performance from the social interactive perspective. In the present dynamic and competitive environment, the source of competitive advantage is knowledge (Spender and Grant, 1996; Matusik and Hill, 1998; Chen, 2004). Thus, knowledge management plays a significant role in firm strategy and innovativeness (Nonaka, 1994; Massey et al., 2002; Chen et al., 2010). However, from the social interactive perspective, social interaction may affect the knowledge management to improve organizational performance (Hsiao, Chen and Chang, 2011). Two social interaction variables, coordination and communication, were studied by Hsiao, Chen and Chang (2011). Coordination refers to the ability to carry out the assignments and the procedures to link the employees and organizations together to finish the work (Ruekert and Walker, 1987). And communication refers to the ability to flow information among employees and organizations through formal and informal activities (Pinto and Pinto, 1990). Organizational performance can be measured by profitability and sales growth, cash turnover, financial goal achievement (Hsiao, Chen and Chang,2011), and risk management (Venkartraman and Ramanujan, 1986; Dyer and Reeves, 1995). Knowledge management capacity construct is measured by the extent of the ability to acquire and disseminate knowledge within the firm (Nonaka, 1994; Gilbert and Gordey, 1996; Grant, 1996). Social interaction can be measured by the degree of interactions among organizational members. Hsiao, Chen and Chang (2011) adopted two dimensions of social interaction, including coordination and communication from the previous research (Ruekert and Walker, 1987). A questionnaire approach was employed to collect the data from a sample of 105 out of the population of 5000 Taiwanese firms. Regression analysis was applied to test the hypotheses. The findings suggested that two dimensions of knowledge management capacity, i.e., knowledge acquisition and knowledge dissemination, and the communication factor of social interaction were positively related to the organizational performance. And

social interaction combined with knowledge management capacity, had synergistic effects on organizational performance. The strong point of the study was that it was based on social interaction view which was rarely considered in knowledge management research. However, the weak points of the study were that no model was proposed and the measurement of organizational performance focused only on financial indicators of private organizations. Thus, this researcher decided to study the measurement of public organizational performance to fill up the gap of the measurement of organizational performance.

The examination of the role of KM capabilities on the OP of small to medium-sized enterprises (SMEs) which play an important role in developing economies was also performed in Iran (Gharakhani and Mousakhani, 2012). Gharakhani and Mousakhani (2012) proposed that OP could be measured by sales growth, quality improvement and customer satisfaction. A questionnaire survey with a five-point Likert scale was conducted with the sample of 30 SMEs in Iran. The participants were top executives of SMEs: presidents, vice-presidents, directors, and general managers. Regression analysis was used, and the results showed that all three factors of KM capabilities (knowledge acquisition, knowledge sharing and knowledge application) had positive effects on SMEs' OP. The strong point of the research was that it revealed the effects of KM on SMEs's OP in developing countries. However, the weak point of the research was that the study might not be appropriate for explaining the effects of KM on the OP of public organizations in developing countries. So the author's study address this problem by investigating the effects of KM on the OP of public organizations in developing countries.

The strong points of past research were reviewed to get definitions of KM practices and OP for advanced measurement. However, the weak point of past research was that the measurement of OP was suitable only for private organizations, further investigation about KM practices and OP in public organizations need to be conducted.

Although previous studied dealt with clarify KM practices and OP in public organizations are rarely found. Pietrantonio (2007) quantitatively investigated the efficiency of knowledge management system (KMS) and OP in Italian public organization by the balanced scorecard (BSC) designed for private companies. Four

dimensions of OP were measured: 1) learning and growth which measures the improvement of people, systems and procedures, 2) efficiency of organizational processes, 3) customer satisfaction, and 4) financial indicator. So the strong point of Pietrantonio's research was the public OP measurement by four dimensions of BSC. However, no model was proposed and the findings could not confirm that there is the OP improvement resulted from the KMS which are the weak points of Pietrantonio's research. So, the author further investigated KM and public OP measurement.

Monavvarian and Kasaei (2007) investigated OP and KM of the Labour Ministry in Iran. OP was measured in four areas: 1) decision making improvement for public services, 2) effective public participation in decision making, 3) societal intellectual capabilities, and 4) KM workforce development. The dependent variables were knowledge acquisition and creation, knowledge sharing, knowledge storage, knowledge transfer and application, and the implementation of KM. And the independent variables were organizational culture, technology, information and communication flows, document transparency status, organizational structure, human resources, and training. It was found that only some of the independent variables had effects on KM. The strong point of Monavvarian and Kasaei's research was that the OP measurement of public organization was mentioned; however, the OP was not measured, which was the weak point, thus future OP research should be done to measure.

Cong, Li-Hua, and Stonehouse (2007) investigated the KM processes and organizational improvement in the Chinese public sector. Although the key success factors and the processes of KM were studied, the organizational performance was not measured. Furthermore, Gomes, Yasin and Lisboa (2008) examined the Portuguese public sector and proposed the measurement of organizational performance focusing on information availability. Additionally, Seba, Rowley and Delbridge (2012) studied KM in the Dubai Police Force in order to enhance its performance. However, their study focused only on the KM initiatives, challenges and barriers of KM, and the measurement of public OP still left for further investigation.

From past literature, the author proposes that there may be innovation from KM which mediate the OP. Related researches and papers state that the innovation may result from KM practices and then the innovation may affect the OP. However,

there was no research on the overall KM practices, innovation and OP, and few researches studying KM and innovation either. Alegre, Sengupta and Lapiedra (2011) measured the effects of KM on innovation performance and competitive advantage by defining that the innovation was composed of successful application of new ideas (Amabile et al., 1996) related to knowledge creation and knowledge utilization. KM processes result in innovation which can be new or improved technology or environment-friendly products (Alegre, Sengupta and Lapiedra, 2011). Furthermore, size and R&D of the firm, which were related to important resources, such as budget and employees, were the factors which impacted product innovation (Henderson and Cockburn, 1994).

Gubbins and Dooley (2013) studied the stage of KM for innovation in a social network (which have inter-organizational relations by studying university-industry partnership network). And the adapted model of Gubbins and Dooley (2013) was shown in Figure 3.8. The theoretical background of network perspective of KM for innovation networks integrated information and knowledge with expertise and resources from internal and external sources to create new knowledge and innovations (Johnson, Hiemann and O'Neill, 2001; Trott, 2008). In short, networks facilitated KM for innovation. The phases of an innovation process are 1) searching the environment and identifying the needs for innovation, 2) realizing and selecting the available innovation and 3) maturing the innovation by transforming the concept into practice.

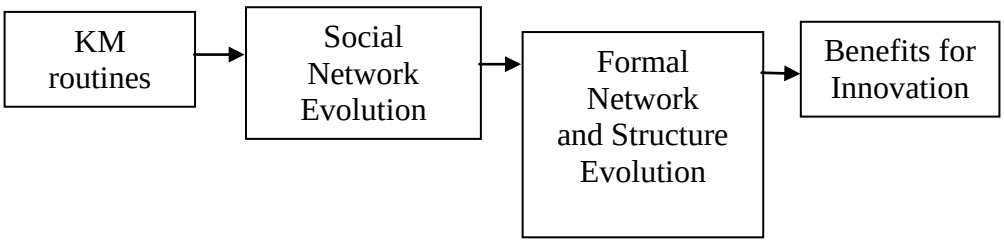

Figure 3.8 Previous Research Model (8)
Source: Adapted from Gubbins and Dooley, 2013: 162-185.

Lungu (2011) proposes the concept of knowledge management in the military context as an essential resource for military organizations' full range of operations

from combat to humanitarian assistance in environmental changes. Since knowledge management fostered knowledge flow into and within organizations, organizational performance resulting from knowledge management was composed of 1) improvement of decision-making processes, 2) improvement of quality and responsiveness, 3) improvement of efficiency and effectiveness, 4) operational sustainability, 5) common capabilities strengthening. And the success of knowledge management in military organizations was evaluated by 1) the capacity to sustain operations, 2) new capability development and application, and operational methods improvement as shown in Figure 3.9.

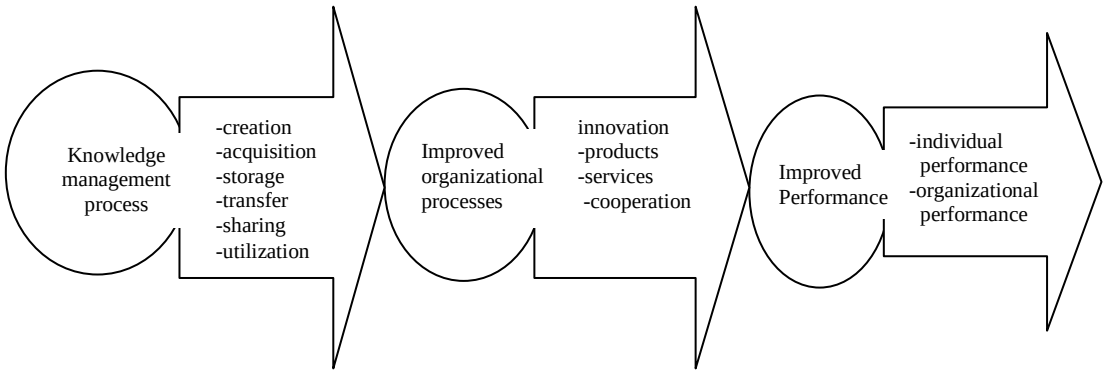

Figure 3.9 Effect of Knowledge Management Processes on Innovation and Performance

Source: Lungu, 2011: 9.

The strong point of the article is the harmonized model which explains the knowledge management, innovation and other factors on the performance of military forces which is a public organization. However, the weak points are no focus on innovation factors that affected on organizational performance, and since this paper presented a conceptual model, thus no evidence-based research study (such as the statistical methods and findings) was shown to test the integrated model. From the limitations of the paper, the author addressed the problem by focusing on knowledge management practices, innovation and public organizational performance and on testing the proposed model by quantitative and qualitative studies.

3.5 Research Model

From the related past literature about KM for innovation, OP was not measured. Lungu (2011) also states in the conceptual paper that KM processes cause innovation and performance improvement. However, in Lungu's research (2011) KM processes, innovation and OP were not measured, and innovation was not focused. Khalifa, Yu and Shen (2008) suggested that KMS usage caused innovativeness and then high OP; however, KM practices and innovation were ignored. After integration and concentration of important factors, the author assumes that new knowledge from knowledge management can create innovations and then foster the overall organizational performance.

In investigating KM practices as antecedents to OP, the researcher attempted to include factors (e.g. organizational behavior, culture) that are similar to some previous research investigated by Gold et al.(2001) and others. Since the objectives of the research were to develop a model of knowledge management practices and organizational performance, to validate the relationship of a model of knowledge management practices and organizational performance and to suggest for the improvement of knowledge management practices and organizational performance. The researcher focused on how knowledge management practices and innovation effect on organizational performance, and what the overall effects of knowledge management practices and innovation on organizational performance are. Thus, the researcher intended to clarify the relationship of knowledge management practices, innovation and organizational performance.

3.5.1 KM Practices

Knowledge management practices can be defined as knowledge obtaining, knowledge organizing, and knowledge applying. According to the literature, three dimensions of KM practices were related to innovation and OP.

Knowledge is essential for creating innovation (Polanyi, 1966). Knowledge is the useful information for operational supporting, or better performance (Tippawan Lorsuwannarat, 2005). The advantage of organization results from organizational ability to create and transfer knowledge (Ghosal and Moran, 1996). Long- term

competitive advantages of the organization are achieved by its ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). More applicable knowledge can be gained by knowledge management (Teece, 1998). In fact, new combinations of organizational knowledge and other sources create new knowledge and innovation (Cohen and Levinthal, 1990; Kogut and Zander, 1992). Relationships (for example, buyers and suppliers or network of relationships) and closed linkages among cross-functional team result in innovation performance (; Clark and Fujimoto, 1987; von Hippel, 1998). Flexible capability of knowledge conversion to share each other functions in the organization fosters firms to speedy create new product development (Clark and Fujimoto, 1991). The ability of the firm to recognize, understand, and utilize knowledge leads to its innovation as a new commercial goods and services (Cohen and Levinthal, 1990). Organizational knowledge gives rise to organizational core competence, sustainable competitiveness (Prahalad and Hamel, 1990). Thus, knowledge is the most valuable resource for organizations because it results in sustainable competitive advantage (Polanyi, 1966). In addition, knowledge results in high organizational performance, effectiveness and efficiency (Schultze and Leidner, 2002). Furthermore, knowledge management practices can be divided into three stages which are knowledge obtaining, knowledge organizing and knowledge applying (Niu, 2010). Knowledge management may improve organizational processes, and both individual and organizational performances (Lungu, 2011). In brief, knowledge management practices foster innovation and organizational performance.

In total, KM practices classified as knowledge obtaining, knowledge organizing and knowledge applying had been suggested to be essential for innovation and OP. Twenty-three KM practices were listed in the items for measurement. A ten-point Likert scale was applied to examine each of these KM practices.

3.5.2 Innovation

New combinations of organizational knowledge and other sources lead to new knowledge and innovation (Cohen and Levinthal, 1990; Kogut and Zander, 1992). Knowledge transfer among organizations is a source of innovation (Frenz and Ietto-Gillies, 2009). Since innovative processes are co-operative, networked processes,

networking such as dialogues of co-operators will enhance the environment for innovation (Harmaakorpi and Mutanen, 2008). Community of Practices also contribute power for knowledge creation to produce new product and service (Marquardt,1996). Knowledge creates innovation, such as new technologies (Sunding and Zilberman, 2000). Characteristics and types of innovation are product innovation, process innovation, technological innovation and information innovation which depend on computer technologies (Schumpeter, 1943; Moore and Benbasat, 1991; Sunding and Zilberman, 2000; Tether, 2002; Organization for Economic Cooperation and Development and European Community, 2005; Palangkalaya et al., 2010;). Innovation is the fostering power for the organization (Harmaakorpi and Mutanen, 2008). The capability of organization to create and utilize intangible assets and creative-based innovation is beneficial for customer's satisfaction and need (Nicholas, 2010). There is a link between organizational decision to innovate, organizational innovative processes, output and OP (Palangkalaya et al., 2010). Output of innovation process is measured by the number of new product and process (Jensen and Webster, 2009; Palangkalaya et al., 2010).

In total, three forms of innovation (new product and/or service, new technologies, new process) were listed in the measurement items.

3.5.3 Organizational Performance

Knowledge management practices create innovation (Sunding and Zilberman, 2000) and improve organizational performances (Lungu, 2011). OP are usually measured on the basis of the achievement of organizational objectives or goal-- how well an organization accomplishes organizational objectives or an organization's efficiency and effectiveness of goal achievement (Venkatraman and Ramanujam, 1986; Robbins and Coulter, 2002; Anderson, 2006). In order to measure OP, the customer satisfaction index was invented to measure the organizational performance (Ho, 2008; Lee, Lee and Kang, 2005). Akroush and Al-Mohammad (2010) examines OP by customer satisfaction (creating satisfied customers by organizational capabilities for new products). Nicholas (2010) examines OP by efficiency measures (the monetary expense per unit of output), effectiveness measures (the extent to which organizational goals are attained).

In total, three dimensions of OP (efficiency, customer satisfaction and effectiveness) were listed for measurement. A ten-point Likert scale was applied to examine each of these OP dimensions. There were six questions in the items for measurement.

The research model and conceptual framework to be empirically examined in the study is depicted in Figures 3.10 and 3.11. This model is constructed according the research objectives and is derived from the concepts and theories described in the literature review. According to the theory, the model suggests that KM practices influence innovation, innovation influence OP, and KM practices influence OP. Consequently, the model also suggests that KM practices influence OP, through innovation. The relationship of knowledge management practices and innovation with the overall organizational performance in the proposed model and conceptual framework were tested. Both quantitative research and qualitative research were conducted.

