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Information Technology Application for Knowledge Management in Medium-Size Businesses

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***Abstract*—**Result of the study on knowledge management systems in businesses was shown that the most of these businesses provide internet accessibility for their employees in order to study new knowledge via internet, corporate website, electronic mail, and electronic learning system. These business organizations use information technology application for knowledge management because of convenience, time saving, ease of use, accuracy of information and knowledge usefulness. The result indicated prominent improvements for corporate knowledge management systems as the following; 1) administrations must support corporate knowledge management system 2) the goal of corporate knowledge management must be clear 3) corporate culture should facilitate the exchange and sharing of knowledge within the organization 4) cooperation of personnel of all levels must be obtained 5) information technology infrastructure must be provided 6) they must develop the system regularly and constantly.

***Keywords*—**Business organizations, information technology application, knowledge management systems, and prominent improvements.

I. Introduction

BUSINESSES are competing more fiercely in present. The effects of global economic conditions, natural disasters, terrorisms, and political conditions affect to the business operations in all regions of the world. Under the advancement of Information Technology (IT), if the business organizations continue to operate their businesses without any improvement, especially in the use of information technology applications for their business transactions, they will lose business opportunity and competitiveness in their business operations.

Due to the current business environment in Thailand, many business organizations applied Knowledge Management (KM) to the improvement of their business operations widely. However, the most of business organizations do not yet know how information technology applications have influences to corporate knowledge managements and they do not know how to apply information technology to support processes of organizational knowledge managements.

The researches on the developments of information technology applications for knowledge management systems in business organizations in Thailand will motivate entrepreneurs to develop their business operations and urge them to apply information technology application for knowledge management in their organizations appropriately and guide these businesses to develop their organizational managements in a better way in near future. This research focused on these following objectives; 1) to develop an appropriate model for information technology application for knowledge management in business organizations in Thailand 2) to find the reasons and problems of the use of information technology applications for knowledge management systems in different ways in order to guide them to use information technology appropriately 3) to find solutions for the development of corporate knowledge management system modernly and usefully for organizational managements.

Sometimes, the use of information technology applications could not meet the needs of the organization requirements because there is a lot of information in business processes. Information and knowledge are different while information management and knowledge management are also different. Knowledge management is more complex than information management. Therefore, it is not easy to change from the form of provided information to the form of knowledge representation.

Knowledge management is an important tool in business processes. It is a topic that has been discussed widely in the development of corporate performance because knowledge management can increase the efficiency of the business organizations. These organizations may improve the existing processes without any additional investment. The idea of information technology applications for knowledge management in business organizations encourages them to develop their organizational managements in globalization.

Knowledge can be extracted from the information meanwhile knowledge is important because it optimizes business operations and makes the organization be strengthen. Knowledge can be classified by many categories. For example, it can be divided into individual knowledge and organizational knowledge. The knowledge characterizations are based on sources of knowledge; internal knowledge and external knowledge.

Every organization requires the transferring of knowledge between individuals and organizations effectively. The organizational managements have to transfer related organizational knowledge to employees in order to make them understand and use knowledge for their works as well. Meanwhile, organizational managements must transfer individual knowledge from their staffs or experts to organizational knowledge so that knowledge cannot be lost from the organization and it will be a source of competitive advantage for the organization. However, the transference of knowledge between individuals and organizations is not easy. It can be seen that the most of business organizations are

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experiencing difficulties in training, project report preparation and annual report. In addition, the most of business organizations still have problems when employees who have knowledge or special expertise resigned. So, organizational knowledge can be lost with the departure of the employees.

In addition, knowledge can be divided into two major categories; explicit knowledge and tacit knowledge. Explicit knowledge is knowledge that can be described as a character, function or equation. Tacit knowledge is knowledge that cannot be written or explained. Transference of this knowledge is difficult. In order to have tacit knowledge, employees have to learn from practical training such as building the skills or abilities of the individual.

Many organizations may have experienced problems related to knowledge management. For example, some experts or employees who have their knowledge and skills resigned or have reason to make it unworkable. Hence, the organizations are having trouble and cannot find any other employees to work alternatively and immediately.

Each organization has a different meaning of organizational knowledge. Therefore, the definitions of knowledge management of individual and organization are different. Knowledge management refers to the management of information and knowledge which are the important assets or intangible assets that the organization needs and uses as the basis for making a difference to the organization comparing to business competitors through the process of knowledge management. The organization will have advantages in organizational development and business competitiveness.

