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บทคัดย่อ

บทความนี้มีวัตถุประสงค์เพื่อ 1) ศึกษาสภาพปัจจุบัน ปัญหา ปัจจัยที่มีความสำคัญในการจัดการความรู้ 2) พัฒนารูปแบบ และ 3) ประเมินรูปแบบการจัดการความรู้ โดยวิธีการวิจัยผสมผสาน เชิงปริมาณควบคู่กับเชิงคุณภาพ กลุ่มตัวอย่างแบ่งเป็น 3 กลุ่ม ได้แก่ กลุ่มที่ 1 กลุ่มตัวอย่างวิจัยเชิงปริมาณ คือบุคลากรผู้ผลิตเครื่องสุขภัณฑ์เซรามิก จำนวน 371 คน ใช้วิธีสุ่มอย่างง่าย กลุ่มที่ 2 กลุ่มตัวอย่างวิจัยเชิงคุณภาพจำนวน 20 คน ใช้วิธีการเลือกแบบเจาะจง กลุ่มที่ 3 กลุ่มผู้ทรงคุณวุฒิ จำนวน 12 คน เครื่องมือในการรวบรวมข้อมูล ได้แก่ แบบสอบถาม แบบสัมภาษณ์กึ่งมีโครงสร้าง และแบบประเมินความเหมาะสมของรูปแบบ ผลการวิจัยพบว่า

1) สภาพปัจจุบันด้านการจัดการความรู้ของอุตสาหกรรมเซรามิกในประเทศไทยส่วนใหญ่มีการดำเนินการอยู่แล้ว โดยการฝึกอบรม การแก้ไขปัญหาตามหลัก PDCA การระดมสมอง และการจัดเก็บเอกสารให้สอดคล้องตามข้อกำหนดมาตรฐานระบบบริหารงานคุณภาพ ด้านปัญหาและอุปสรรคที่สำคัญ ได้แก่ ขาดการสนับสนุนจากผู้บริหาร นโยบายการจัดการความรู้ไม่ชัดเจน การมุ่งเน้นพัฒนาศักยภาพบุคลากรเฉพาะกลุ่ม

2) รูปแบบการจัดการความรู้ที่จะทำให้การจัดการความรู้ประสบความสำเร็จ ประกอบด้วย 4 ขั้นตอนหรือ 4C Model ได้แก่ สร้าง-เก็บ-ใช้-แชร์ และปัจจัยที่มีความสำคัญต่อการจัดการความรู้มี 5 ปัจจัย ได้แก่ ภาวะผู้นำ วัฒนธรรมองค์กร เทคโนโลยีสารสนเทศ นโยบายและกลยุทธ์ และองค์กรแห่งความสุข

3) ผลการประเมินรูปแบบการจัดการความรู้ พบว่า มีความเหมาะสม ชัดเจน สอดคล้องกับการปฏิบัติงาน ง่ายต่อการนำไปใช้ได้เป็นอย่างดี

4) ผู้วิจัยมีข้อเสนอแนะว่า ผู้บริหารควรเป็นต้นแบบในการจัดการความรู้ในองค์กร กำหนดผู้รับผิดชอบการจัดการความรู้ที่ชัดเจน และจัดให้ความรู้เกี่ยวกับหลักการจัดการความรู้กับบุคลากรทุกระดับ สิ่งนี้จะช่วยให้การจัดการความรู้ในองค์กรมีประสิทธิภาพมากขึ้น

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DEVELOPMENT OF A KNOWLEDGE MANAGEMENT MODEL FOR PERSONNEL OF CERAMIC INDUSTRIES, THAILAND

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Abstract

The purpose of this research aimed to 1) examine current situation, problem, and important factors of knowledge management 2) develop a knowledge management model and 3) evaluate a knowledge management model for personnel of ceramic industries, Thailand. The study was mixed-method research of quantitative and qualitative approaches. The data were collected from 3 groups of respondents. The first group consisted of 371 sanitaryware production personnel who were randomly selected for quantitative data, whereas the second group contained 20 purposive samples. The third group comprised 12 experts. The instruments employed in this study were questionnaire, semi-structured interview, and appropriate assessment form of knowledge management model. The results of this study were as follows:

1) At present the ceramic industries of Thailand have conducted knowledge management by dissemination of knowledge via training, problem solving as PDCA cycle, brainstorming, searching from various sources and documenting to align with ISO9001. The problems and threats of knowledge management implementation were lack of support from management, unclear knowledge management policy, focused skills development on some particular groups.