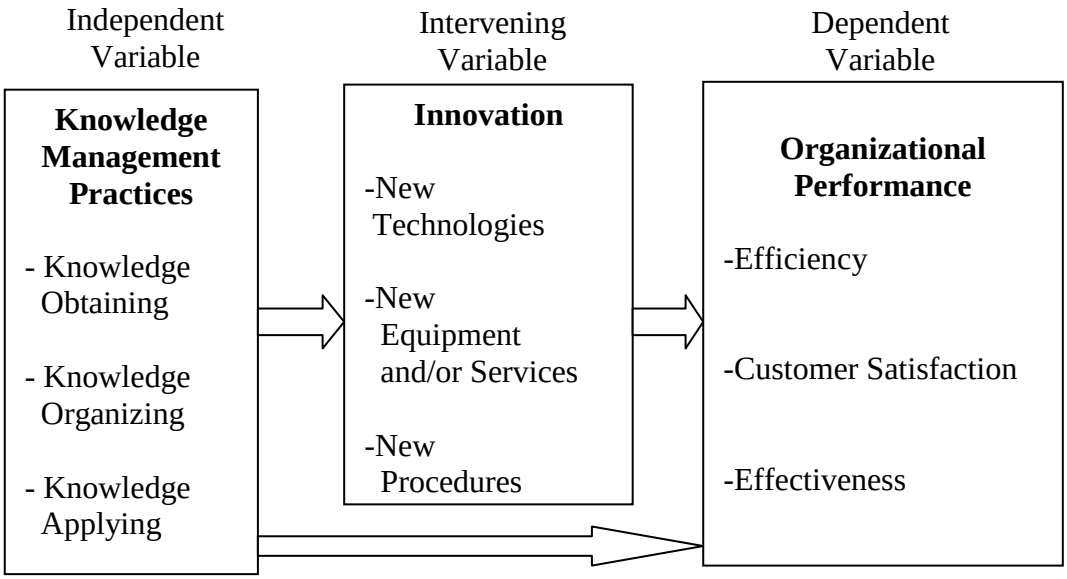

Figure 3.10 Model

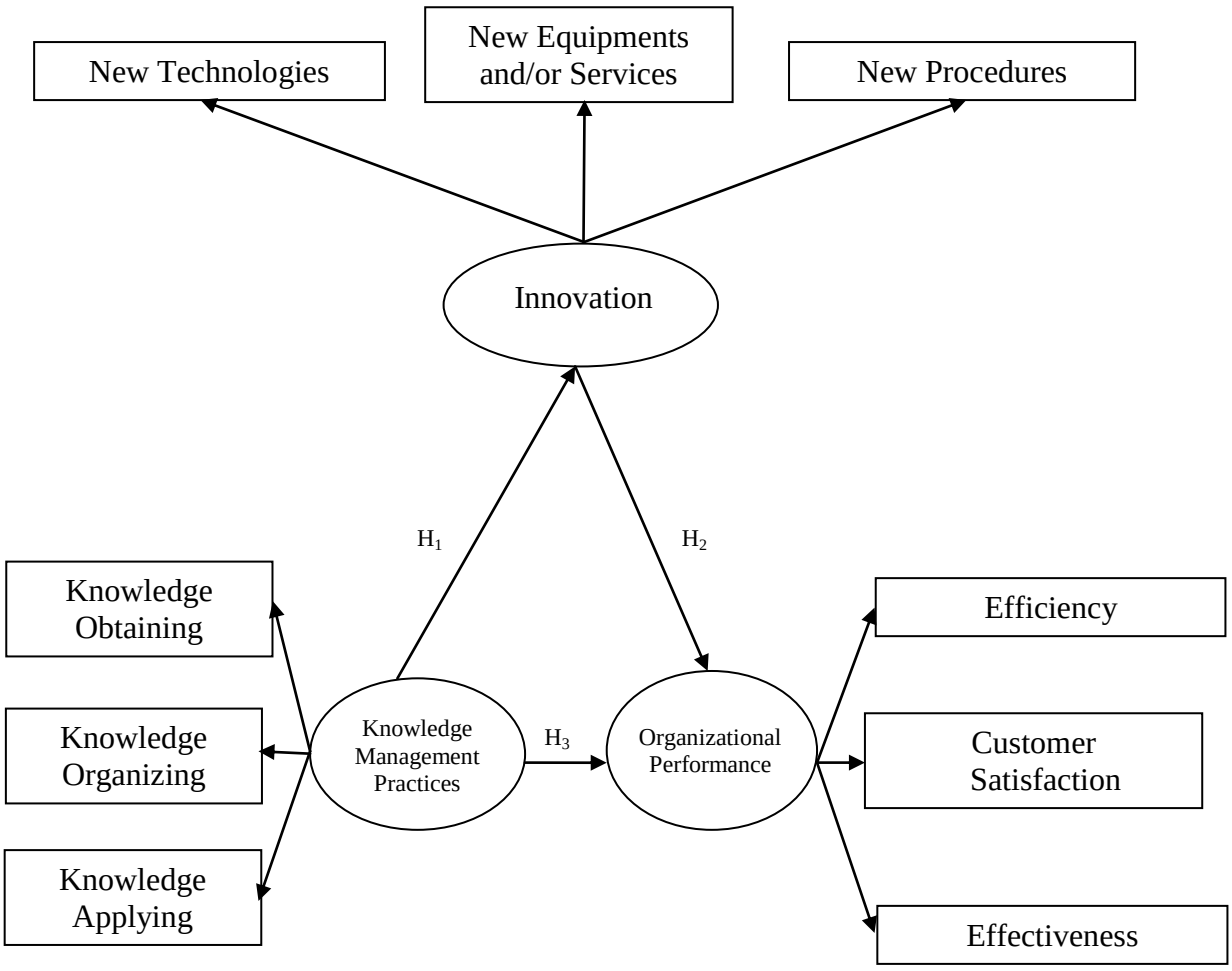

Figure 3.11 Conceptual Framework

3.6 Hypothesis

From the past literature, the researcher assumes that innovation can be conducted from KM and the innovation affect the OP (Gubbins and Dooley, 2013; Lungu, 2011; Khalifa, Yu and Shen, 2008). Thus, the researcher formulated the following hypotheses.

H_1: Knowledge management practices positively influence innovation

Knowledge management practices can be classified into 3 processes: knowledge obtaining, knowledge organizing, and knowledge applying (Niu, 2010). Knowledge in practice-based processes also affects the innovation (Harmaakorpi and Mutanen, 2008). In addition, long- term competitive advantages of the organization are achieved by its ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). In fact, new combinations of organizational knowledge and other sources create new knowledge and innovation (Cohen and Levinthal, 1990; Kogut and Zander, 1992). Flexible capability of knowledge conversion to share each other functions in the organization fosters firms to speedy create new product development (Clark and Fujimoto, 1991). The ability of the firm to recognize, understand, and utilize external information and knowledge leads to its innovation as a new commercial goods and services (Cohen and Levinthal, 1990). Having access to expertise and facilities leads to organizational ability to build and strengthen skills and knowledge needed to advance new technologies (Patthareeya, 2010). Community of Practice (CoP) is also a tool for knowledge management. CoP is a group of individuals from inside and outside organizations attempting to solve organizational problems by providing links among individuals to support useful information for achieving knowledge, innovation, and vision (Nonaka, 1994).

H_2: Innovation positively influences organizational performance

Innovation is defined as a continuous process for new products and services (Harmaakorpi and Mutanen, 2008). Innovation, which is the development of new products and processes, is the fostering power for the organization (Harmaakorpi and Mutanen, 2008). Innovation is defined as cooperation for knowledge production by different background people within the same interest network (Harmaakorpi and

Mutanen, 2008), innovative processes are co-operative, networked processes, networking such as dialogues of co-operators will enhance the environment for innovation (Harmaakorpi and Mutanen, 2008). Successful innovations may result from the co-operation of interactive operators and experts in the gradually learning processes (Harmaakorpi and Mutanen, 2008). Long-term competitive advantages of an organization are achieved by the organizational ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). Creation of innovation improve individual and organizational performances (Lungu, 2011).

H_3: Knowledge management practices positively influence organizational performance

KM practices, concentrated on processes, mechanism and the ability to locate and share internal best practices, are essential for overall organizational performance (Davenport and Prusak, 1998; Szulanski, 1996). And KM is also focused on utilizing external knowledge for new product innovation (von Hippel, 1994) and organizational performance (Sher and Lee, 2004).

3.7 Chapter Summary

In this chapter, the researcher reviews the related literature and theories, which are organizational performance, knowledge management practices and innovation and propose a model, a conceptual framework, and hypotheses.

CHAPTER 4

RESEARCH METHODOLOGY

The research methodology of this study is described in this chapter. Firstly, the research designs and sampling methods are introduced. Then the research instrument and methods of data collection are elaborated. The constructs and measurement, the purification of measures are given. Finally, method for data analysis is shown.

4.1 Research Design and Sampling Method

The design of this study was a mixed method of quantitative and qualitative research. This cross-sectional study was investigated during April, 2014-August, 2014. The unit of analysis was organization (Division and Wing). This study used a survey research method to examine the relationship between knowledge management practices, innovation and organizational performance.

4.1.1 Population and Sampling

4.1.1.1 Quantitative Research

The population were 185 directors and commanders from 185 organizations of RTAF in Bangkok and other provinces in Thailand.

1) 166 directors (Senior Group Captain). Each director supervised about 40-100 members

2) 19 commanders (Senior Group Captain). Each commander supervised about 1,000 members

Because of the small population size, census sampling was applied. So all the 185 participants are organizational representatives as shown in Table 4.1.

Table 4.1 Number of Participants in the Questionnaire Survey Classified by Position

Representative of Organization	Population	Participants
Director	166	166
Commander	19	19
Total	185	185

The participants in the research were determined by considering their mission or responsibility related to KM practices in RTAF organizations. At the beginning of 2014, the Commander-in-Chief, RTAF has declared that all RTAF organizations have to launch KM activities for organizational work improvement and RTAF organizations must have obvious KM practices. And the KM practices in RTAF organizations has been evaluated and presented every year in the RTAF Quality Development Contest Symposiums. All the heads of RTAF organizations have realized the importance of the RTAF Quality Development Contest Symposiums. The RTAF Commander-in-chief, or his representative, presides over the RTAF Quality Development Contest Symposium every year. The KM groups are selected by the RTAF quality development evaluation subcommittee to present KM work and innovation in the Symposium. The awards for the winner groups are presented by the RTAF Commander-in-chief, or his representative.

4.1.1.2 Qualitative Research

The population were six administrators of RTAF related to knowledge management of RTAF.

The RTAF administrators at all levels have been attempted to accomplish the objective of Commander-in-Chief's policy to facilitate KM practices in all RTAF organizations. The positions of the RTAF administrators who are appointed to be responsible for the success of KM are Deputy Chief of the Air Staff (Personnel), Assistant Chief of the Air Staff for Personnel, Director of Personnel, the RTAF quality development activity group committee, the RTAF quality development evaluation subcommittee, RTAF subcommittee for learning organization planning, the committee for fostering the plan for RTAF to be a learning organization, and the RTAF information system for promoting learning organization.

The present rank and position of these key informants (in 2014 when the data were collected) were shown as follows.

1) Air Chief Marshal Prajin Juntong, Commander-in-Chief of the RTAF

2) Air Marshal Twidanes Angsusingha, Deputy Chief of the Air Staff (Personnel and Logistics) and President of the RTAF quality development activity group committee

3) Air Marshal Yanyong Kanthasorn, Assistant Chief of the Air Staff for Personnel, RTAF

4) Air Vice Marshal Chawarat Marungruang, Director of Personnel, RTAF

5) Air Vice Marshal Rit Ampansaeng, President of the RTAF quality development evaluation subcommittee

6) Group Captain Suttipun Taithong, Deputy Director of Personnel, RTAF (other KM related positions include Deputy President of RTAF subcommittee for learning organization planning, Secretary of the committee for fostering plan for RTAF to be a learning organization, President of the RTAF information system for promoting learning organization).

4.2 Data Collection Method

The studied organizations, the tools for data collection, and the target groups for the research were shown in Table 4.2. In the quantitative study, the participants were asked to fill out a ten-point Likert scale questionnaire with an additional open ended question. The researcher used several channels to get questionnaires back. For example, the researcher visited some participants' offices to distribute the questionnaire herself and asked them to return by 1-2 weeks. Also, the researcher asked the messenger at her office to distribute the questionnaire at the documentary morning market at the RTAF headquarters and collect them back a few days after that. In addition, the questionnaires were sent online via RTAF e-mail for the participants to complete and return through the same channel. After distribution of the

questionnaires, the researcher also made telephone calls to request them to fill out the questionnaires , so 100% of them were returned.

Benbasat, Goldstein, and Mead (1987) indicate that "a phenomenon in a natural settings, employing multiple methods of data collection to gather information from one to a few entities". Thus, in this study, the data for qualitative research were taken from related papers and document of all the RTAF organizations. The secondary data included the policy, plan, minutes of the meeting, academic documents, research reports, journal papers, and related dissertations. These documentary data were analyzed to be used to formulate the conceptual framework and hypotheses and to create items in the questionnaire, and to form questions for interviews.

Table 4.2 Studied Organizations, Tools for Data Collection, and Target Groups

Data	Organizations	Tool	Target Group
OP	RTAF organizations	questionnaire	166 directors and 19 commanders
	RTAF organizations, committee, and subcommittee	Interview	6 administrators of RTAF and presidents of RTAF committee and subcommittee related to knowledge management of RTAF.
Innovation	RTAF organizations	questionnaire	166 directors and 19 commanders
	RTAF organizations, committee, and subcommittee	Interview	6 administrators of RTAF and presidents of RTAF committee and subcommittee related to knowledge management of RTAF.
KM practices	RTAF organizations	questionnaire	166 directors and 19 commanders
	RTAF organizations, committee, and subcommittee	Interview	6 administrators of RTAF and presidents of RTAF committee and subcommittee related to knowledge management of RTAF.

Additionally, semi-structure interviews of the six key informants were conducted. The researcher modified the semi-structure interview according to the situation.

4.3 Research Instrument and Measurement

The research instruments were questionnaires and interviews. They were employed to investigate the relationship of knowledge management practices, innovation and organizational performance.

This study investigated one independent variable (knowledge management practices), one intervening variable (innovation) and one dependent variable (organizational performance).

4.3.1 Operational Definition

The operational definition is the definition of the concept for the research, which is changed from abstractive theoretical definition to a practical, measurable definition. The concept of each variable is divided into sub-concepts with a set of empirical indicators to measure the variable.

4.3.2 Item Writing

The concepts, the sub-concepts including questions or items for measurement are shown in Specification Table (Table 4.3).

4.3.3 Questionnaire Design

The researcher designed a questionnaire as an instrument for data collection and analysis by following three steps: 1) preparation of the question items related to reviewed literature, the conceptual framework and the indicators, 2) analysis of the quality of measurement items, and 3) adjustment of the questionnaire before distribution for data collection.

Table 4.3 Specification Table

Concept	Sub-concept	Definition	Item/Indicator
1. Knowledge Management Practices (Niu, 2010)	1.1 Knowledge Obtaining 1.1.1 Knowledge Acquisition (Duffy, 2000; Cohen and Levinthal, 1990; McDermott, 1999; Crossan et al., 1999; Levinthal, 1991; March, 1991; Huber, 1991; Niu, 2010; Lim et al., 1999; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008; Hsiao, Chen and Chang, 2011; Holsapple and Singh, 2001; Gold et al., 2001; Quinstas et al., 1997; Huber, 1991; Nonaka and Takeuchi, 1995; Leonard, 1995; Grant, 1996; Matusik and Hill, 1998; Assimakopoulos and Yan, 2006; Brown and Dugaid, 2001; Gharakhani and Mousakhani, 2011; Yli –Renko et al., 2001)	1.1.1.1 Knowledge identification is the evaluation, and selection of essential knowledge to be managed for the present and future organizational core functional mission and vision . 1.1.1.2 Knowledge searching is an organization's activity to obtain tacit and/or explicit knowledge for organizational core functional mission and vision from internal and/or external sources and from the personnel and/or papers, virtual networks	1. Your organization evaluates organizational knowledge which is essential for organizational core functional mission and vision . 2. Your organization identifies knowledge by the selection of core identical knowledge which is fitted for organizational core functional mission and vision. 3. Your organization identifies knowledge by the selection of the knowledge which the organization must acquire and create. 4. Your organization has activities to gain knowledge from internal sources for obtaining the selected knowledge. 5. Your organization has activities to gain knowledge from external sources for obtaining the selected knowledge.