Turban et al. presented a sequential process of knowledge management circle which knowledge can be created, captured and stored, refined, distributed, used and monitored [1], [2]. Probst et al. defined that knowledge management processes composed of knowledge identification, knowledge acquisition, knowledge development, knowledge transfer, knowledge storage, and knowledge utilization. The relationships in the mesh are related to each process [3]. It can be concluded that the knowledge management process consists of knowledge creation, storage, transfer, and knowledge application. However, the knowledge managements for each organization are different according to the nature of business and other elements, such as works of the organizations, organizational structures, and technology. Thus, each organization needs to develop the structure of the knowledge management processes for organizational business.

There are many researches in knowledge management which have tried to explain the relationship and the role of information technology for knowledge management and there are many business organizations have successes in knowledge management by the use of information technology applications [4]-[8]. Knowledge management composes of business processes. Although it is not technology, but technology is expected to be an important factor that can help business organizations to have successes in knowledge management. Therefore, the most of business organizations provide budgets for the appropriate technology which affects to the success of knowledge management system. Information technology is a tool which supports knowledge management systems for employees and business organizations.

The related information technology and its role in knowledge management include communication technology, collaboration technology and storage technology which help employees access to knowledge easier and more convenient. Moreover, communication technology can help them to communicate with experts in various fields. They can search the information and knowledge that they need via intranet, extranet or internet. Technology can support collaboration and it helps employees coordinate with their colleagues effectively. For instance, groupware and screen sharing can reduce hurdles in the distance meanwhile storage technology supports knowledge storing and knowledge management. It can be seen that the technology used in the organizational knowledge management must support and cover knowledge management processes as much as possible. For example, database system and communication system can help employees to create, search, exchange and store knowledge. However, there is current related software for knowledge management or know-ware such as electronic document management systems or enterprise knowledge portals which can support organizational knowledge management.

Borghoff et al. studied on information technology for knowledge management. He found that knowledge is the most valuable asset of an organization. Information technology can support and enhance organizational knowledge. Each types of information technology are suitable for each types of knowledge management [9]. Huseyin conducted research on the relationship between the knowledge management and results of operations of the business combination. He found that the corporate information technology can enhance the ability of organizational knowledge management in products, services and customers. Information technology has a significant relationship with the business operating result via enterprise knowledge management media [10].

This research mainly relies on a qualitative research. Quantitative research method was also used to assembled and supported in order to obtain information on the needs and expectations of entrepreneurs in the information technology applications in knowledge management in medium enterprises in the central region of Thailand. The data were analyzed to determine the feasibility of the development of a model using information technology for knowledge management for medium-sized enterprises in the globalization properly.

II. Research Conducting

A. Processes of Research Conducting

Fig. 1 shows processes of research conducting. The first step is the preliminary study on the development of information technology using for knowledge management in medium-size enterprises. The second step is the development of a questionnaire design for business staffs and the development of depth interview questions for business managers and computer staffs. The third step is the distribution for questionnaires and interviews to the

samplings. The forth step is data collection. The fifth step is data analyzing. Finally, data and results of this research are reported.

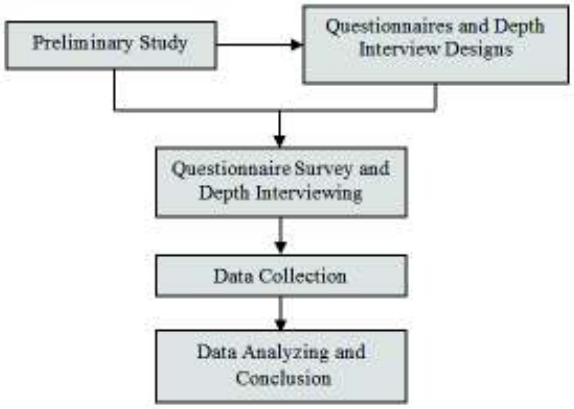

Fig. 1 The processes of research conducting

B. Population and Samples

This research focused on a population of medium-sized businesses in central region of Thailand. 400 staffs in these organizations were chosen as samples by random sampling for questionnaires. The researcher also conducted depth interviewing for 5 business managers and computer staffs.