2) The knowledge management model for personnel of ceramic industries, Thailand for the success of knowledge management were consisted of 4 main components (4C Model): Create–Collect–Carry Out–Communicate. The important factors of knowledge management were consisted of 5 main factors: leadership, organizational culture, information technology, policy and strategy and happy workplace.

3) The evaluation of the developed knowledge management model was appropriate, concise, and useful for organizations, aligned with the operation and practicality in organizations for applying in organizations of ceramic industries, Thailand.

4) The researcher suggested that the executives or top management should be a role model in KM implementation in organizations, set the clear KM representative in the organizations and educate knowledge management principle at all levels. These were the important things to make KM Model more effective.

Keywords: development of knowledge management model, ceramic industries, Thailand

1. Introduction

Today's enterprises face uncertainty and unpredictable event, on a global level. These phenomena are due to rapid changes in technology, consumer behaviors, international trade wars and the COVID-19 outbreak. This situation is called VUCA world; it consists of volatility, uncertainty, complexity, and ambiguity. Therefore, entrepreneurs' business must change themselves to survive and succeed. The important supportive factors to improve the competitiveness of enterprises is "people"-- those who must develop their skills continually. Consequently, the concept of skill and knowledge management is very popular because it can improve work efficiency and push the effective result of the organizations. (Ha, Lo & Wang, 2015, p. 184)

At present, many countries realize the importance of knowledge management (KM). They also apply KM to all aspects of the organization, such as the World Health Organization (WHO) who set WHO Global Knowledge Management Strategy to solve the problems of acquiring health knowledge (World Health Organization, 2005, pp. 1-8).

World Bank also recognizes the importance of knowledge management by setting the meeting agenda for all members about the Global knowledge for development: K4D in order to review and set knowledge management sustainability guideline and strengthen social learning and strong economic development (World Bank, 2017).

Furthermore, many world-class companies have knowledge management in organizations, e.g., Chevron, realizes the importance of knowledge sharing and knowledge management in organizations. Knowledge management plays a pivotal role in supporting and reducing production costs and create new ideas, methods, or innovations for the organization. (Bhojaraju, 2005, p.39)

Hewlett-Packard uses an in-house knowledge management program for consulting work to make working process more efficient. The company considers it as a factor contributing to the business growth, and to reduce business costs as well as to help improve customer service levels. (Garfield, 2018).

In the context of National Economic and Social Development Plan issue 12 (Y2017-2021), the principle of national development is "Sufficient Economy", "Sustainable Development" and "People as "the center of development". It is about the preparation of human resources and capabilities at all ages. The purpose is to improve the quality of human capital and develop the skills to meet the needs of the labor market.

Additionally, the impacts of COVID-19 outbreaks and Thailand's economy are increasing rapidly. The Thai government has taken various measures to cope with this epidemic. This may affect the acute labor force in Bangkok, which is about six million people. The impact of this crisis led to enterprise restructuring, managing the human resources of the organization to get the most benefits. Therefore, knowledge management is very indispensable.

The ceramic industry is one of the most important industries of the national economy, which uses the raw materials in Thailand and has a large labor force. Although the growth of the ceramic industry is likely to perform better, there are still problems affecting the domestic ceramic industry. The problems

are 1) marketing problems, the entrepreneurs lack of skills to use information technology efficiently 2) skilled labor shortage and low-level labor shortage, 3) lack of business management knowledge, cost management, human resource development and organizational knowledge management, 4) financial issues due to the strict support of financial institutions--loan opportunities. (Kittisak Samuttarak, 2014 pp. 1-3)

Although the government supports the industrial sector by reducing costs, there is no support in term of human capital development, which is an important organizational cost. It is a pivotal part of the “New Economy” that is a knowledge-based society. For this reason, the development of personnel in the ceramic industry can enhance the employee efficiency to support career advancement, achieve organization’s goal and survive in a disruptive world.

For all of the above, knowledge is the key driving force of organizations for work and people skill development. It can increase the competitiveness of the organization. If the organizations utilize knowledge effectively, it will affect growth in the ceramics industry in Thailand. The researcher recognized the importance of organizational knowledge management as being important in helping to increase the competitiveness of the business and studied to develop a knowledge management model for personnel in ceramic industry of Thailand. The knowledge gained from this research can be used as a model for managing knowledge in the organization to create competitive advantage and sustainable growth of ceramic industry organizations in Thailand.