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
			6. Your organization obtains the selected explicit knowledge from papers, documents and electronic media. 7. Your organization obtains the selected tacit knowledge from experts, knowledgeable personnel or skilled workers. 8. Your organization obtains the selected knowledge from the meetings or other formal and informal social activities,. 9. Your organization obtains the selected knowledge from the ICT.
	1.1.2 Knowledge Creation (Lim et al., 1999; Gottschalk, 2006; Cepeda and Vera, 2007; Ho, 2008; Nonaka and Takeuchi, 1995; Nonaka, 1998; Crossan et al, 1998; March, 1991; Niu, 2010).	1.1.2.1 Knowledge Creation is an organization's attempt to create new knowledge from obtained knowledge.	10. Your organization has the processes of transforming the obtained knowledge to new organizational knowledge in meetings, and by experimenting, practicing, research and development. 11. Your organization has a process of adjusting the new organizational knowledge

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
	1.2 Knowledge Organizing (Crossan et al, 1999; Zack, 1999; March, 1991; Huber, 1991; Niu, 2010; Grover and Davenport, 2001; Earl, 2001)		by many cycles of knowledge searching and knowledge creation
	1.2.1 Knowledge Refining	1.2.1.1Knowledge Systemizing is an organization's value-adding process of knowledge categorizing, and indexing to newly obtained knowledge.	12. Your organization systemizes or categorizes newly created knowledge by information technology software or programs for easy searching and access. 13. Your organization systemizes or categorizes newly created knowledge by manual indexing for easy searching and access.
		1.2.1.2 Knowledge Integration and Validation is an organization's value-adding process of integrating and validating to newly obtained knowledge .	14. Your organization has the integrate newly created knowledge to the main unique organizational knowledge which is fitted to the core mission and RTAF vision

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
			15. Your organization validates the newly knowledge by experts and skilled practitioners.
	1.2.2 Knowledge Storing (Crossan et al, 1999; Duffy, 2000; Huber, 1991; Zack, 1999; Niu, 2010; Lee and Yang, 2000; Lee, Kim and Kim, 2011)	Knowledge Storing is an organization's attempt to store and save knowledge after refining by manual or IT with suitable protection for knowledge access.	16. Your organization has computerized systems to store and save knowledge after refining. 17. Your organization has documentary systems to store and save knowledge after refining. 18. Your organization has suitable protection of knowledge storing for accessing refined knowledge.
	1.2.3 Knowledge sharing (Adapted from Hogel et al., 2003; Davenport and Prusak, 1998).	Knowledge sharing is the sharing or exchanging of new knowledge by applying both formal or informal face-to-face meetings and virtual networks, between internal and external	19. Your organization has the exchange of new knowledge through formal and/or informal face-to-face meetings among internal organizations. 20. Your organization exchange new knowledge through formal and/or informal

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
		organizations.	face-to-face meetings among external organizations. 21. Your organization exchange new knowledge via virtual networks among internal organizations. 22. Your organization exchange new knowledge via virtual networks among external organizations.
	1.3 Knowledge Applying (Bhatt, 2001; Grant, 1996; Gold et al., 2001; Pfeffer and Sutton, 2000; Gold et al, 2001; Wong and Radcliffe, 2000; Tushman and Romanelli, 1985; Niu, 2010)	Knowledge Applying is an organization's value creating activity by using new knowledge.	23. Your organization's new knowledge is actually utilized.
2. Innovation (Adapted from Damanpour, 1991; Ibarra, 1993; Chen, C.; Huang, J. and Hsiao Y. 2010, Zack, McKeen and Singh, 2009; Lee, Kim and Kim, 2012)	2.1 New Technologies	New technologies are an innovative technologies or systems from new knowledge for organizational operations and/or communication.	24. Your organization has created or developed from new knowledge new technologies or systems for operations and/or communication.

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
	2.2 New Equipments and/or Services	New Equipment/ and Services are innovative equipment and/ or services obtained from new knowledge to fulfill internal and/or external customer satisfaction	25. Your organization has created or developed new equipments from new knowledge. 26. Your organization has created or developed new services from new knowledge.
	2.3 New Procedures	New Procedures are an innovative procedures from new knowledge for effectively organizational operations	27. Your organization has created or developed new procedures from new knowledge.
3. Organizational Performance	3.1 Efficiency	Organizational efficiency are organizational output resulted from operations by the use of innovations (Robbins and Coulter, 2002; Anderson, 2006; Ho, 2008)	28. Your organization has more efficiency by reducing the operational cost. 29. Your organization has more efficiency by reducing steps and time of operational processes.
	3.2 Customer Satisfaction	The customer satisfaction is	

Table 4.3 (Continued)

Concept	Sub-concept	Definition	Item/Indicator
		the satisfaction resulted from the responsiveness of new equipments and/or services fitted to the internal and/or external customer's need (Ho, 2008; Zack, McKeen and Singh, 2009)	30. Your organization has better quality of equipment production and maintenance fitted to customer's need . 31. Your organization has better quality of services fitted to customer's need.
3. Organizational Performance	3.3 Effectiveness	Achievement of organizational effectiveness (Robbins and Coulter, 2002; Anderson, 2006; Ho, 2008), or ultimate goal, or vision (Kaplan and Norton,1992; Lee, et al., 2005), or the capability to response to unexpected incidents and crises (Adapted from Lee, Kim and Kim, 2012).	32. Your organization has the capability to respond to unexpected incidents and crises 33.Your organization has the capability to achieve organizational outcomes or ultimate goals. 34.Your organization has the capability to fulfill the RTAF vision.

The questionnaire has two sections: Section A: General information about the participant and the organization and Section B: Effects of knowledge management practices and innovation on organizational performance of RTAF. The questionnaire measures the organizational behavior or practice by ten-point Likert scale.

4.4 Validity Testing

4.4.1 Quantitative Analysis

The quality of the measurement tool was analyzed by Item Analysis

4.4.1.1 Validity

The validity was evaluated as follows:

1) Content Validity

The researcher examined that the items or indicators at the empirical level, whether they have the right and complete contents as indicated in operational definitions and conceptual definitions of the sub-concepts and concepts. And the researcher adjusted all the items after the pretest by deleting some words in the items which had no content validity.

2) Logical Validity or Face Validity

Five experts (namely, Associate Professor Tippawan Lorsuwananrat, Air Vice Marshal Supit Prasopsil, Group Captain Jarassri Jindarattanawong, Wing Commander Suwimol Smata, Wing Commander Nuntawan Buddhawan) evaluated the logical validity of each item and the researcher adjusted all the items by deleting unsuitable words and adding suitable words in the items as suggested by these experts.

3) Criteria Related Validity

An item in the questionnaire is valid when the Item -Total Correlation is more than 0.7. The result of pretest analysis showed that from the total of 34 items, there were 31 items which had the Item -Total Correlation of more than 0.7. The three items which were item number 25 (Innovation, New Equipment and/or Services), item number 26 (Innovation, New Equipment and/or Services), and item number 29 (Organizational Performance, Efficiency) had the Item -Total Correlation of less than 0.7 . So these items were deleted from the questionnaire, then the total

number of items was reduced from 34 to 31 items. All of the31 items had criteria related validity (more than 0.7) as proved by the Item -Total Correlation , which ranged from 0.925 to 0.712. In fact, measures with Item -Total Correlation of more than 0.6 are considered to have high Criteria Related Validity (Kerlinger, 1999), the criterion related validity in this study is very satisfactory.

4) Construct Validity

In order to ensure the validity, the researcher examined whether the concepts and sub-concepts and had construct validity or theoretical validity.

LISREL which is the software program developed by Joreskog and Sorbom (1993) was applied to prove the Structural Equation Model by analyzing the relationship between variables in the conceptual framework or causal model. The model was also proved if it fitted the evidence-based data or real phenomena. Model LISREL is composed of 1) Measurement model and 2) Structural Equation model. Variables in the Structural Equation Model were classified as latent variables and observed variables. The LISREL measurement model was used for evaluating construct validity of the latent variables. In this study, the first latent variable was knowledge management practices, which was measured by three observed variables: knowledge obtaining, knowledge organizing, and knowledge applying. The second latent variable was innovation, which was measured by two observed variables: new technologies and new procedures. The last latent variable was organizational performance, which was measured by three observed variables: efficiency, customer satisfaction, and effectiveness. The results of measurement model as shown in Figure 4.1 and Figure 4.2 indicated that the construct validity of two latent variables-- knowledge management practices and organizational performance. The results of measurement model did not indicate the construct validity of one latent variable, i.e., innovation, all the three latent variables have been proved to have Content Validity, Logical Validity or Face Validity, and Criteria Related Validity to have strong validity in the previous validity examination. So all of the three latent variables, which were KM practices, innovation and OP were further analyzed by LISREL to find out the relationship of latent variables. The measures also

indicate whether the structural equation model meets recommended levels. The acceptable thresholds for the fit indices were shown in Table 4.4.

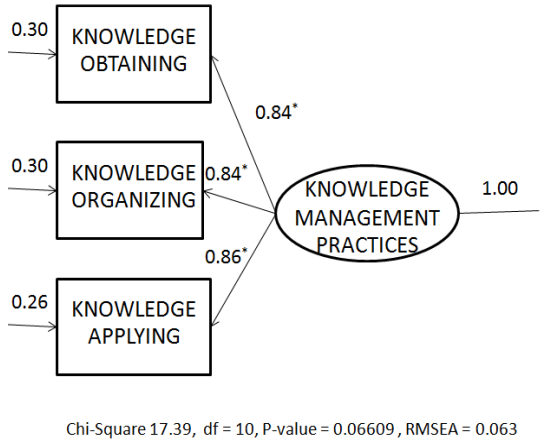

Figure 4.1 Measurement Model of Knowledge Management Practices

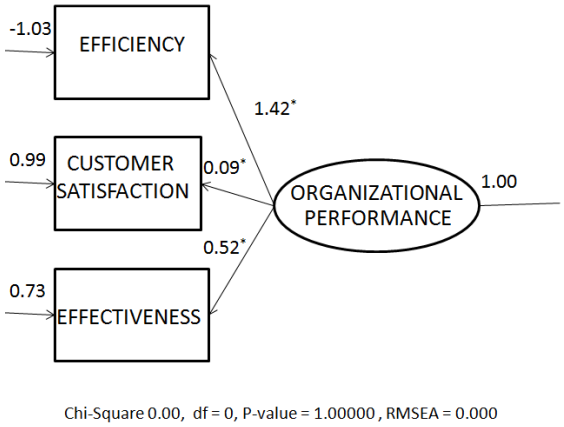

Figure 4.2 Measurement Model of Organizational Performance

The third step was to perform Path analysis by Multiple Regression, Maximum Likelihood (ML) estimation to find out the relationship of latent variables. The measures also indicate whether the structural equation model

meets recommended levels. The acceptable thresholds for the fit indices were shown in Table 4.4.

Table 4.4 Acceptable Thresholds for the Fit Indices

Absolute Fit Index	Acceptable Thresholds Level
Chi-Square (χ^2)	Low χ^2 relative to degrees of freedom with an insignificant p value ($p>0.05$)
Relative Chi-Square (χ^2/df)	not be more than 2 (Tabachnik and Fidell, 2007)
Root Mean Square Error of Approximation (RMSEA)	Value 0.05 to 0.10 (MacCallum et al., 1996)

4.4.2 Validity of Qualitative Analysis

The validity of the qualitative data was analyzed by the data triangulation method or the use of multiple sources of data (official documents and related participants including organizational executives) to confirm the validity as mentioned by Rossman and Rallis (2012). Being closely involved in the setting for a long period of time is another strategy for enhancing the credibility of the qualitative analysis (Rossman and Rallis, 2012). In this research, the researcher has been working in the RTAF for 29 years. And the researcher has been involved in many KM activities of RTAF for 8 years, and has until now been head of CoP, a lecturer, an evaluator and a member of related subcommittees.

4.5 Reliability Testing

Reliability, is the predictability of the results by the repeated measurement, was tested and the results were as follows:

4.5.1 Internal Consistency Reliability

In general, Cronbach's Alpha Coefficient is used to test the internal consistency reliability of the question, the Likert scale of which is more than 3 (Nunnally, 1978). In this study, the Alpha Coefficient Reliability was calculated to find out the reliability of the questionnaire, had 10- Likert scale. Cronbach's Alpha estimation which was applied to measure the internal consistency of the measurement items revealed that each item was reliable since the reliability value/ (Cronbach's Alpha: α- coefficient) was higher than 0.9, indicated the strong reliability (Cuieford, 1965). To be specific, the result of pretest analysis showed that Cronbach's Alpha was .980 and the result of the final analysis showed that Cronbach's Alpha was .929 (Table 4.5).

Table 4.5 Cronbach's Alpha Coefficient Reliability Test

Variables	Cronbach's Alpha	Variance
Knowledge management practices	0.886	0.241
Innovation	0.731	1.116
Organizational Performance	0.844	0.304
Total	0.929	0.661

4.6 The Examination of Multicollinearity

LISREL Analysis requires data cleansing by examining the multicollinearity which must be evaluated before the statistical analysis of the full model of Structural Equation Model (SEM). Table 4.6 demonstrates the correlation matrix for the constructs in the model. Multicollinearity exists if the independent variables are highly correlated with each other, which results in difficulty in determining the contribution of each independent variable. Suchart Prasith-Rathsint (1997) and Hair et al. (1998) propose that the correlation of 0.8 or above indicates a Multicollinearity problem. The correlation coefficients and the strength of relationship is shown in Table 4.6. In this study, the correlation matrix for the constructs in the model as shown in Table 4.7 indicates that the correlation coefficients of all variables in this

study ranged from 0.46 to 0.76 at the 0.01 level of statistical significance. So the Multicollinearity was not problematic for further analysis.

Table 4.6 The Strength of Correlation

Correlation (r)	Strength of relationship
0.9	Very Strong
0.8	Strong
0.7	Rather Strong
0.6	Moderately Strong
0.5	Moderately Strong
0.4	Moderately Strong
0.3	Rather Weak
0.2	Weak
0.1	Very Weak

Source: Pornpen Petsuksiri, 2005: 120.

Table 4.7 Correlation Matrix

Variables	1	2	3	4	5	6	7
1.K obtaining							
2.K organizing	.76**						
3.K applying	.69**	.75**					
4.Innovation (IT)	.46**	.64**	.49**				
5.Innovation (procedure)	.60**	.71**	.69**	.59**			
6.OP(efficiency)	.61**	.69**	.66**	.46**	.81**		
7.OP (satisfaction)	.54**	.64**	.55**	.58**	.67**	.65**	
8.OP (effectiveness)	.71**	.76**	.72**	.47**	.71**	.72**	.57**

Notes: n=185 **. Correlation is significant at the 0.01 level (2-tailed).

4.7 Methods of Data Analysis

4.7.1 Quantitative Analysis

The data concerning research of KM practices, innovation and OP were statistically analyzed by full model of Structural Equation Model (SEM). The Path Analysis in the LISREL version 8.52 (Joreskorg and Sorbon, 1993) was employed to find out direct and indirect relationship of the independent variable, the dependent variable and the intervening variable.

4.7.2 Qualitative Analysis

Data analysis which is interpretation, data connection (categorizing, and identifying patterns), and the presentation of the information or reporting the findings to be appropriate for the audiences to access and understand were performed (Rossman and Rallis, 2012).

4.8 Chapter Summary

In this chapter, the researcher describes the research design and sampling methods, methods of data collection, research instrument, measurement and purification process, validity testing, reliability testing, methods of data analysis, and data analysis procedures. The methodology of this study is mixed method, qualitative and quantitative. The qualitative data were collect by a survey research. And the qualitative data were gathered by conducting 1) documentary research, 2) semi-structure interview. The conceptual framework and the cause-effect model which have been formulated from document research. Then, qualitative and quantitative research method were to prove the model.

CHAPTER 5

RESEARCH RESULTS

The research procedure started from indicating the research problems, reviewing related past papers and researches, and creating of a research model. Then, the data were statistically analyzed, which may lead to a new theory or body of knowledge. In this chapter, the characteristics of sample were described by descriptive statistics followed by the results of the proposed model testing, the results of hypotheses testing, and the results of qualitative analysis that confirmed the results of quantitative analysis.

5.1 Sample Demographics

The characteristics of the population were described--position, job concern, and location of their organizations. A population are 166 directors and 19 commanders from 185 organizations of RTAF in Bangkok and other provinces in Thailand. The researcher used several channels (visiting, delivering by messenger and e-mailinh) to get questionnaires back, so the return rate of the questionnaires was 100%. The majority of the respondents were directors, accounting for 76.8% of the total respondents, and the rest were commander, accounting for 23.2%, as shown in Table 5.1. Almost all or 180 respondents or 97.3% were responsible for KM, innovation and organizational performance accounting for 97.3%. And only 2.7% had nothing to do directly with KM, innovation and organizational performance. The organizations of 165 respondents were mainly in Bangkok, accounting for 89.2% of the total organizations. And the organizations of the other respondents were located in other provinces (10.8%). Finally, the return rate of questionnaire is 100%.