C. Data Analyzing

Collected data were analyzed and classified into two parts: 1) descriptive analysis; to study the use of information technology application for knowledge management in medium-size businesses. The collected data were analyzed by percentage, mean, frequency, etc. 2) quantitative analysis; the collected data were gathered in order to analyze the factors that affect businesses in the use of information technology for knowledge management in business organizations. Problems and satisfactions with the use of information technology for knowledge management in business organizations were assigned within a score based on the priority levels.

III. Problems and Satisfactions of IT Application for KM

The research result found that medium-size businesses use IT for KM because of these relevant factors; high level of convenience, knowledge utilization, ease of use, knowledge reliability, cost saving, data integrity, knowledge sharing and knowledge presentation techniques, respectively.

Table I shows problems of IT applications for KM, we found that businesses have difficulty factors in terms of convenience, accuracy of data, utilization of knowledge, and modernization of technology at a high level. Meanwhile, businesses have found some problems in the quality of the service, and services of knowledge at a moderate level.

TABLE I
Problems of IT Applications for KM

Factors	Mean	S.D.	Levels of Impact
Quality of service	3.47	0.55	Medium
Accuracy of data	3.64	0.79	High
Convenience	3.67	0.38	High
Modernization of technology	3.58	1.01	High
Service of knowledge	3.40	0.83	Medium
Utilization of Knowledge	3.64	0.96	High

S.D. is standard deviation.

This research also analyzed satisfactions of information technology applications for knowledge management in business organizations. The research result found that the most of business organizations are satisfied with the use of information technology for knowledge management in the enterprise at a high level. These businesses considered these relevant factors for the use of information technology applications for knowledge management in their businesses; knowledge utilization, the accuracy of the information, information and knowledge providing, modern technology, convenience, and quality of service, respectively.

IV. The Development of IT Applications for KM

Table II shows the use of information technology application for knowledge management processes. We found that 73.75 percentages of samples use IT application for knowledge storing, 57.25 percentages of them use IT application for knowledge searching and 56.75 percentages of them use IT application for knowledge creation, respectively. Meanwhile, the samples use IT application for knowledge use approximately 48.75 percentages, knowledge transferring approximately 47.75 percentages and knowledge analyzing approximately 43.50 percentages. This result means that the majority of them use IT application for knowledge storing, knowledge searching and knowledge creation while the minorities of them use IT application for knowledge use, knowledge transferring and knowledge analyzing, respectively.

TABLE II
IT Applications for KM Processes

KM Processes	Quantity (persons)	Percentages
Knowledge searching	229	57.25
Knowledge creation	227	56.75
Knowledge analyzing	174	43.50
Knowledge storing	295	73.75
Knowledge use	195	48.75
Knowledge transferring	191	47.75

Data were collected from 400 samples.

This research proposed a model using information technology application for knowledge management in medium-size businesses in order to meet the needs of entrepreneurs as shown in Fig. 2. The details of the proposed model will be explained in the following subsections.

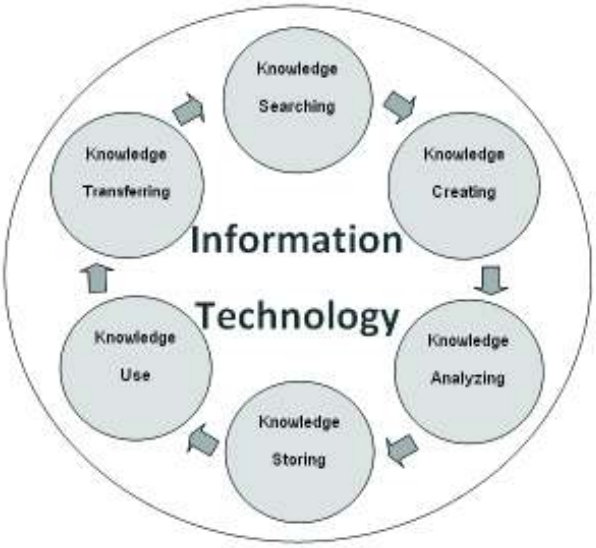

Fig. 2 A model of information technology application for knowledge management in medium-size business organizations

A. Knowledge Searching

Table III shows channels for knowledge searching which were used by employees. We found that 77.75 percentages of them use internet in order to search for external knowledge. Meanwhile, 61.00 percentages of them find knowledge by reading articles, journals and other publications, and 58.50 percentages of them search knowledge via corporate websites, respectively.