2. Objectives of the studies

- 1) To examine current situations, problems, and important factors for development of knowledge management for personnel of ceramic industries in Thailand.
- 2) To develop a knowledge management model for personnel of ceramic industries in Thailand.
- 3) To evaluate a knowledge management model for personnel of ceramic industries in Thailand

3. Literature Review

3.1 Knowledge Management Theories

The knowledge-creation theory (Nonaka, 1994, pp. 14-25) classified knowledge in two types: explicit knowledge and tacit knowledge. It presented the way of knowledge creation in organizations that is called the spiral of knowledge or SECI model: socialization, externalization, combination, and internalization.

Socialization is the transfer of tacit knowledge in one person to tacit knowledge in another person through shared experiences, the tacit knowledge of one person is shared and transmitted to another person and it becomes part of the other person’s tacit knowledge. Externalization is the second concept of knowledge transfer. It is a process of articulating tacit knowledge into explicit knowledge as concepts or diagrams. Third, Combination is the transfer of explicit knowledge to explicit knowledge through the process of codification. It is a process of assembling new and existing explicit knowledge into a systematic

knowledge. The final concept is internalization. It is the reverse of Externalization. It is a process of embodying explicit knowledge into tacit knowledge or know-how or operational knowledge. This model can promote the learning and development process and knowledge sharing continually.

3.2 Learning Organization Theories

There are three theories related to the construction of learning organization: David Garvin (1993) emphasizes the learning device of creating knowledge through five main activities of the organization include solving problems systematically, experimenting, learning from past experiences, learning from others, and transferring knowledge. The construction of learning organization cannot be established immediately. It will take some time and be engrossed in the development goal of learning organization. Additionally, the organizations must build the organizations' environment for learning, knowledge sharing, and opening for new ideas to be the learning organizations. Michael J Marquardt (2002, pp. 23-33) has mentioned five factors leading to be learning organization include learning, people, technology, knowledge, and organization. Peter Senge (2006, p. 129) has an idea to promote and support learning organizations. The focus is on faster learning ability than competition by establishing five discipline guidelines for a learning organization. This includes personal mastery, mental models, building shared vision, team learning and system thinking. Different scholars have different views, but what they have in common is to create shared ideas and development direction. This has led to the continuous and innovative work of employee development ability which leads to a Sustainable Development Organization

3.3 Knowledge Management Process

The current concept of knowledge management is influenced by five main concepts. They are the Wigg KM Cycle, the Zack KM Cycle, the McElroy KM Cycle, the Bukowitz and Williams KM Cycle, and Kimiz Dalkir KM Cycle. According to the synthesis of knowledge management processes of various academics both domestically and internationally, it can be concluded that the knowledge management process consisted of four main processes: 1) knowledge creation and acquisition, 2) knowledge storage and collection, 3) knowledge usage and application, and 4) knowledge sharing and transfer.

Knowledge creation and acquisition is the process of seeking, searching, filtering knowledge of the organization to let the organization know what knowledge is needed or important for the organization. It also includes the acquisition of knowledge from both internal and external knowledge sources, and then through the creation of knowledge.

Knowledge storage and collection is an important step for an organization. If the organization has a good knowledge storage, it will be like a repository of knowledge that can be used both now and in the future. Not only that it can use as the knowledge base for business decision making or the practice guidelines of organization.

Knowledge usage and application is the use of knowledge, expertise and experience which are valuable resources of the organization. Knowledge should be disseminated and transmitted throughout the organization by using Information technology as a tool. It will increase their skills and expertise in

working, making decisions, planning and problem solving effectively, including improving work processes to be more efficient as well.

Knowledge sharing and transfer is the act of exchanging information or understanding between individuals, teams, communities, or organizations. It can help individuals and business be more agile and adaptable in the face of change.

Table-1: Difference in researchers' point of views about Knowledge Management Processes.

Writer	Knowledge Management Process
Wiig (1993, pp.17-232)	1-Build, 2-Hold, 3-Pool, 4-Use
Zack and Meyer (1996, pp. 43-49)	1-Acquisition, 2-Retirement, 3-Storage/Retrieval, 4- Distribution, 5-Presentation
McElroy (1999)	1-Knowledge Production, 2-Knowledge Integration
Bukowitz and Williams (2000)	1-Get, 2-Use, 3-Learn, 4-Contribute, 5-Assess 6-Build/Sustain, 7-Divert
Dalkir (2017, pp. 43-46)	1-Knowledge Capture and/or Creation, 2-Knowledge Sharing and Dissemination, 3-Knowledge Acquisition and Application
Daranee Pimchangthong and Supaporn Tinprapa (2012, pp. 543-546)	1-Discovery, 2-Capture, 3-Sharing, 4-Application
Nasimi et al. (2013, pp.56-64)	1-Creation of knowledge, 2-Documentation & data storage, 3-Transfer knowledge, 4-Re-using of knowledge