Table 5.1 Profile of the Respondents

Characteristics	Frequency	Percent
Position		
Director	142	76.8
Commander	15	8.1
Others	28	15.1
Total	185	100.0
Job		
Directly Related to KM	180	97.3
Indirectly Related to KM	5	2.7
Total	185	100.0
Location of Organization		
Bangkok	165	89.2
Other provinces	20	10.8
Total	185	100.0

5.2 Descriptive Statistics

The respondents were asked by ten-point Likert scale which varied from the minimum level 1 (strongly disagree) to the maximum level 10 (strongly agree). The descriptive statistics and Pearson's correlation were used to analyze the data by SPSS. As shown in Appendix F, the results show that the agreement as evaluated by the mean score of individual items ranged from 8.68 (Item 31: OP(in terms of effectiveness)) to 6.76 (Item 27: OP(in terms of customer satisfaction)).

The standard deviations shown in Table 5.2, which ranged from 1.06 to 1.95, indicated the fair degree of the variance in the response. Table 5.2 also shows the correlation (r) of the observed variables by the identity matrix. The correlation of all 28 pairs of the observed variables have a positive value of r. The correlation coefficients (r) ranged from 0.46 to 0.81 with significance at the 0.01 level. So the

observed variables could be said to have a moderate to strong relationship, as shown in Table 4.6 (Pornpen Petsuksiri, 2005).

Table 5.2 Mean, Standard Deviation, and Correlation of the Observed Variables

Variables	Mean	SD	1	2	3	4	5	6	7
1.K obtaining	8.26	1.06							
2.K organizing	7.72	1.38	.76**						
3.K applying	8.39	1.42	.69**	.75**					
4.Innovation (IT)	7.20	1.96	.46**	.64**	.49**				
5.Innovation (procedure)	7.96	1.54	.60**	.71**	.69**	.59**			
6.OP(efficiency)	7.78	1.64	.61**	.69**	.66**	.46**	.81**		
7.OP (satisfaction)	7.48	1.68	.54**	.64**	.55**	.58**	.67**	.65**	
8.OP (effectiveness)	8.55	1.35	.71**	.76**	.72**	.47**	.71**	.72**	.57**

Notes: n=185 **. Correlation is significant at the 0.01 level (2-tailed).

5.2.1 Knowledge Management Practices

The mean scores which indicated agreement to the three observed variables of knowledge management practices were shown in Table 5.2 and Fig. 5.1. The mean scores ranged from 8.39 to 7.72**.** Knowledge applying had the highest mean scores (8.39), followed by knowledge obtaining (8.26) and knowledge organizing (7.72), respectively.

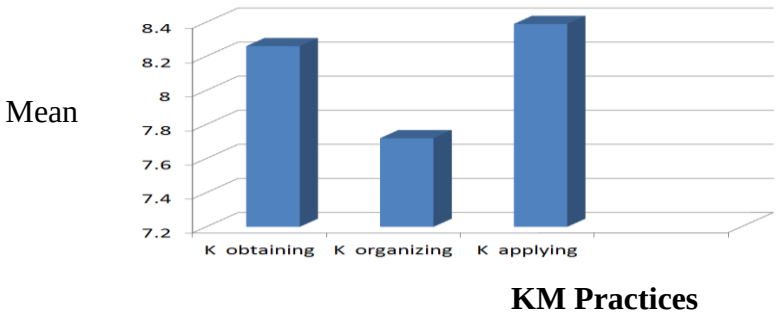

Fig. 5.1 Mean Score of KM Practices

5.2.2 Innovation

As illustrated in Table 5.2 and Fig. 5.2, the mean score of the agreement to innovation ranged from 7.96 to 7.20**.** The innovation (new procedure) had the maximum mean score of 7.96 (the most agreed), while innovation (new technologies) had the minimum mean of 7.20.

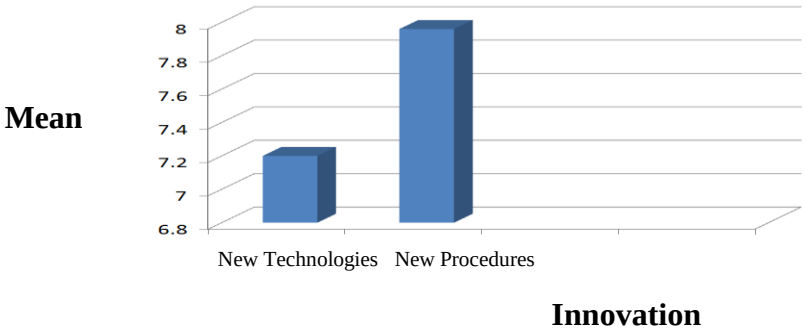

Fig. 5.2 Mean Score of Innovation

5.2.3 Organizational Performance

As shown in Table 5.2 and Fig. 5.3, the mean of the agreement to organizational performance ranged from 8.55 to 7.48**.** Effectiveness had the highest mean scores (8.55), followed by efficiency (7.78) and customer satisfaction (7.48), respectively.

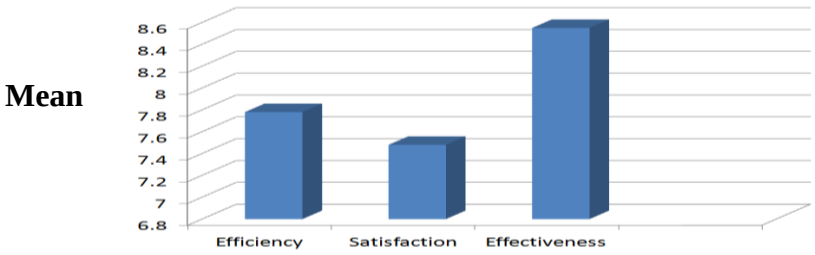

Fig. 5.3 Mean Score of Organizational Performance

5.3 Results of the Proposed Model Testing

The data concerning research of knowledge management practices, innovation and organizational performance were statistically analyzed by full model of Structural Equation Model (SEM). The Path Analysis in the LISREL version 8.52 was employed to find out direct and indirect relationship of independent variable, the dependent variable and the intervening variable. The LISREL analytical model which is fitted to the evidence-based data enables the researcher to make generalizations and to create a new body of knowledge.

The first step in the LISREL analysis was to evaluate whether the independent variable in the model was not Multicollinear. After that the measurement model for evaluating construct validity was used to prove that the three latent variables were well defined by observed variables. The third step was to perform Path analysis by Multiple Regression, Maximum Likelihood (ML) estimation to find out the relationship of latent variables. The measures also indicate whether the structural equation model meets recommended levels. The acceptable thresholds for the fit indices were shown in Table 4.3. Then the Model Fit evaluated by Goodness of Fit indices. The derived Chi-square not have a statistical significance (probability of more than .05 ($p>.05$)). And chi-square/df should not be more than 2 (Tabachnik and Fidell, 2007). The result of Path analysis showed that the chi-square of 17.39, df of 10, p-value of 0.06609. Since chi square / df is 1.7, the model is fitted to the empirical data. The Model Fit was further evaluated by RMSEA which should be in

the range of .05 to 0.10 to show the fit of the model (MacCallum et al., 1996). The fit of the model as shown by the value of resulted of RMSEA was 0.063.

The relationship among the three latent variables which were knowledge management practices, innovation and organizational performance was fitted to the Path Analysis Model as shown in Figure 5.4. Thus, the analytical results of the LISREL model indicated a fit for the sample data. All of the three hypothesized relationships are statistically significant.

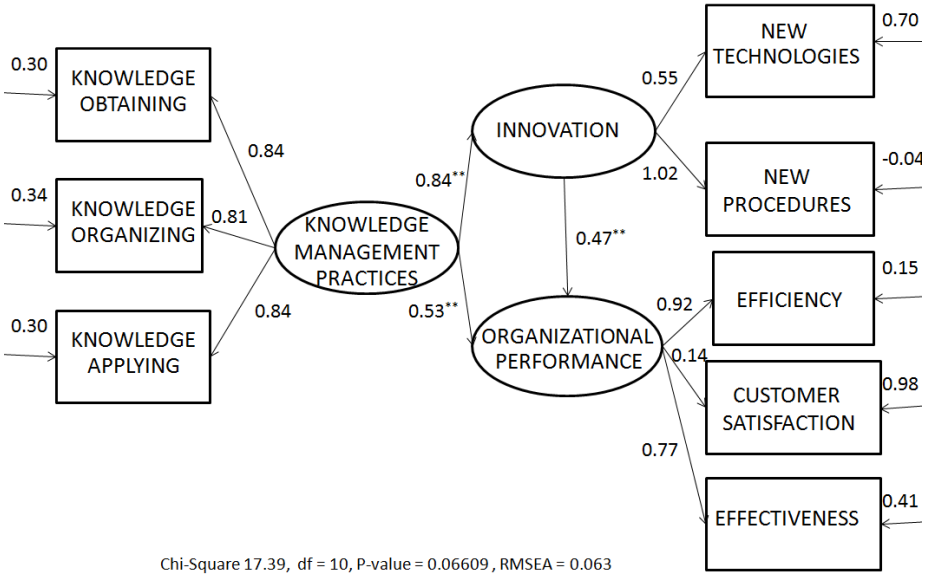

Figure 5.4 The Analytical Model of The Study

5.4 Results of Hypothesis Testing

The results showed that the effect of knowledge management practices and innovation on organizational performance was statistically significance. Effective knowledge management can increase OP (Lee and Sukoco, 2007). And KM practices may contribute to innovation (Marquardt,1996), as well. Additionally, innovation creation by knowledge management practices can, in turn, improve individuals and organizational performance (Lungu, 2011). The testing of the three hypotheses by Path analysis were summarized in Table 5.3. The value of β in the model was used

to explain the causal relationship. In Table 5.3, the paths leading from knowledge management practices to innovation were statistically significant (β =0.84); thus, hypothesis I was accepted. KM practices have a positive direct influence on innovation (H_1 is supported). Similarly, the paths leading from innovation to OP were statistically significant (β =0.47); thus, hypothesis II was accepted. Innovation has a positive direct influence on OP (H_2 is supported). Next, the paths leading from KM practices to OP were statistically significant (β =0.53); thus, hypothesis III was accepted. KM practices have a positive direct influence on OP (H_3 is supported). And KM practices have an indirect influence on OP, through innovation (H_1 and H_2 are supported).

Table 5.3 The Summary of the Results of Hypothesis Testing

Hypotheses	Path	Results
H_1: KM practices positively influence innovation	KM ⟶ Innovation	Statistically significant
H_2: Innovation positively influences OP	Innovation ⟶ OP	Statistically significant
H_3: KM practices positively influence OP	KM ⟶ OP	Statistically significant

The results of the data analysis indicated that the observed variables were reliable measures for the three latent variables. The theoretical model also satisfactorily fits the empirical data, which support the construct validity.

H_1: Knowledge management practices positively influence innovation

Knowledge management practices can be classified into 3 processes: knowledge obtaining, knowledge organizing, and knowledge applying (Niu, 2010). Knowledge in practice-based processes also affects the innovation (Harmaakorpi and Mutanen, 2008). In addition, long- term competitive advantages of the organization are achieved by its ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). In fact, new combinations of organizational knowledge and other sources create new knowledge

and innovation (Cohen and Levinthal, 1990; Kogut and Zander, 1992). Flexible capability of knowledge conversion to share each other functions in the organization fosters firms to speedy create new product development (Clark and Fujimoto, 1991). The ability of the firm to recognize, understand, and utilize external information and knowledge leads to its innovation as a new commercial goods and services (Cohen and Levinthal, 1990). Having access to expertise and facilities leads to organizational ability to build and strengthen skills and knowledge needed to advance new technologies (Pathareeya Lakpetch, 2010). Community of Practice (CoP) is also a tool for knowledge management. CoP is a group of individuals from inside and outside organizations attempting to solve organizational problems by providing links among individuals to support useful information for achieving knowledge, innovation, and vision (Nonaka, 1994).

In the study, KM practices were hypothesized to effectively facilitate innovation ($H_{1)}$. The standardized coefficient for the relationships represented by H_1 (β =0.84) showed a strong positive effect of the proposed variables.

H_2: Innovation positively influences organizational performance

Innovation is defined as a continuous process for new products and services (Harmaakorpi and Mutanen, 2008). Innovation, which is the development of new products and processes, is the fostering power for the organization (Harmaakorpi and Mutanen, 2008). Innovation is defined as cooperation for knowledge production by different background people within the same interest network (Harmaakorpi and Mutanen, 2008), Innovative processes are co-operative, networked processes, networking such as dialogues of co-operators will enhance the environment for innovation (Harmaakorpi and Mutanen, 2008). Characteristics and types of innovation are product innovation, process innovation and technological innovation (Schumpeter, 1943; Moore and Benbasat, 1991; Sunding and Zilberman, 2000; Tether, 2002; Organization for Economic Cooperation and Development and European Community, 2005; Palangkalaya et al., 2010). Innovation is the fostering power for the organization (Harmaakorpi and Mutanen, 2008). The capability of organization to create and utilize intangible assets and creative-based innovation is beneficial for customer's satisfaction and need (Nicholas, 2010). There is a link between organizational decision to innovate, organizational innovative processes,

output and OP (Palangkalaya et al., 2010). Output of innovation process is measured by the number of new product and process (Jensen and Webster, 2009; Palangkalaya et al., 2010). Successful innovations may result from the co-operation of interactive operators and experts in the gradually learning processes (Harmaakorpi and Mutanen, 2008). Long-term competitive advantages of an organization are achieved by the organizational ability to continuously create new knowledge for producing new products and services (Von Krogh, Roos and Slocum, 1994). Innovation improves individual and organizational performances (Lungu, 2011).

In the study, innovation was hypothesized to effectively facilitate OP ($H_{2)}$. The standardized coefficient for the relationships represented by H_2 (β =0.47) showed a strong positive effect of the proposed variables.

H_3: Knowledge management practices positively influence organizational performance

KM practices, concentrated on processes, mechanism and the ability to locate and share internal best practices, are essential for overall organizational performance (Szulanski, 1996; Davenport and Prusak, 1998). And KM is also focused on utilizing external knowledge for new product innovation (von Hippel, 1994) and organizational performance (Sher and Lee, 2004).

In the study, KM practices were hypothesized to effectively facilitate OP ($H_{3)}$. The standardized coefficient for the relationships represented by H_3 (β =0.53) showed a strong positive effect of the proposed variables.

From the analysis of the variables, it was found that KM practices could adequately explain innovation with the value of square multiple correlation of 0.85 (R^2=0.85). And KM practices could adequately explain the OP with the value of square multiple correlation of 0.94 (R^2=0.94). KM practices and innovation could adequately explain the OP with the value of the coefficient determination in the model, or square multiple correlation (R^2) of greater than .40 (Joreskorg and Sorbon, 1993). To conclude, KM practices and innovation were hypothesized to effectively facilitate the OP (H_1, $H_{2,}$ and $H_{3)}$. The standardized coefficient for the relationships represented by H_1 (β =0.84), H_2 (β =0.47), and H_3 (β =0.53) showed a strong positive effect of all proposed variables. All of the three hypotheses were accepted. So it

could be concluded that KM practices positively influence the OP, through innovation in the public organization context.

5.5 Chapter Summary

This chapter summarized the results of quantitative and qualitative analyses. The findings from quantitative analysis by means of Path analysis proved the hypotheses of the proposed model that measured the relationship of knowledge management practices, innovation and organizational performance. Knowledge management practices include knowledge obtaining, knowledge organizing, and knowledge applying. The innovations include new technologies, new procedures, and new services and products. The results showed that the effect of knowledge management practices on organizational performance was statistically significant through innovation. The findings reveal that KM practices and innovation have increased the efficiency, customer satisfaction, and effectiveness of the organizational performance.

CHAPTER 6

CONCLUSIONS AND DISCUSSION

This chapter presents the conclusion and the discussion of the findings. After that, theoretical, managerial and practical suggestions are also given. Additionally, suggestions for further studies are made.

6.1 Conclusions

The objectives of the research were 1) to develop a model of knowledge management practices and organizational performance, 2) to validate the relationship of knowledge management practices and organizational performance in the model, and 3) to suggest for the improvement of knowledge management practices and organizational performance**.**

The proposed model was analyzed by path analysis applying structural equation modeling to evaluate the theoretical construct, to validate the measures, and to evaluate the relationships of the variables in the causal model. In quantitative research, a questionnaire survey was conducted to collect the data from all 185 commanders and directors of Royal Thai Air Force organizations. And the number of returned questionnaires was 100%. In qualitative research, the population were six RTAF administrators who were responsible for knowledge management, including the Commander-in-Chief of the RTAF.