TABLE III
CHANNELS FOR KNOWLEDGE SEARCHING

Channels	Quantity (persons)	Percentages
Knowledge querying to others	193	48.25
Reading articles, journals and other publications	244	61.00
E-learning	196	49.00
E-mail for knowledge exchange	208	52.00
Corporate websites	234	58.50
Internet	311	77.75
Other	28	7.00

Data were collected from 400 samples.

To promote employees searching for business knowledge via IT application, business organizations should provide a variety of channels for their employees. Moreover, business organizations should provide adequately communication channels for all employees in order to encourage them to search knowledge by themselves through the websites and exchange their knowledge through electronic mail. The organizations should also provide other sources of knowledge searching for employees, such as journal articles and other publications.

B. Knowledge Creation

Table IV shows various methods for knowledge creation. We found that 88.50 percentages of samples create knowledge by working with others, 67.25 percentages of them create knowledge from reading articles, journals, manuals and electronic media and 65.75 percentages of them create knowledge from suggestions and complaints. Meanwhile, 56.75 percentages of them create knowledge by learning from experiences.

TABLE IV
METHODS FOR KNOWLEDGE CREATION

Methods	Quantity (persons)	Percentages
Work groups	254	88.50
Learning from experiences	227	56.75
Knowledge creating from suggestions and complaints	263	65.75
Reading articles, journals, manuals and electronic medias	269	67.25
Other	39	9.75

Refer to the research result, business organizations should encourage their employees to work together within a group in order to encourage them to share their working experiences within workgroups and encourage them to improve their reading habits in order to increase knowledge. In addition, organizations should improve knowledge support to employees through websites, organizational bulletin board, electronic mail and text messaging via mobile phones effectively.

C. Knowledge Analysis

Table V shows various methods for knowledge analysis. We found that 62.75 percentages of samples analyzed knowledge by modern knowledge-based technology for decision making and problem solving, 61.75 percentages of them analyzed knowledge by individual analytical skills for their work operations, 61.00 percentages of them analyzed knowledge which were feed backed from users in order to improve their services and 59.50 percentages of them extracted knowledge from their working skills. However, there are 51.50 percentages of them extracted knowledge after external data were processed and applied to use it for their works.

TABLE V
METHODS FOR KNOWLEDGE ANALYSIS

Methods	Quantity (persons)	Percentages
Analyzing knowledge from users	244	61.00
Extracting knowledge from working skills	238	59.50
Analyzing knowledge by modern knowledge-based technology	251	62.75
Analyzing knowledge by individual analytical skills	247	61.75
Extracted knowledge from processed external data	206	51.50

Data were collected from 400 samples.

For knowledge analysis, the business organizations should provide training courses for knowledge analysis skills to all employees, especially the practical training courses in knowledge of statistical data analysis and mathematics. So that employees have ability to use organizational knowledge-base, and processing technology via modern network and online

analytical processing in order to use these knowledge for their decision makings, and business operation improvements. Moreover, knowledge of work skills and the external knowledge can be analyzed and applied to use for their businesses.

D.Knowledge Storing

Table VI shows various methods for knowledge storage. We found that 70.25 percentages of samples stored internal knowledge systematically, 66.25 percentages of them stored external knowledge in electronic format, 58.75 percentages of them stored knowledge by categories, necessities and priorities. 51.75 percentages of them stored knowledge in network which can be access from other organizations within the network. However, there are 42.25 percentages of them stored external knowledge systematically.

TABLE VI
KNOWLEDGE STORAGE

Methods	Quantity (persons)	Percentages
Internal knowledge was stored Systematically	281	70.25
External knowledge was stored systematically	169	42.25
Knowledge was sorted by categories, necessities and priorities	235	58.75
Knowledge is stored in electronic format	265	66.25
Knowledge is stored in network and users can access knowledge from other organizations within network	207	51.75

Data were collected from 400 samples.

Business organizations should provide knowledge storage technology for business operations adequately, such as servers, hard disks and other storage media in order to allow their employees to query the knowledge quickly and easily. Moreover, these storage systems should be developed to link the data with other knowledge systems.

E. Knowledge Use

Table VII shows knowledge use in business organizations. We found that 69.25 percentages of samples use knowledge for problem solving in business, 67.75 percentages of them use knowledge for team projects and 63.75 percentages of them use knowledge for work groups.