3.4 The Important Factors for Success of Knowledge Management

Based on the study and review of relevant literature on factors that are important for knowledge management, the findings were as follows:

Table-2: Reference Literature of Factors of Knowledge Management

Factors	Sources
Factor-1: Leadership	Litvaj and Stancekova (2015) Kozjek and Ovsenlk (2017)
Factor-2: Organizational Culture	Mathi, (2004) Daranee Pimchangthong and Supaporn Tinprapa (2012) Torabi and El-Dan (2017) Attar (2020)
Factor-3: Information Technology	Pawlowski and Bick (2012) Egiri and Wuritka (2015)
Factor-4: Policy and Strategy	Khoshsima and Ebrahiminejad (2008) Mousa (2015)
Factor-5: Happy Workplace	Njoki (2013) Fisher (2010)

4. Research Methodology

The study was a mixed method which combined quantitative and qualitative approaches.

4.1 Sampling Selection

This research collected data from personnel of the top 3 ceramic sanitaryware manufacturers (81% market share) in Thailand. In total there were 5,106 employees. The simple random sampling method was used to collect data.

For the quantitative approach, the 371 questionnaires were distributed. The sample size calculation is from Taro Yamane at 95% acceptable level (Yamane, 1967, p. 886; cited in Ajay and Micah, 2014, p. 11). The questionnaires were categorized into 2 parts. In the first part, there were 40 questions about the knowledge management process: knowledge creation and acquisition, knowledge collection and storage, knowledge using and applying and knowledge sharing and transferring. In the second part, there were 25 questions about important factors for success of knowledge management: leadership, organizational culture, information technology, policy and strategy and happy workplace. The questionnaires used interval rating scale measurement. The Cronbach's alpha value for reliability test of the questionnaires was 0.982. For Quantitative Data analysis, we set equal interval for questionnaire to interpret data.

Table-3: The interpretation of the questionnaire

The range of the score	Interpretation (Degree of Important)	Interpretation (Level of Agreement)
Score 4.51-5.00	Very Important	Strongly Agree
Score 3.51 – 4.50	Important	Agree
Score 2.51 – 3.50	Moderately Important	Undecided
Score 1.51 – 2.50	Slightly Important	Disagree
Score 1.00 – 1.50	Unimportant	Strongly Disagree

For the qualitative approach, the semi structured in-depth interviews were used for 20 research samples (7 senior, 7 middle and 6 junior managers with 5 year-experience in ceramic industry) by purposive sampling method. Twelve experts were also four senior managers, four middle managers and four junior managers who have worked at least for five years in ceramic industry. They also participated in focus group discussion on the knowledge management model. For Qualitative data analysis, we analyzed data of related documents, in-depth interview.

Table-4: Ceramic sanitaryware manufacturers in Thailand and the sample of quantitative study.

Manufacturer	Market Share (%)	Number Employees	Number of Samples
Kohler (Thailand) Public Company Limited	25%	3,106	225
Siam Sanitaryware Industry Company Limited	36%	1,000	73
LIXIL (Thailand) Public Company Limited	25%	1,000	73
Total	81%	5,106	371

4.2 Steps of the Study

Step-1: Study the conceptual framework, knowledge management theories and research related to principles, theory of knowledge management both domestically and internationally, develop into a research concept framework and then create a questionnaire tool.

Step-2: Collect data of the current situation of knowledge management by using questionnaire survey tools. The current situation of knowledge management is analyzed.

Step-3: Create Semi structured in-depth interviews and interviews with managers for collecting data of knowledge management process and important factors related to successful knowledge management. After that paraphrase the content and conclusion of the interview.

Step-4: Analyze the data and summarize the overview of the knowledge management process, the important factors that make knowledge management successful, and synthesis the Knowledge Management Model for Personnel of Ceramic Industries in Thailand (draft version).

Step-5: Develop knowledge management model for personnel of ceramic industries, Thailand. 12 experts participated in focus group discussion on the knowledge management model, summarize the suggestions and improve the knowledge management model for personnel of ceramic industries in Thailand.

Step-6: Improve the knowledge management model for personnel of ceramic Industries in Thailand.