The results was statistically proved the proposed model and supported hypothesis testing by the examination of Multicollinearity, measurement model and LISREL program version 8.52 which were applied to evaluate the relations of latented variables. The findings were that knowledge management practices positively influenced the organizational performance, through innovation. The results of quantitative analysis were supported by the results of qualitative analysis

6.2 Discussion

In this study, the researcher attempts to investigate the effects of KM practices and innovation on OP. The empirical results provide considerable support to the proposed framework. As predicted, the findings are clearly in favor of the view that KM practices and innovation are enablers of OP. The following discussion is based upon the results of LISREL analysis (Figure 5.4).

H_1: Knowledge management practices positively influence innovation

It is first noted that the paths leading from knowledge management practices to innovation were statistically significant (β =0.84); thus, hypothesis I was accepted. KM practices have a positive direct influence on innovation (H_1 is supported).

As estimated, the results clearly support the concepts that new knowledge from KM practices is the key factor of innovation (Tidd, Bessant and Pavitt, 2005; Gubbins and Dooley, 2013). And organizational KM practices may convert to new products and services or innovation (Balconi, Breschi and Lissoni, 2004). The results of this study support the findings of previous studies concerning the influence of knowledge management practices on innovation (Clark and Fujimoto, 1991; Von Krogh, Roos and Slocum, 1994; Harmaakorpi and Mutanen, 2008), since the researcher found the direct influence of KM practices on OP (i.e. H_1 is supported). Based on the structure of this research model, the results seem to be reasonable. That is the model suggests that the organizations need to effectively practice KM to create innovation.

The findings of qualitative research confirm those of quantitative analysis that KM practices positively influence innovation. KM in RTAF is practiced by the KM team or KM group or CoP. KM practices consist of 3 processes: knowledge obtaining, knowledge organizing and knowledge applying.

1) Knowledge obtaining (knowledge identification, knowledge searching and knowledge creation)

Knowledge identification for each organization means to identify and evaluate its knowledge relevant to the organizational vision, mission and strategic goal by discussing in the meetings and brain storming.

Knowledge searching means to obtain tacit and/or explicit knowledge for organizational core functional missions and vision from internal and/or external sources, from the personnel (experts, knowledgeable personnel or skilled workers) and/or papers, from documents and/or electronic media and virtual networks, from meetings and other formal and informal social activities and/or the ICT.

Knowledge creation concerns acquisition of new knowledge and previous knowledge which still have high value. KM practices in RTAF organizations consist of the processes of transforming obtained knowledge to new organizational knowledge in meetings, and by experimenting, practicing, research and development. The processes of adjusting new organizational knowledge by many cycles of knowledge searching and knowledge creation are performed. Knowledge creation results in new knowledge and innovation.

2) Knowledge organizing (knowledge refining, knowledge storing, knowledge sharing)

Knowledge refining is performed by 1) knowledge systemizing or categorizing newly created knowledge by information technology software or programs for easy searching and access, and/or by manual indexing for easy searching and access, 2) knowledge integration and validation, which integrate newly created knowledge to the main unique organizational knowledge which is fitted to the core mission and RTAF vision. And knowledge is validated by experts and skilled workers.

Knowledge storing is performed by storing and saving knowledge after refining by manual or IT with suitable protection for knowledge access by computerized systems and/or documentary systems. Various forms for storing knowledge are 1) documentary form, such as media, printed material, book, document, and paper sheet, 2) electronic form, e.g., data file, sound file, image file, and multimedia file, which provide ease and convenient for knowledge access via IT and 3) material form, e.g., subjective model for learning.

Knowledge sharing is performed by sharing or exchanging of new knowledge by applying both formal or informal face-to-face meetings and virtual networks between internal and external organizations.

3) Knowledge applying means that new knowledge from KM practices is actually utilized by RTAF organizations.

In RTAF, data and information accumulated in the organizational documentary forms or books have been sent from senior to junior generations. And knowledge is continuously revised and updated. New knowledge and innovation come from KM practices by learning from experience, brain storming, cross functional team, community of practices, quality group activity, mentoring system, work rotations, borrowing of experts, on- the- job training (OJT), senior teaching or brotherhood coaching, seminars, or informal meetings and knowledge forum have been practiced to create. In addition, many military study courses enable the personnel to gain knowledge and ability to increase work efficiency, rapidness, and correctness of work.

KM practices enable the personnel to generalize new knowledge. Air Marshal Twidanes and Air Vice Marshal Chawarat insisted that "KM practices of RTAF organizations lead to new knowledge". And the information enables the decision makers to timely make correct decisions. Air Marshal Yanyong gave an example: "The air force bases aim to develop to be the network centric air base (NCAB) which require new knowledge. And Wing 7 developed new knowledge to be NCAB and then distributed the NCAB knowledge to other RTAF air bases. As a result, many air bases have more new knowledge to achieve our missions". KM practices of RTAF organizations certainly lead to new knowledge--the body of knowledge for operators and organizations-- in form of documents, work manuals, standards, etc. When old knowledge is integrated with accumulated experiences, then new knowledge is created and this leads to the achievement of mission. If KM has been well practiced, new knowledge for RTAF organizational missions and RTAF vision will be gained. Since new knowledge is created from research and development and from problem solving groups such as some organizational QC groups.

New knowledge from KM practices of RTAF organizations has brought about innovation. Air Chief Marshal Prajin defined innovation as "new procedures to do things or new ideas for working processes. From the definition, innovation is certainly caused by new knowledge". However, new knowledge may hardly be different from previous knowledge, but one result from KM processes is new procedure of present work. The present procedure might be good in the past, but may be unsuitable for the present condition. Furthermore, Air Marshal Twidanes, Air Marshal Yanyong, and Air Vice Marshal Chawarat stressed that "new knowledge obviously create innovation". Additionally, Air Vice Marshal Rit explained that "new knowledge is an innovation in the form of new documents or media, new equipment or tools, and new procedures". New procedures may replace old procedures by reducing some operational steps or errors, making the operational speed increase. Furthermore, some organizations have a low budget, so the organization has to create innovation or new processes to repair or maintain of equipment for survival and self-dependence. To illustrate, many RTAF organizations which have KM practices produce many innovations: for example, the UAV (unmanned aerial vehicle) center of Thai military forces, the innovation of physical therapy in Bhumibol Adulyadej Hospital, the one stop service RTAF personnel center, and the RTAF Disaster Assistant Center. New knowledge is integrated to respond to the past problems in mission operation and others. Solution of the logistic system is another example. In the past, C-130 had low fully mission capable (FMC) status. Since Wing 6 has practiced the knowledge management, now Wing 6 successfully increases the FMC and solve the logistic problem. Moreover, the Gripen procurement program by Wing 7 is an innovation. It is the model for aircraft or armament procurement program in the future. Additionally, an innovative tool by Wing 21 for exchanging the aircraft's gear box, which is the electric power generator, reduces the number of mechanics from 3 to 2, and the time from 180 minutes to not more than 65 minutes. Since the innovation alters the working process, it reduces the operational time, manpower, and organizational costs. Another example is the readiness of Wing21's fighter airplanes for mission, which enables the fighter airplanes to fly two hours more rapidly than ordinary. Furthermore, the Human Resource Information System (HRIS) which integrates

Human Resource management of all RTAF organizations can be considered one of the IT innovations which Directorate of Personnel, RTAF, has initiated in collaboration with a private company. However, in the past RTAF used to construct airplanes but did not do so continuously. At present, RTAF attempts to update knowledge and technology to construct a new RTAF airplane for RTAF missions. The researcher concludes that innovations include 1) new technologies, 2) new products and services, and 3) new procedures.

H_2: Innovation positively influences organizational performance

The paths leading from innovation to OP were statistically significant (β =0.47); thus, hypothesis II was accepted. Innovation has a positive direct influence on OP (H_2 is supported).

Consistent with expectation, the results show the clearly support that innovation is the fostering power for the organizational performance (Harmaakorpi and Mutanen, 2008) by the development of new products or equipments and services or maintenance, new processes or procedure, and new technologies. The innovation is beneficial for customer's satisfaction and need (Nicholas, 2010). And innovation improves organizational performances (Lungu, 2011). The results of this study support the findings of previous studies concerning the influence of innovation on OP (Harmaakorpi and Mutanen, 2008; Lungu, 2011). Since the researcher found the direct influence of innovation on OP (i.e. H_2 is supported). Based on the structure of this research model, the results seem to be reasonable. That is the model suggests that the organizations need to create innovation to enhance OP.

The findings of qualitative research support the results of quantitative analysis that innovations from KM practices in RTAF organizations positively influences OP. In this study, OP consists of: 1) efficiency, 2) customer satisfaction, and 3) effectiveness.

Efficiency

KM practices in RTAF organizations and innovation can lead to the efficiency of the operating processes. KM helps create new methods and equipment which increase the output and outcome and enable the organization to respond to the goals and targets. Additionally, KM practices in RTAF organizations and the application of innovation lead to more efficiency of operating processes. Steps in the

process can be reduced, so the process is faster, and the cost is lower. Indeed, KM practices lead to less steps, faster work, and cheaper costs. Air Vice Marshal Rit also believed that "if one organization have strongly KM practiced, the whole work of the organization will be correct and fast". Although, some work is not faster or does not have a shorter process, it is clearly seen that the work is more correct. So KM processes cause more operational efficiency, which leads to the goal achievement of the mission fulfillment without any error. Moreover, KM practices can enhance the organizational efficiency by reducing the working steps, operational time and costs. Further, KM can cause the effective use of the real time information and a more rapid work process, which leads to a more rapid decision for command and control. "In the war, if we make a decision more rapidly than the enemy, we will win the war" Air Marshal Yanyong stated.

Customer Satisfaction

KM practices in RTAF organizations and the innovation lead to the quality improvement of services and production for related organizations and fulfillment of RTAF requirements. The results of KM are new better work procedures or innovation which leads to more work efficiency and effectiveness. And new knowledge and innovation from KM practices can help organizations themselves to meet the customer's need in every condition. KM practices in RTAF organizations and the innovation lead to the improvement of the quality of services, maintenance and production of material, equipment, or weapons of related organizations and the fulfillment of RTAF requirements. The evident example is the efficiency and readiness of aircraft. For some period of time, the capacity of the aircraft for a full mission has reduced because the body of knowledge for aircraft maintenance transferred from the aircraft company to RTAF mechanics was not recorded and transferred to new RTAF mechanics. When the body of knowledge for aircraft maintenance is well managed by integrating the original knowledge of the aircraft company with the experiences of the mechanics. So the full mission capacity of the aircraft has clearly increased. KM practices of RTAF organizations and the resulted innovation can increase the quality of armament, equipment and materials which RTAF organizations produce or repair if the KM is rightly practiced. Furthermore, the feasibility check should be performed to assure the possibility and

usability of the innovation in the real environment. Air Marshal Yanyong indicated that "KM practices can respond to the need of the related personnel or organizations". For example, KM practices of Armament Directorate, which respond to the maintenance and production of RTAF armament, provide knowledge and information for decision making of the personnel in a cross-functional team. As well, the knowledge of building construction of Civil Engineer Directorate, which respond to the maintenance and construction of RTAF buildings and facilities, is available for related RTAF personnel, in another organizations too. So KM and LO make RTAF become a knowledge-based society. Air Vice Marshal Rit explained that "the quality of service depends on the quality of the operator who respond to the satisfaction of the customer". The quality of equipment or tools, i.e., correct or non-error function of equipment or tools leads to the acceptance of the users. For instance, KM practices can reduce the weakness of the bullet, explosive material and rocket production, so the quality of equipment is higher. The higher quality of material which RTAF produces or manufactures, repairs or maintains is considered from less waste in the production processes, and the repaired materials do not malfunction before the time for new turn of maintenance.

Effectiveness

KM practices in RTAF organizations and the innovation lead to the RTAF effectiveness, and attainment of the strategic goal, and RTAF vision. The results of KM practices need to be adapted to meet the nature of organizational work and to reduce the work process cycle with the same output, outcome and goal. The learnt lessons are exchanged among the organizations, and are adapted to fit for the nature of each organization. If every organization have better adapted KM for organizational work, the vision achievement will be faster. Air Marshal Yanyong stated that "KM practices in RTAF organizations and the resulted innovation bring the operational effectiveness, the achievement of the strategy and NCO vision. Because the base of NCO is knowledge, the knowledge must be managed. The knowledge must be practical to be useful for RTAF. Without knowledge, RTAF cannot function". For example, after from KM concerning aircraft maintenance, the effectiveness of the mission, achievement of RTAF vision and strategic goal. KM

practices and the innovation of some RTAF organizations will continuously lead to the RTAF effectiveness, strategic goal's achievement, and RTAF vision.

H_3: Knowledge management practices positively influence organizational performance

The paths leading from KM practices to OP were statistically significant (β =0.53); thus, hypothesis III was accepted. KM practices have a positive direct influence on OP (H_3 is supported).

KM practices, concentrated on processes, mechanism and the ability to locate and share internal best practices, are essential for overall organizational performance (Szulanski, 1996; Davenport and Prusak, 1998). And KM is also focused on utilizing external knowledge for new product innovation (von Hippel, 1994) and organizational performance (Sher and Lee, 2004). Since the researcher found the direct influence of KM practices on OP (i.e. H_3 is supported). Based on the structure of this research model, the results seem to be reasonable. That is the model suggests that the organizations need to effectively practice KM to enhance OP.

To understand the linkage between KM practices, innovation on OP in greater detail, three sub models were tested (Figure 5.4). The study results provide strong empirical support for the overall research model. KM practices have an indirect influence on OP, through innovation (H_1 and H_2 are supported). The findings of this study indicate that KM practices enable OP, through innovation.

To support the findings of quantitative research that knowledge management practices positively influence organizational performance through innovation. An example of KM team or CoP is "Get Smart", the KM team in Bhumibol Adulyadej Hospital . "Get Smart" invented the product innovation as new equipment called Posture Examination equipment instead of buying the "Digidoso" equipment for physical therapy. The cost of the new inventory equipment is only about 1,000 baht. On the contrary, the cost of the Digidoso equipment is about 11 million baht. Thus, the operational cost is reduced.

Another example is "The RTAF Medical Logistics Management Information System CoP", Directorate of Medical Services, RTAF, that presents the process innovation as new operational processes by applying Logistics Management Information System (LMIS) of RTAF which reduces steps of issue processes

(processes for medical supplies distribution) from 6 to 3 steps; thus the operational time is reduced. The old process required many processes and operational time and cost. At present, the amount of paper for each issue transaction is also reduced from 6 to 2 sheets of paper; thus the operational cost was reduced.

Also, "Cobra Team Spirit", the KM team of Wing 4 created technological innovation "Cobra Web" which provided data and knowledge management for Mid-Life Update of F-16 aircraft (F-16 MLU). F-16 is one of the fighter aircraft. KM for F-16 MLU of Wing 4 has been practiced to accumulate the body of knowledge of F-16 MLU.

"Gripen Team", the KM team of Wing 7 applied a software program with suitable knowledge protection to make knowledge "visible" or known and accessible for all RTAF pilots who fly "Gripen" aircraft. "Gripen" is the most modern type of RTAF fighter aircraft. And such new information technology reduce time and steps of flight missions, such as flight plans, tests and knowledge transfer for pilots.

"The Nest", a CoP of Civil Engineer Directorate, RTAF has created a new practical program for sharing and access of information and knowledge of building or construction. By this program, administrators and other related workers are able to know and share the body of knowledge of construction and related information, such as whom the present process is and what status of work is. Private companies which supply building material and equipment can access to give details about their goods. Thus, the time for searching of essential information is reduced. And the budget to hire a programmer can be saved.

"Hercules", the KM team of Wing 6 has created an innovation for services through KM practices. C-130 or "Hercules" is an aircraft for military transportation. The new service maintenance system increases the fully mission capability (FMC) status of C-130 to meet the requirement of RTAF and customer satisfaction.

The mixed method analysis is a suitable method for investigation in this research. In quantitative analysis, the data were analyzed and then synthesized to get the whole (Laszlo and Krippner, 1998). On the contrary, qualitative analysis investigates and explains from the whole phenomena to parts. Thus, the mixed method analysis fill the gaps of each analysis to gain the complete explanation of real phenomena.