Business organizations should support their employees to establish knowledge management groups within the organizations in order to encourage them to have knowledge management skills creatively. Organizations should encourage their employees to extract knowledge from corporate knowledge base through various information technology channels usefully and regularly. In addition, business organizations should motivate their employees to do knowledge management activities together, such as best practice of knowledge management group contest award, outstanding knowledge management project, etc.

TABLE VII
KNOWLEDGE USE

Knowledge use	Quantity (persons)	Percentages
Work groups	255	63.75
Problem solutions for business	277	69.25
Team projects	271	67.75
Individual uses	146	36.50
Experience exchanges	203	50.75
Finding for the best practice	188	47.00

Data were collected from 400 samples.

F. Knowledge Transferring

Table VIII shows various methods for knowledge transferring. We found that 60.75 percentages of samples agreed that knowledge was transferred by training, 59.25 percentages by video or internet and 56.00 percentages by manuals, record or report.

TABLE VIII
METHODS FOR KNOWLEDGE TRANSFERRING

Methods	Quantity (persons)	Percentages
Knowledge publications to colleagues	324	51.00
Work manuals, records, reports, etc.	224	56.00
Video, internet, etc.	237	59.25
Work rotations	146	36.50
Training courses	243	60.75
IT networks for knowledge sharing	155	38.75
E-learning	136	34.00

Data were collected from 400 samples.

Business organizations should provide communication media and channels of knowledge transferring for their employees adequately, such as web board, chat, electronic learning, electronic mail, teleconferencing, etc., in order to support knowledge transferring within organizations effectively.

V. THE ROLE OF IT FOR KM IN AN ORGANIZATION

Information technology plays a key role as a knowledge management tool to support knowledge management in an organization effectively. Examples of information technology applications that have been applied to the knowledge management systems are electronic document and content management (Document and content management systems), information searching (Search engines), system of electronic learning (Electronics meeting systems and VDO conference), network media (Electronic broadcasting), brainstorming network (Web board or electronic discussion), supporting software for team work (Groupware), tool for knowledge sharing (Blog or weblog) and experience through virtual space (Cyber space).

VI. THE KEY SUCCESS FACTORS IN IT APPLICATION FOR KM IN BUSINESS ORGANIZATIONS

The key success factors in the development of information technology application for knowledge management system in business organizations are as the following. Firstly, business managements have to support information technology

application for corporate knowledge management. The management of the organization should have understanding and awareness of importance and benefits of the development of knowledge management systems. Secondly, the goal of corporate knowledge management must be clear. The goal must be consistent with the corporate strategy. Thirdly, the corporate culture must be conducive to exchange and share knowledge within the organization. Fourthly, information technology should be applied to use as a tool for knowledge management in business properly, such as knowledge searching, data analysis, knowledge organizing and knowledge using. Fifthly, the cooperation of all levels of employees must be obtained. They must be aware of the significance and the value of knowledge management. Sixthly, the evaluation system for knowledge management must be set up. This factor enables the organization to know the status and the progress of knowledge management within the organization. Moreover, they should review and update the strategy and relevant events in order to achieve the stated goals. Lastly, the organization should provide the infrastructure that supports and promotes the knowledge exchange as well as the development of knowledge management consistently and continuously.

VII. Conclusion

Business organizations can apply the information technology applications for all processes of knowledge management; knowledge searching, knowledge creation, knowledge storing, knowledge application, and knowledge transferring. Information technology plays an important role in knowledge management as a tool to support knowledge management in business organizations effectively. Important factors contributing to the success in the development of information technology application for knowledge management in business organizations are as the following; the support of the management must be adequate, the goal of knowledge management must be clear, the corporate culture that is conducive to exchange and share knowledge within the organization must be created, the cooperation of all levels of employees must be obtained, all employees must realized in importance and value of knowledge management and the infrastructure for information technology that supports and promotes knowledge exchange must be provided. Moreover, knowledge management system must be developed consistently and continuously. If business organizations can apply information technology to organizational knowledge management appropriately, the corporate knowledge management will be potent. Therefore, their employees can apply the knowledge for business operations effectively which help them to increase business competitiveness.

This research emphasized on the development of information technology application for knowledge management in medium-size businesses. To achieve better results, further study should focused on the following issues; 1) to study the use of information technology for knowledge management in small and large business organizations in order to compare and find the similarities and differences 2) to study the use of information technology for knowledge management in business organizations located in other regions in both developing countries and developed countries.

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