6.3 Theoretical Suggestions

The model in this study contributes to the body of knowledge of knowledge management practices, innovation and organizational performance. Previous studies have paid attentions to investigate the role of KM on OP. To illustrate, the results of Khalifa, Yu and Shen (2008) clearly proved the effects of Knowledge management systems (KMS) in private firms on OP, and the research model indicated that the innovativeness influenced the OP. However, the study of Khalifa, Yu and Shen (2008) had a gap in OP measurement in public organizations and the innovation was not measured. Lungu (2011) showed the model which explained the knowledge management, innovation and other factors on the performance of military forces which was a public organization. However, there were no focus on innovation factors that affected on organizational performance, and since this paper presented a conceptual model, thus no evidence-based research study (such as the statistical methods and findings) was shown to test the integrated model. According to the literature, few empirical evidences have been provided to connect the relationships among KM practices, innovation and OP. This lack is serious because of the increasing important of KM to the improvement of OP. This study argues that the link between KM practices and OP may be influenced by innovation. Following the suggestion of previous research (Lungu, 2011), this study builds up the conceptual model and hypothesizes the moderating role of innovation between KM practices and OP.

This study contributes to the literature by empirically investigating the relationship among KM practices, innovation and OP. The findings support the researcher's argument that KM practices positively influence OP, through innovation. The findings of this study fill the gap in the literature (Lungu, 2011) that is lack of empirically investigating the effects of KM practices, innovation on OP.

To sum, this study contributes to the literature by theoretically developing a conceptual model and then empirically examining the relationships among KM practices, innovation and OP.

6.4 Implications for Practitioners

The findings in this study are valuable for manager's reference, especially for those whose circumstances are similar to the military organizations. The structural equation model provides useful information for managers to enhance OP through KM practices and innovation. Practitioners can use the findings to extend research on knowledge management and innovation.

6.5 Limitations of the Study and Suggestions for Further Studies

The findings of this study should be interpreted with caution in some limitations. First, from the literature review, innovation should be measured by new technologies , new equipment and/or services, and new procedures of the organization. However, not all the RTAF organizations manufacture equipment or products. So the only two dimensions employed to measure innovation are new technologies and new procedures. The measurement of innovation should be evaluated in other ways in future research.

The source of data collected is in a military organization in Thailand; hence the findings may not be easily generalized to non military organizations in other regions or countries. So future work should investigate the influence of geography and culture on KM practices.

Moreover, a comparative study should be made between different wings and divisions to find out the organization with the best KM practices and innovation and use this organization as a model for other organizations to follow. Further research may study KM practices in other forces and compare them in this aspect. Lastly, factors fostering KM practices and innovation and factors inhibiting KM practices and innovation should be studied to improve organizational performance.

6.6 Chapter Summary

The findings from the mixed method, quantitative research and qualitative research are discussed to explain how knowledge management practices and innovation have effects on the organizational performance. This chapter provides theoretical, managerial and practical suggestions from the discussion of the findings. The managerial advices for RTAF and other organizations based on empirical evidence from this study should be considered for organizational development. Furthermore, the limitation of the research in the public organizational context regarding the measurement of product innovation, was provided for further study to take into account. And the source of data collected was in a military organization in Thailand; hence the findings may not be easily generalized to non military organizations in other regions or countries. So future studies should be investigated.

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APPENDIX A

QUESTIONNAIRE (ENGLISH VERSION)

QUESTIONNAIRE

KNOWLEDGE MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE: A CASE OF THE ROYAL THAI AIR FORCE

This questionnaire is part of research undertaken in a doctoral degree study in a doctoral program in public administration at the National Institute of Development Administration (NIDA).

Your response for this research project gives significant contribution not only to the Royal Thai Air Force but also to other public organizations and the sake of overall society and developmental purposes.

In total, there are 12 pages (including this page). Please answer every question and suggest at the end of the questionnaire. Please be assured that your response is strictly confidential and only aggregate reports are reported.

Thank you for your time and effort that are contributed to this study and organizational development.

Group Captain Pranee Mooklai,
Ph.D.Candidate in Public Administration at NIDA,
Phone 081 269 3884, 02 534 2640 Fax 02 534 2638

Definition:

Knowledge management practices can be defined as knowledge obtaining, knowledge organizing, and knowledge applying.

Innovation can be defined as new technologies, new equipments and /or new services, and new procedures.

Organizational performance can be defined as efficiency, quality, and effectiveness of the organization.

This questionnaire has 2 sections, Section A: General Information and Section B: Knowledge management practices, innovation and organizational performance.

Section A: General Information

Instruction: Please mark / at your response in the following questions that indicate most precisely your perception, estimation, or facts for each question)

1. Does your job concerning knowledge management practices, innovation and organizational performance of your organization?

- ☐ No, Please forward this survey to the person you see fit, thank you
- ☐ Yes

2. Which category best describes your position in the organization?

- ☐ Director
- ☐ Commander
- ☐ Others, please specify……..

3. Where is the location of your organization?

- ☐ Bangkok
- ☐ Other provinces

To what extent do you agree or disagree concerning knowledge management practices, innovation and public organizational performance of your organization.
(1 = Strongly Disagree ⟶ 10 = Strongly Agree)

Item	Level Strongly Disagree ⟶ Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
Knowledge Management Practices Variable										
Knowledge Obtaining										
1. Your organization evaluates organizational knowledge which is essential for organizational core functional mission and vision .										
2. Your organization identifies knowledge by the selection of core identical knowledge which is fitted for organizational core functional mission and vision.										
3. Your organization identifies knowledge by the selection of the knowledge which the organization must acquire and create.										

Item	Level Strongly Disagree → Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
4. Your organization has activities to gain knowledge from internal sources for obtaining the selected knowledge.										
5. Your organization has activities to gain knowledge from external sources for obtaining the selected knowledge.										
6. Your organization obtains the selected explicit knowledge from papers, documents and electronic media.										
7. Your organization obtains the selected tacit knowledge from experts, knowledgeable personnel or skilled workers.										

Item	Level Strongly Disagree ⟶ Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
8. Your organization obtains the selected knowledge from the meetings or other formal and informal social activities,.										
9. Your organization obtains the selected knowledge from the ICT.										
10. Your organization has the processes of transforming the obtained knowledge to new organizational knowledge in meetings, and by experimenting, practicing, research and development.										

Item	Level Strongly Disagree ⟶ Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
11. Your organization has a process of adjusting the new organizational knowledge by many cycles of knowledge searching and knowledge creation.										
Knowledge Organizing										
12. Your organization systemizes or categorizes newly created knowledge by information technology software or programs for easy searching and access.										
13. Your organization systemizes or categorizes newly created knowledge by manual indexing for easy searching and access.										

Item	Level Strongly Disagree ⟶ Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
14. Your organization has the integrate newly created knowledge to the main unique organizational knowledge which is fitted to the core mission and RTAF vision										
15. Your organization validates the newly knowledge by experts and skilled practitioners.										
16. Your organization has computerized systems to store and save knowledge after refining.										
17. Your organization has documentary systems to store and save knowledge after refining.										
18. Your organization has suitable protection of knowledge storing for accessing refined knowledge.										

Item	Level Strongly Disagree → Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
19. Your organization has the exchange of new knowledge through formal and/or informal face-to-face meetings among internal organizations.										
20. Your organization exchange new knowledge through formal and/or informal face-to-face meetings among external organizations.										
21. Your organization exchange new knowledge via virtual networks among internal organizations. .										

Item	Level Strongly Disagree → Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
22. Your organization exchange new knowledge via virtual networks among external organizations.										
Knowledge Applying										
23. Your organization's new knowledge is actually utilized										
Innovation Variable										
New Technologies										
24. Your organization has created or developed from new knowledge new technologies or systems for operations and/or communication.										

Item	Level Strongly Disagree → Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
New Procedures										
25. Your organization has created or developed new procedures from new knowledge.										
Organiza-tional Performance Variable										
Efficiency										
26. Your organization has more efficiency by reducing the operational cost.										
Customer Satisfaction										
27. Your organization has better quality of equipments production and maintenance fitted to customer's need . .										

Item	Level Strongly Disagree ⟶ Strongly Agree									
	1	2	3	4	5	6	7	8	9	10
28. Your organization has better quality of services fitted to customer's need . .										
Effectiveness										
29. Your organization has the capability to respond to unexpected incidents and crises										
30. Your organization has the capability to achieve organizational outcomes or ultimate goals.										
31. .Your organization has the capability to fulfill the RTAF vision										

Suggestion……………………………………………………………………………..
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APPENDIX B

QUESTIONNAIRE (THAI VERSION)

แบบสอบถาม

KNOWLEDGE MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE: A CASE OF THE ROYAL THAI AIR FORCE

คำชี้แจง

แบบสอบถามฉบับนี้ เป็นส่วนหนึ่งของการวิจัยในหลักสูตรรัฐประศาสนศาสตรดุษฎีบัณฑิต คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์

การแสดงความคิดเห็นของท่าน จะทำให้เกิดความรู้ที่ได้จากการวิจัย ซึ่งไม่เพียงแต่จะเป็นประโยชน์ต่อการพัฒนากองทัพอากาศเท่านั้น แต่ยังคงเป็นประโยชน์ต่อการพัฒนาองค์การภาครัฐต่างๆ อันจะส่งผลดีต่อการพัฒนาสังคมโดยรวมด้วย

แบบสอบถามมีจำนวน 12 หน้า (รวมถึงหน้านี้ด้วย) ขอความอนุเคราะห์ ผู้ตอบแบบสอบถาม ตอบแบบสอบถามทุกข้อ และกรณีมีข้อเสนอแนะ สามารถเขียนเพิ่มเติมได้ที่ท้ายแบบสอบถาม และโปรดมั่นใจว่า คำตอบของท่านจะเป็นความลับ โดยจะรายงานการวิจัยเป็นภาพรวม

ผู้วิจัยขอกราบขอบพระคุณท่านผู้ตอบแบบสอบถามทุกท่านเป็นอย่างสูง ที่ท่านได้กรุณาสละเวลา และอนุเคราะห์ให้ข้อมูลต่างๆ เพื่อประโยชน์ต่อการพัฒนาองค์การและการศึกษาต่อไป

ผู้วิจัย: น.อ.หญิง ปราณี มุขลาย
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คำนิยาม

การทำการจัดการความรู้ หมายถึง การได้รับความรู้ (Knowledge Obtaining), การจัดระบบความรู้ (Knowledge Organizing) และ การนำความรู้ไปใช้ (Knowledge Applying)

นวัตกรรม หมายถึง เทคโนโลยีสมัยใหม่ (New Technologies), วัสดุ เครื่องมือหรืออาวุธยุทโธปกรณ์ (New Equipments) และ/หรือ การบริการ (New Services), และ กระบวนการทำงาน (New Procedures) ใหม่ๆที่แตกต่างไปจากเดิม

ผลการปฏิบัติงานขององค์การ หมายถึง ประสิทธิภาพ (Efficiency), คุณภาพ (Quality) และ ประสิทธิผล (Effectiveness) ขององค์การ

แบบสอบถามแบ่งออกเป็น 2 ตอน ได้แก่ ตอนที่ 1 ข้อมูลทั่วไป และตอนที่ 2 การทำการจัดการความรู้, นวัตกรรม และ ผลการปฏิบัติงานขององค์การ

ตอนที่ 1 : ข้อมูลทั่วไป

คำชี้แจง : โปรดทำเครื่องหมาย / ลงในช่องที่ตรงกับข้อมูลของท่าน ตามความคิดเห็นและสภาพความเป็นจริง

1. งานของท่านเกี่ยวข้องกับ การทำการจัดการความรู้, นวัตกรรม และ ผลการปฏิบัติงานขององค์การ หรือไม่ ?

☐ ไม่ (โปรดส่งต่อแบบสอบถามไปยังผู้ที่เกี่ยวข้อง)

☐ ใช่

2. ตำแหน่งของท่านในองค์การ คือ

☐ ผู้อำนวยการ

☐ ผู้บังคับการ

☐ อื่นๆ โปรดระบุ ……..

3. องค์การของท่านตั้งอยู่ทำเล (บริเวณที่ตั้ง)

☐ กรุงเทพมหานคร

☐ ต่างจังหวัด

4. กรุณาตอบแบบสอบถามเกี่ยวกับการทำการจัดการความรู้, นวัตกรรม และ ผลการปฏิบัติงานขององค์การของท่าน
โดยทำเครื่องหมาย / ที่ตรงกับความความคิดเห็นของท่านมากที่สุด โดยแบ่งออกเป็น 10 ระดับ ดังต่อไปนี้

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
ตัวแปร การทำการจัดการความรู้										
การได้รับความรู้										
1. องค์การของท่านมีการประเมินว่า องค์การมีความรู้ที่จำเป็นต่อวิสัยทัศน์ของ ทอ.และภารกิจหลักขององค์การในภาพรวม										
2. องค์การของท่านมีการบ่งชี้ความรู้ โดยการคัดเลือกเฉพาะความรู้หลักที่เป็นเอกลักษณ์ขององค์การ ซึ่งมีความเฉพาะเจาะจงต่อภารกิจหลักขององค์การ และวิสัยทัศน์ของ ทอ.										
3. องค์การของท่านมีการบ่งชี้ความรู้ โดยการคัดเลือกเฉพาะความรู้ซึ่งองค์การยังมีความจำเป็นที่จะต้องแสวงหาและสร้างขึ้นใหม่										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
4. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากแหล่งความรู้ต่างๆที่อยู่ภายในองค์การ										
5. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากแหล่งความรู้ต่างๆที่อยู่ภายนอกองค์การ										
6. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากแหล่งความรู้ที่เป็นความรู้ชัดแจ้ง เช่น เอกสาร สื่ออิเล็กทรอนิกส์ เป็นต้น										
7. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากแหล่งความรู้ที่เป็นความรู้ที่อยู่ในตัวคน เช่น ผู้เชี่ยวชาญ ผู้รู้ ผู้ชำนาญงาน เป็นต้น										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
8. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากจัดการประชุมหรือกิจกรรมทางสังคมต่างๆซึ่งมีการพบหน้ากัน ทั้งที่เป็นทางการและไม่เป็นทางการ										
9. องค์การของท่านมีการแสวงหาและได้รับความรู้ตามที่ได้บ่งชี้ไว้ จากการใช้ระบบเทคโนโลยีสารสนเทศและการติดต่อสื่อสาร										
10. องค์การของท่านมีการนำความรู้ซึ่งแสวงหาได้ตามที่ได้บ่งชี้ไว้มาปรับเปลี่ยน เพื่อสร้างเป็นความรู้ใหม่ขององค์การ โดยใช้การประชุม การทดลอง การลงมือปฏิบัติ การวิจัย และการพัฒนา เป็นต้น										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
11. องค์การของท่านมีการปรับปรุงแก้ไขความรู้ใหม่ขององค์การ โดยใช้กระบวนการแสวงหาและสร้างความรู้ หลายๆรอบ										
การจัดระบบความรู้										
12. องค์การของท่านมีการจัดระบบ หรือหมวดหมู่ให้กับความรู้ใหม่ที่สร้างขึ้นโดยใช้โปรแกรมคอมพิวเตอร์ เพื่อสะดวกต่อการค้นหาหรือเข้าถึงความรู้										
13. องค์การของท่านมีการจัดระบบ หรือหมวดหมู่ให้กับความรู้ใหม่ที่สร้างขึ้นโดยใช้เอกสารดัชนีสืบค้นเพื่อสะดวกต่อการค้นหาหรือเข้าถึงความรู้										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
14. องค์การของท่านมีการประมวลความรู้ใหม่ที่สร้างขึ้นหลายความรู้ ให้เป็นความรู้หลัก ซึ่งเป็นเอกลักษณ์ขององค์การที่มีความเฉพาะเจาะจงต่อภารกิจหลักขององค์การและวิสัยทัศน์ของ ทอ.										
15. องค์การของท่านมีการกลั่นกรองตรวจสอบความถูกต้องของความรู้ใหม่ เช่น การตรวจสอบโดยผู้รู้ ผู้เชี่ยวชาญ เป็นต้น										
16. องค์การของท่านมีระบบคอมพิวเตอร์ในการบันทึกจัดเก็บความรู้ใหม่ที่ได้กลั่นกรองแล้ว										
17. องค์การของท่านมีระบบเอกสารในการบันทึกจัดเก็บความรู้ใหม่ที่ได้กลั่นกรองแล้ว										
18. องค์การของท่านมีการรักษาความปลอดภัยในการเข้าถึงความรู้ใหม่ที่ได้กลั่นกรองแล้ว										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
19. องค์การของท่านมีการแบ่งปันความรู้ใหม่ขององค์การไปสู่หน่วยงานต่างๆ ภายในองค์การโดยจัดการประชุมหรือกิจกรรมต่างๆ ซึ่งมีการพบหน้ากันทั้งที่เป็นทางการและไม่เป็นทางการ										
20. องค์การของท่านมีการแบ่งปันความรู้ใหม่ขององค์การไปสู่หน่วยงานต่างๆ ภายนอกองค์การโดยจัดการประชุมหรือกิจกรรมต่างๆ ซึ่งมีการพบหน้ากันทั้งที่เป็นทางการและไม่เป็นทางการ										
21. องค์การของท่านมีการแบ่งปันความรู้ใหม่ขององค์การไปสู่หน่วยงานต่างๆ ภายในองค์การโดยผ่านระบบเทคโนโลยีสารสนเทศและการติดต่อสื่อสาร										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
22. องค์การของท่านมีการแบ่งปันความรู้ใหม่ขององค์การไปสู่หน่วยงานต่างๆภายนอกองค์การโดยผ่านระบบเทคโนโลยีสารสนเทศและการติดต่อสื่อสาร										
การนำความรู้ไปใช้										
23. องค์การของท่านมีการนำความรู้ใหม่ไปใช้ในการปฏิบัติงานอย่างแท้จริง										
ตัวแปร นวัตกรรม										
เทคโนโลยีใหม่										
24. องค์การของท่านมีการนำความรู้ใหม่ไปสร้างหรือพัฒนาโปรแกรม software ที่ใช้ในการปฏิบัติงาน หรือระบบเทคโนโลยีสารสนเทศและการติดต่อสื่อสารใหม่ๆ ที่ต่างไปจากเดิม										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
กระบวนการหรือระบบการทำงานใหม่ๆ										
25. องค์การของท่านมีการนำความรู้ใหม่ไปสร้างหรือปรับปรุง พัฒนากระบวนการหรือระบบการทำงานใหม่ๆที่ต่างไปจากเดิม										
ตัวแปร ผลการปฏิบัติงานขององค์การ										
ประสิทธิภาพ										
26. องค์การของท่านสามารถเพิ่มประสิทธิภาพโดยการประหยัดต้นทุน ค่าใช้จ่ายต่างๆ ในการทำงาน										
ความพึงพอใจของผู้รับบริการ										
27. องค์การของท่านสามารถเพิ่มคุณภาพในการซ่อม สร้าง หรือผลิตอาวุธยุทธภัณฑ์ เครื่องมือหรืออุปกรณ์ เพื่อตอบสนองความพึงพอใจของผู้รับบริการ										

คำถาม	ระดับ ไม่เห็นด้วยมากที่สุด ⟶ เห็นด้วยมากที่สุด									
	1	2	3	4	5	6	7	8	9	10
28. องค์การของท่านสามารถเพิ่มคุณภาพในการให้บริการต่างๆ เพื่อตอบสนองความพึงพอใจของผู้รับบริการ										
ประสิทธิผล										
29. องค์การของท่านมีความสามารถในการปฏิบัติงานเพื่อตอบสนองต่อภาวะวิกฤตและอุบัติการณ์ต่างๆ										
30. องค์การของท่านมีความสามารถในการปฏิบัติงาน ได้บรรลุเป้าหมายตามตัวชี้วัดขององค์การ\										
31. องค์การของท่านมีความสามารถในการขับเคลื่อนวิสัยทัศน์ของ ทอ.ได้										

ข้อเสนอแนะ ……..

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APPENDIX C

INTERVIEW FORM (ENGLISH VERSION)

SEMI-STRUCTURE INTERVIEW FORM

KNOWLEDGE MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE: A CASE OF THE ROYAL THAI AIR FORCE

Group Captain Pranee Mooklai,
Ph.D.Candidate in Public Administration at NIDA,
Phone 081 269 3884, 02 534 2640 Fax 02 534 2638

1. Do RTAF organizations have KM practices? And how?

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2. What are the factors fostering KM practices in RTAF organizations? And do RTAF organizations have the fostering factors?

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3. Do RTAF organizations have a suitable direction for KM practices?

What is the suitable direction for KM practices?

And should the suitable direction for KM practices support the RTAF vision?

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4. Do KM practices of RTAF organizations lead to the new knowledge for core missions of RTAF organizations and the RTAF vision? Please give some examples.

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5. Does the new knowledge from KM practices in RTAF organizations lead to innovation?

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6. What are examples of innovation from KM practices in RTAF organizations?

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7. Do KM practices in RTAF organizations and innovation lead to the efficiency of the operating processes: fewer steps, faster operation, and lower costs, for example?

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8. Do KM practices in RTAF organizations and innovation lead to the quality improvement of services, maintenance and production of material, equipment, and weapons as required by related RTAF organizations?

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9. Do KM practices in RTAF organizations and innovation lead to the RTAF effectiveness, and achievement of strategic goal, and RTAF vision?

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10. Do KM practices in RTAF organizations and innovation support the RTAF operations in the crises and disastrous situations?

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11. What are the other results of KM practices in RTAF organizations and innovation derived from KM?

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12. Do KM practices in RTAF organizations have any inhibiting factors ? And what are they?

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13. What are some suggestions for KM practices and innovation in RTAF organizations to improve the organizational performance?

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APPENDIX D

INTERVIEW FORM (THAI VERSION)

แบบสัมภาษณ์

KNOWLEDGE MANAGEMENT PRACTICES AND ORGANIZATIONAL PERFORMANCE: A CASE OF THE ROYAL THAI AIR FORCE

ผู้วิจัย: น.อ.หญิง ปราณี มุขลาย
นักศึกษาหลักสูตรรัฐประศาสนศาสตรดุษฎีบัณฑิต
คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์
E-Mail: pranee_mook@rtaf.mi.th
โทร. 2-2640, 081-2693884

1. ท่านคิดว่า ในทางปฏิบัติแล้ว หน่วยงานต่างๆของ ทอ.มีการทำการจัดการความรู้หรือไม่ และหากมีการทำการจัดการความรู้ ทำอย่างไร

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2. ท่านคิดว่า มีปัจจัยใดบ้างที่ส่งเสริมต่อการทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. และ การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. ได้รับการสนับสนุนปัจจัยต่างๆ เหล่านั้นหรือไม่

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3. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ.เป็นไปในทิศทางที่เหมาะสมหรือไม่ โดยทิศทางที่เหมาะสมควรเป็นไปในทิศทางใด และควรเป็นไปในทิศทางที่ช่วยขับเคลื่อนวิสัยทัศน์ของ ทอ.หรือไม่

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4. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. ทำให้เกิดความรู้ใหม่ๆที่จำเป็นภารกิจหลักของหน่วยงานต่างๆของ ทอ. และวิสัยทัศน์ของ ทอ.บ้างหรือไม่ กรุณายกตัวอย่าง

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5. ท่านคิดว่า ความรู้ใหม่ๆที่เกิดจากการทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. มีผลทำให้เกิดนวัตกรรมได้บ้างหรือไม่

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6. กรุณายกตัวอย่างที่ท่านคิดว่า เป็นนวัตกรรมที่เกิดจากการทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ.

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7. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. และ นวัตกรรมที่เกิดขึ้น มีผลทำให้กระบวนการทำงานต่างๆ มีประสิทธิภาพเพิ่มขึ้นหรือไม่ เช่น ขั้นตอนลดลง รวดเร็วขึ้น คุ้มค่าขึ้น เป็นต้น

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8. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. และ นวัตกรรมที่เกิดขึ้น ส่งผลต่อการเพิ่มคุณภาพของวัสดุ เครื่องมือหรืออาวุธยุทโธปกรณ์ที่ ทอ. ซ่อม สร้าง หรือ ผลิต รวมทั้งการให้บริการต่างๆ ดีขึ้น และตอบสนองต่อความต้องการของผู้เกี่ยวข้อง หน่วยเกี่ยวข้อง และกองทัพอากาศ ได้เพิ่มขึ้นบ้างหรือไม่

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9. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. และ นวัตกรรมที่เกิดขึ้น มีผลต่อประสิทธิผลในการปฏิบัติภารกิจของ ทอ. การบรรลุเป้าหมายตามประเด็นยุทธศาสตร์ และการบรรลุวิสัยทัศน์ของ ทอ. บ้างหรือไม่

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10. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. และ นวัตกรรมที่เกิดขึ้นมีผลต่อการปฏิบัติงานในภาวะวิกฤตหรืออุบัติการณ์ต่างๆ ได้บ้างหรือไม่

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11. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. ทำให้เกิดผลอื่นๆใด อีกบ้าง

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12. ท่านคิดว่า การทำการจัดการความรู้ของหน่วยงานต่างๆของ ทอ. มีปัญหาใดบ้างหรือไม่

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13. ท่านมีข้อเสนอแนะเกี่ยวกับการจัดการความรู้และนวัตกรรมเพื่อการพัฒนาผลการปฏิบัติงานของกองทัพอากาศบ้างหรือไม่

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APPENDIX E

TESTIMONIALS AND LETTERS OF APPROVAL

บันทึกข้อความ

ส่วนราชการ กพ.ทอ.(กศศ.โทร.๒-๗๐๕๓)

ที่ กห ๐๖๐๔.๖/ ๕๖๔ **วันที่** ๓๐ พ.ย.๕๗

เรื่อง ขอความอนุเคราะห์ค้นคว้าข้อมูลในการทำวิทยานิพนธ์

เรียน ผบ.ทอ.

๑. ด้วย คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์ ขอความอนุเคราะห์ให้ น.อ.หญิง ปราณี มุขลาย ตำแหน่ง นาสังกร กวภ.ทอ. ซึ่งปัจจุบันกำลังศึกษาหลักสูตรรัฐประศาสนศาสตร์ดุษฎีบัณฑิต สาขาการจัดการภาครัฐและเอกชน คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์ และศึกษาวิจัยในหัวข้อ "Knowledge Management Practices, Innovation and Public Organizational Performance : Royal Thai Air Force" ค้นคว้าข้อมูลที่เกี่ยวข้องในการทำวิทยานิพนธ์โดยการแจกแบบสอบถามผู้บริหารระดับผู้บังคับการหรือผู้อำนวยการกอง พร้อมทั้งสัมภาษณ์ผู้บริหารและผู้ที่เกี่ยวข้องกับการจัดการความรู้ของ ทอ. (แนบ ๑)

๒. กพ.ทอ.ตรวจสอบแล้ว อนุมัติ ผบ.ทอ.(จก.พอ.รับคำสั่ง ฯ) เมื่อ ๓ พ.ย.๕๓ ท้ายหนังสือ พอ.ลง ๓ พ.ย.๕๓ (ต่อ พอ.เลขรับ ๑๕๒๗๓/๕๓) โดยให้ น.อ.หญิง ปราณี ฯ เข้ารับการศึกษาในหลักสูตรรัฐประศาสนศาสตร์ดุษฎีบัณฑิต สาขาการจัดการภาครัฐและเอกชน ณ คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์ ระยะเวลาการศึกษา ๖ ปี ตั้งแต่ ๑๒ พ.ย.๕๓ เป็นต้นไป โดยใช้เวลานอกเวลาราชการ และใช้ทุนส่วนตัว (แนบ ๒)

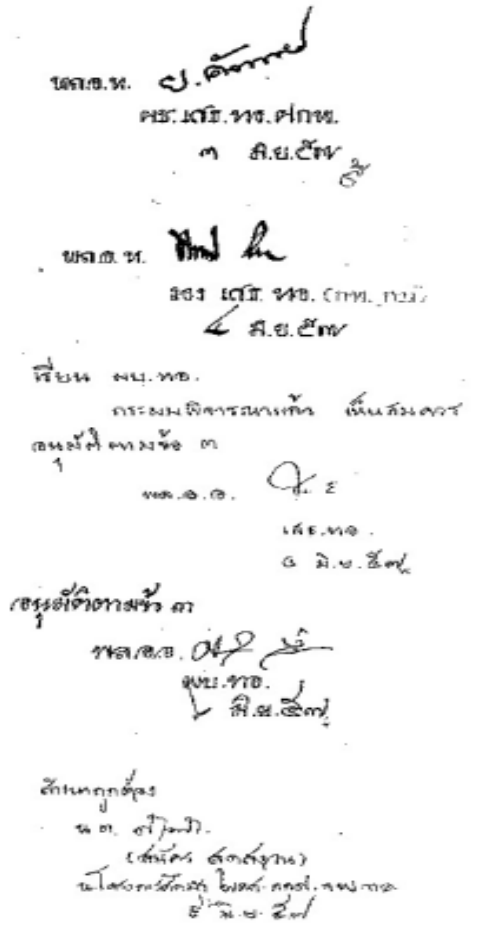
๓. กพ.ทอ.พิจารณาแล้ว เพื่อให้การศึกษาของ น.อ.หญิง ปราณี ฯ เป็นไปด้วยความเรียบร้อย สามารถสำเร็จการศึกษาได้ในที่สุด ซึ่งจะเป็นประโยชน์ต่อ ทอ.ในอนาคต จึงเห็นสมควรให้ค้นคว้าข้อมูลและสัมภาษณ์ผู้เกี่ยวข้องในการทำวิทยานิพนธ์ ดังนี้

๓.๑ นขต.ทอ.ให้ความร่วมมือในการตอบแบบสอบถามโดยผู้บริหารระดับผู้บังคับการหรือผู้อำนวยการกอง

๓.๒ การสัมภาษณ์ผู้บังคับบัญชาระดับสูงของ ทอ.ตามที่ระบุ ให้ประสานรายละเอียดกับ สน.ผู้บังคับบัญชาโดยตรง และให้อยู่ในดุลยพินิจผู้บังคับบัญชาจะพิจารณาให้สัมภาษณ์ตามที่เห็นสมควร

จึงเรียนมาเพื่อพิจารณาอนุมัติตามข้อ ๓

น.อ.
รอง จก.กพ.ทอ.ทำการแทน
จก.กพ.ทอ.



รายละเอียดการเก็บข้อมูลเพื่อวิทยานิพนธ์ของ น.อ.เหมิง ปราณี มุขลาย
เรื่อง Knowledge Management Practices, Innovation and Public Organizational Performance : Royal Thai Air Force ดังนี้

๑. แจกแบบสอบถามผู้บริหารระดับ ผู้บังคับการ และ ผู้อำนวยการกอง
๒. สัมภาษณ์ผู้บริหารของ ทอ. และผู้ที่เกี่ยวข้องกับการจัดการความรู้ของ ทอ. ได้แก่
   ๒.๑ ผู้บัญชาการทหารอากาศ
   ๒.๒ รองเสนาธิการทหารอากาศ /ประธานกรรมการคณะกรรมการพัฒนาคุณภาพ ทอ.
   ๒.๓ ผู้ช่วยเสนาธิการทหารอากาศฝ่ายกำลังพล
   ๒.๔ เจ้ากรมกำลังพลทหารอากาศ
   ๒.๕ ประธานอนุกรรมการตัดสินและงานกลุ่มกิจกรรมการพัฒนาคุณภาพ ทอ.
   ๒.๖ รองเจ้ากรมกำลังพลทหารอากาศ

ที่ ศธ [illegible]

คณะรัฐประศาสนศาสตร์
สถาบันบัณฑิตพัฒนบริหารศาสตร์
คลองจั่น บางกะปิ กรุงเทพฯ ๑๐๒๔๐

[illegible] พฤศจิกายน ๒๕๕๖

เรื่อง ขอความอนุเคราะห์ข้อมูลในการทำวิทยานิพนธ์

เรียน ผู้บัญชาการทหารอากาศ
(พลอากาศเอก ประจิน จั่นตอง)

ด้วย นาวาอากาศเอกหญิงปราณี มุขดาย รหัสประจำตัว [illegible] นักศึกษาหลักสูตรรัฐประศาสนศาสตรดุษฎีบัณฑิต สาขาการจัดการภาครัฐและเอกชน คณะรัฐประศาสนศาสตร์ สถาบันบัณฑิตพัฒนบริหารศาสตร์ กำลังศึกษาวิจัยในหัวข้อ "Knowledge Management Practices, Innovation and Public Organizational Performance : Royal Thai Air Force"

ในการนี้ คณะรัฐประศาสนศาสตร์ ได้พิจารณาเห็นว่าหน่วยงานของท่านเป็นหน่วยงานที่น่าสนใจและมีขอบข่ายการดำเนินงานที่เกี่ยวข้องกับหัวข้อที่ศึกษา จึงเรียนมาเพื่อขออนุญาตให้ นาวาอากาศเอกหญิงปราณี มุขดาย ค้นคว้าข้อมูลและสัมภาษณ์ผู้ที่เกี่ยวข้องในหน่วยงานของท่าน หากข้อมูลและรายละเอียดใดที่พอจะเปิดเผยให้นักศึกษาทราบได้ ขอความกรุณาอำนวยความสะดวกให้ด้วย ทั้งนี้ท่านสามารถประสานงานกับ นาวาอากาศเอกหญิงปราณี มุขดาย ได้ที่เบอร์โทรศัพท์ [illegible] Email: pranee.m@hotmail.com

คณะรัฐประศาสนศาสตร์ หวังเป็นอย่างยิ่งว่าคงได้รับความอนุเคราะห์จากท่านด้วยดี จึงขอขอบคุณมา ณ ที่นี้

ขอแสดงความนับถือ

(อาจารย์ ดร.ธนพันธ์ ไล่ประกอบทรัพย์)
รองคณบดีฝ่ายวางแผนและพัฒนา
รักษาราชการแทนคณบดีคณะรัฐประศาสนศาสตร์

สำนักงานเลขานุการคณะ (กลุ่มงานการศึกษา)
โทรศัพท์ [illegible]
โทรสาร [illegible]

APPENDIX F

STATISTICS

Item-Total Correlations		
1K Obtaining (acquisition, iden)	Pearson Correlation	.809
	Sig. (2-tailed)	.000
	N	28
2K Obtaining (acquisition, iden)	Pearson Correlation	.818
	Sig. (2-tailed)	.000
	N	25
3K Obtaining (acquisition, iden)	Pearson Correlation	.801
	Sig. (2-tailed)	.000
	N	27
4K Obtaining (acquisition, search)	Pearson Correlation	.896
	Sig. (2-tailed)	.000
	N	23
5K Obtaining5(acquisition, search)	Pearson Correlation	.905
	Sig. (2-tailed)	.000
	N	22
6K Obtaining (acquisition, search)	Pearson Correlation	.925
	Sig. (2-tailed)	.000
	N	23
7K Obtaining (acquisition, search)	Pearson Correlation	.913
	Sig. (2-tailed)	.000
	N	22
8K Obtaining (acquisition, search)	Pearson Correlation	.796
	Sig. (2-tailed)	.000
	N	23
9K Obtaining (acquisition, search)	Pearson Correlation	.835
	Sig. (2-tailed)	.000
	N	22

Item-Total Correlations		
10K Obtaining (creation)	Pearson Correlation	.792
	Sig. (2-tailed)	.000
	N	20
11K Obtaining (creation)	Pearson Correlation	.767
	Sig. (2-tailed)	.000
	N	27
12K Organizing (refine,systemize)	Pearson Correlation	.783
	Sig. (2-tailed)	.000
	N	22
13K Organizing (refine,systemize)	Pearson Correlation	.712
	Sig. (2-tailed)	.000
	N	26
14K Organizing (refine,integrate-valid))	Pearson Correlation	.912
	Sig. (2-tailed)	.000
	N	26
15K Organizing (refine,integrate-valid))	Pearson Correlation	.885
	Sig. (2-tailed)	.000
	N	26
16K Organizing (store)	Pearson Correlation	.845
	Sig. (2-tailed)	.000
	N	26
17K Organizing (store)	Pearson Correlation	.721
	Sig. (2-tailed)	.000
	N	26
18K Organizing (store)	Pearson Correlation	.825
	Sig. (2-tailed)	.000
	N	25
19K Organizing (share)	Pearson Correlation	.889
	Sig. (2-tailed)	.000
	N	24

Item-Total Correlations		
20K Organizing(share)	Pearson Correlation	.862
	Sig. (2-tailed)	.000
	N	25
21K Organizing(share)	Pearson Correlation	.887
	Sig. (2-tailed)	.000
	N	26
22K Organizing(share)	Pearson Correlation	.864
	Sig. (2-tailed)	.000
	N	26
23K Applying	Pearson Correlation	.919
	Sig. (2-tailed)	.000
	N	24
24Innovation(IT)	Pearson Correlation	.718
	Sig. (2-tailed)	.000
	N	25
25Innovation(process)	Pearson Correlation	.831
	Sig. (2-tailed)	.000
	N	24
26OP(efficiency)	Pearson Correlation	.788
	Sig. (2-tailed)	.000
	N	25
27OP(satisfaction)	Pearson Correlation	.777
	Sig. (2-tailed)	.000
	N	25
28OP(satisfaction)	Pearson Correlation	.884
	Sig. (2-tailed)	.000
	N	22

Item-Total Correlations		
29OP(effectiveness)	Pearson Correlation	.770
	Sig. (2-tailed)	.000
	N	23
30OP(effectiveness)	Pearson Correlation	.807
	Sig. (2-tailed)	.000
	N	27
31OP(effectiveness)	Pearson Correlation	.831
	Sig. (2-tailed)	.000
	N	28
Sum total	Pearson Correlation	1
	Sig. (2-tailed)	
	N	30

Scale: Knowledge management practices

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.886	.894	3

Scale: Innovation

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.731	.744	2

Scale: Organizational Performance

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.844	.849	3

Scale: Total

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.929	.937	8

Correlations

		K obtaining	K organizing	K applying	Innovation(IT)	Innovation (process)	OP (efficiency)	OP (satisfaction)	OP (effectiveness)
K obtaining	Pearson Correlation	1	.766**	.696**	.468**	.607**	.615**	.549**	.716**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000	.000
	N	185	185	185	185	185	185	179	185
K organizing	Pearson Correlation	.766**	1	.751**	.643**	.712**	.693**	.648**	.767**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	.000
	N	185	185	185	185	185	185	179	185
K applying	Pearson Correlation	.696**	.751**	1	.498**	.698**	.664**	.552**	.728**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000
	N	185	185	185	185	185	185	179	185
Innovation(IT)	Pearson Correlation	.468**	.643**	.498**	1	.593**	.460**	.585**	.477**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000	.000
	N	185	185	185	185	185	185	179	185
Innovation(process)	Pearson Correlation	.607**	.712**	.698**	.593**	1	.810**	.671**	.711**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000
	N	185	185	185	185	185	185	179	185
OP(efficiency)	Pearson Correlation	.615**	.693**	.664**	.460**	.810**	1	.654**	.724**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000	.000
	N	185	185	185	185	185	185	179	185
OP (satisfaction)	Pearson Correlation	.549**	.648**	.552**	.585**	.671**	.654**	1	.572**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.000
	N	179	179	179	179	179	179	179	179
OP (effectiveness)	Pearson Correlation	.716**	.767**	.728**	.477**	.711**	.724**	.572**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	
	N	185	185	185	185	185	185	179	185

**. Correlation is significant at the 0.01 level (2-tailed).

Items	Level Strongly Disagree Disagree 1	Disagree 2	Disagree 3	Disagree 4	Disagree 5	Agree 6	Agree 7	Agree 8	Agree 9	Strongly Agree Agree 10	Mean	S.D.
1Knowledge Obtaining (acquisition, identification)		1(0.5 %)	2(1.1 %)	1(0.5 %)	1(0.5 %)	7(3.8 %)	16(8.6%)	46(24.9%)	58(31.4 %)	53(28.6 %)	8.60	1.396
2Knowledge Obtaining (acquisition, identification)		1(0.5 %)	1(0.5 %)		5(2.7 %)	11(5.9 %)	20(10.8%)	38(20.5 %)	65(35.1 %)	44(23.8 %)	8.46	1.422
3Knowledge Obtaining (acquisition, identification)		3(1.6 %)	3(1.6 %)	2(1.1 %)	4(2.2%)	13(7.0 %)	16(8.6 %)	57(30.8 %)	58(31.4%)	29(15.7 %)	8.11	1.633
4Knowledge Obtaining (acquisition, search)	1(0.5 %)	1(0.5 %)	2(1.1 %)	1(0.5 %)	8(4.3%)	9(4.9%)	28(15.1 %)	50(27.0 %)	59(31.9 %)	26(14.1 %)	8.00	1.562
5Knowledge Obtaining (acquisition, search)		1(0.5 %)	1(0.5 %)	1(0.5 %)	2(1.1 %)	11(5.9 %)	31(16.8 %)	47(25.4 %)	54(29.2 %)	37(20.0 %)	8.29	1.391
6Knowledge Obtaining (acquisition, search)		1(0.5 %)	1(0.5 %)		2(1.1 %)	5(2.7 %)	30(16.2%)	34(18.4%)	70(37.8%)	42(22.7%)	8.52	1.311
7Knowledge Obtaining (acquisition, search)		1(0.5 %)	3(1,6 %)		4(2.2 %)	10(5.4 %)	27(14.6 %)	43(23.2 %)	60(32.4 %)	37(20.0%)	8.29	1.486
8Knowledge Obtaining (acquisition, search)			1(0.5 %)		10(5.4 %)	18(9.7 %)	28(15.1%)	42(22.7%)	59(31.9%)	27(14.6 %)	8.08	1.439

Items	Level Strongly Disagree → Strongly Agree Disagree 1	Disagree 2	Disagree 3	Disagree 4	Disagree 5	Agree 6	Agree 7	Agree 8	Agree 9	Agree 10	Mean	S.D.
9Knowledge Obtaining (acquisition, search)				2(1.1 %)	2(1.1 %)	9(4.9 %)	27(14.6 %)	43(23.2 %)	62(33.5 %)	40(21.6 %)	8.45	1.272
10Knowledge Obtaining (creation)			1(0.5 %)	1(0.5 %)	10(5.4 %)	16(8.6 %)	27(14.6 %)	42(22.7 %)	60(32.4 %)	28(15.1 %)	8.10	1.460
11Knowledge Obtaining (creation)			2(1.1 %)	2(1.1 %)	10(5.4 %)	18(9.7%)	27(14.6 %)	56(30.3 %)	49(26.5%)	21(11.4 %)	7.89	1.478
12Knowledge Organizing (refine,systemize)		3(1.6 %)	3(1.6 %)	1(0.5 %)	8(4.3 %)	16(8.6 %)	30(16.2 %)	55(29.7%)	43(23.2 %)	26(14.1%)	7.85	1.661
13Knowledge Organizing (refine,systemize)		4(2.2 %)	3(1.6 %)	7(3.8%)	9(4.9 %)	18(9.7 %)	44(23.8 %)	48(25.9 %)	39(21.1 %)	13(7.0 %)	7.41	1.736
14Knowledge Organizing (refine,integrate-valid)		1(0.5 %)	4(2.2 %)	4(2.2 %)	6(3.2 %)	13(7.0 %)	27(14.6 %)	54(29.2 %)	50(27.0 %)	26(14.1 %)	7.94	1.626
15Knowledge Organizing (refine,integrate-valid)		2(1.1 %)	7(3.8 %)	3(1.6 %)	7(3.8 %)	15(8.1 %)	30(16.2 %)	60(32.4 %)	41(22.2 %)	20(10.8 %)	7.68	1.729
16Knowledge Organizing (store)	1(0.5 %)	2(1.1 %)	1(0.5 %)		8(4.3 %)	10(5.4%)	27(14.6 %)	40(21.6%)	55(29.7 %)	41(22.2 %)	8.23	1.639

Items	Level: Strongly Disagree Disagree 1	Disagree 2	Disagree 3	Disagree 4	Disagree 5	Agree 6	Agree 7	Agree 8	Agree 9	Strongly Agree Agree 10	Mean	S.D.
17Knowledge Organizing (store)	2(1.1 %)	1(0.5 %)	1(0.5 %)	2(1.1 %)	7(3.8 %)	13(7.0 %)	37(20.0 %)	45(24.3 %)	50(27.0%)	27(14.6 %)	7.93	1.649
18Knowledge Organizing (store)	4(2.2 %)	4(2.2 %)	3(21.6%)	1(0.5 %)	8(4.3 %)	20(10.8 %)	33(17.8%)	46(24.9 %)	39(21.1 %)	27(14.6 %)	7.59	1.995
19Knowledge Organizing (share)		3(1.6 %)	1(0.5 %)	1(0.5 %)	7(3.8 %)	19(10.3 %)	29(15.7 %)	46(24.9 %)	48(25.9 %)	31(16.8 %)	7.97	1.630
20Knowledge Organizing (share)	1(0.5 %)	3(1.6 %)	4(2.2 %)	4(2.2 %)	17(9.2 %)	24(13.0 %)	33(17.8%)	46(24.9%)	41(22.2 %)	12(6.5 %)	7.31	1.811
21Knowledge Organizing (share)	1(0.5 %)	4(2.2 %)	1(0.5 %)	3(1.6 %)	15(8.1%)	11(5.9 %)	28(15.1 %)	52(28.1%)	45(24.3 %)	25(13.5%)	7.74	1.814
22Knowledge Organizing (share)	2(1.1 %)	4(2.2 %)	2(1.1 %)	6(3.2%)	18(9.7 %)	17(9.2%)	33(17.8 %)	50(27.0 %)	41(22.2 %)	12(6.5 %)	7.31	1.882
23Knowledge Applying		1(0.5 %)	2(1.1 %)	1(0.5 %)	3(1.6 %)	9(4.9 %)	19(10.3 %)	53(28.6%)	56(30.3%)	41(22.2%)	8.39	1.429
24Innovation(IT)	3(1.6 %)	7(3.8 %)	2(1.1 %)	2(1.1 %)	13(7.0 %)	25(13.5 %)	40(21.6%)	46(24.9 %)	32(17.3 %)	15(8.1 %)	7.20	1.967
25Innovation(procedure or process)		3(1.6 %)	2(1.1 %)	1(0.5 %)	7(3.8 %)	11(5.9 %)	25(13.5 %)	62(33.5 %)	55(29.7 %)	19(10.3 %)	7.96	1.541

Items	Level: Strongly Disagree → Strongly Agree										Mean	S.D.
	Disagree 1	Disagree 2	Disagree 3	Disagree 4	Disagree 5	Agree 6	Agree 7	Agree 8	Agree 9	Agree 10		
26OP(efficiency)		4(2.2 %)	2(1.1 %)	3 (1.6 %)	4(2.2 %)	15(8.1 %)	41(22.2 %)	47(25.4 %)	49(26.5 %)	20(10.8%)	7.78	1.647
27OP(satisfaction)	11(6.1 %)	11(6.1 %)	4(2.2 %)	2(1.1 %)	17(9.4 %)	16(8.9 %)	33(18.3 %)	38(21.1 %)	33(18.3 %)	15(8.3 %)	6.76	2.514
28OP(satisfaction)	1(0.5 %)	1(0.5 %)	1(0.5 %)	2(1.1 %)	3(1.6 %)	6(3.3 %)	30(16.3 %)	47(25.5%)	68(37.0 %)	25(13.6 %)	8.22	1.445
29OP(effectiveness)	1(0.5 %)	2(1.1 %)	1(0.5 %)	2(1.1 %)	2 (1.1 %)	12(6.5 %)	21(11.4 %)	45(24.3%)	67(36.2 %)	32(17.3 %)	8.26	1.560
30OP(effectiveness)	1(0.5 %)	1(0.5 %)		2(1.1 %)	2(1.1 %)	4(2.2 %)	13(7.0 %)	39(21.1 %)	73(39.5 %)	50(27.0 %)	8.68	1.384
31OP(effectiveness)	1(0.5 %)	1(0.5 %)	1(0.5 %)	1(0.5 %)	1(0.5 %)	4(2.2 %)	19(10.3 %)	32(17.3 %)	73 (39.5 %)	51(27.6 %)	8.72	1.600

BIOGRAPHY

NAME	Group Captain Pranee Mooklai
PRESENT POSITION	- Pharmacist, Medical Supply Division, Directorate of Medical Services, RTAF - Judge, Bangkok Military Court, Thailand
ACADEMIC BACKGROUND	- Secondary school certificate from Mandanarumol School, Chacheongsao Province - High school certificate from Triumudomsuksa School, Bangkok - Bachelor of Pharmacy (Honor), Faculty of Science, Mahidol University, 1985 - RTAF Flying Officers' School, 1987 - Master of Science (Pharmaceutical Technology), Faculty of Science, Mahidol University, 1991 - RTAF Squadron Officers' School, 1993 - RTAF Senior Officers' School, 1999 - Advanced Military Medical Executives Course, Directorate of Medical Services, RTAF, 2007 - Master of Public and Private Management, Graduate School of Public Administration, National Institute of

Development Administration, 2009
- Air War College, 2009

WORK EXPERIENCES AWARDS

- RTAF Flying Officers' School Excellent Award
- Quality Control Excellent Award, RTAF Quality Development Contest Symposium
- Outstanding Person Award, Medical Supply Division, Directorate of Medical Services, RTAF
- Research Award, Air War College
- Knowledge Management Excellent Award, RTAF Quality Development Contest Symposium

OFFICIAL FIELD VISITS OVERSEAS

- Quality Control International Meeting (India)
- Quality Control International Meeting (China)
- Air War College Study Visit (Germany, Switzerland and Austria)
- Quality Development, RTAF (Austria and Czech Republic)
- Medical Supply and Logistics Management Study Visit (England, Germany, Sweden, France and Italy)
- International Exposition on Team Excellence, RTAF (Singapore)