Step-7: Present the knowledge management model for personnel of ceramic industries in Thailand to experts and improve the model until the final knowledge management model for personnel of ceramic industries in Thailand is produced.

5. Research Results

5.1 Knowledge Management Process for Personnel of Ceramic Industries in Thailand.

The result from the in-depth interview is shown that at present. The ceramic industries of Thailand have already conducted knowledge management by dissemination of knowledge via training, problem solving as PDCA cycle, brainstorming, and documenting to align with ISO9001 requirement such

as Standard Operation Procedures (SOP). They also did knowledge sharing activities through team via team meeting.

The overall problems and threats of knowledge management implementation in Ceramic Industries of Thailand are a lack of support from management in term of KM promotion, unclear knowledge management policy, focused skills development on particular groups, communication problems and language problems in knowledge management, etc.

Table-6: Summary result from questionnaire about current situation of knowledge management for personnel of ceramic industries in Thailand

Knowledge Management Process	Average	S.D.	Degree of Important
1. Knowledge Creation and Acquisition (KCA)	3.53	0.61	Important
2. Knowledge Storage and Collection (KSC)	3.25	0.67	Moderately important
3. Knowledge Usage and Application (KUA)	3.50	0.62	Moderately important
4. Knowledge Sharing and Transfer (KST)	3.39	0.68	Moderately important

The result from the questionnaire's showed that the step, which was important for knowledge management process, was Knowledge Creation & Acquisition (3.53) and three steps which are moderately important for the knowledge management process were Knowledge Using & Applying (3.50), Knowledge Collection & Storage (3.25) and Knowledge Sharing & Transfer (3.39). On the opposite side, the result from in-depth interviews were shown in different ways - all four steps are important for the knowledge management process for Personnel of Ceramic Industries in Thailand since Ceramic knowledge is a specialized knowledge, a handicraft that requires knowledge, skills, and expertise in production. Although at present there are machines to support in production, but it still requires human labor to check, inspect and adjust of the products.

Knowledge Creation & Acquisition

The results from the questionnaire show that the current situation, where the ceramic industries have already identified the core knowledge of organizations clearly, promoted knowledge searching for staff, and consulted from experts. Not only that they conducted knowledge sharing within team and brainstormed for solving the production problem. Most organizations in ceramic industries use 3 knowledge creation tools: 1) Brainstorming: it's a simple way of helping team to generate new and unusual ideas, 2) Setting Guru group: It's a way to gather expert in a group to discuss and share any thoughts and insights, 3) After Action Reviewing: it's a technique to evaluate and capture lesson learned upon the completion of a project.

These results from questionnaire were aligned with the in-depth interview results.

However, the in-depth interview shows that the knowledge creation and acquisition should be improved in some areas: 1) need to support staffs for newly generated idea, 2) be opened to team

members for seeking knowledge from various sources such as training and internet for skill improvement
3) create a working environment to support new knowledge creation and promote knowledge creation in the organization.

In addition, the management analysis also pointed out problems affecting the knowledge creation and acquisition, these are 1) problems in collecting tacit knowledge from personal with experience and expertise who are nearly retirement. Many companies in the ceramic industry have just begun to specify the tacit knowledge into production manuals, video material, work observation, including techniques, to improve the working, process and 2) the problem of lack of support for personnel to create new knowledge due to technology limitations of Internet access or the high workload.

Knowledge Collection & Storage

The results of the questionnaire analysis revealed that most organizations in the ceramic industry have good knowledge storage. This means that knowledge is stored in a systematic way, especially, files or information systems. The organizations support employees to increase their knowledge, skills, and abilities, but in some issues, the results of the questionnaire analysis pointed out that it can be improved in some topics: 1) gathering knowledge from work experience of personnel through techniques such as storytelling, learning review or after-action reviewing. 2) collecting knowledge into categories in order to facilitate the storage and retrieval of knowledge. 3) communicating to employees about what is stored knowledge so that personnel will be able to use knowledge to improve and develop effectiveness. Most organizations in ceramic industries use 3 knowledge collection tools: 1) Knowledge bank: it's a collection of information or knowledge about a particular subject, 2) Category: it's a way to divide organization's knowledge in group, 3) Central storage: it's a single storage of data, files and database.

The results of the quantitative and qualitative analysis are consistent. Interestingly, some issues from the viewpoints of interviewees shows that they think in different ways. By thus, they think that at present the organizations do well in knowledge reviewing process and data updating which's different from the analysis of questionnaire results.

In addition, the In-depth interview also points out that problems affecting the storage and collection of knowledge. They are: 1) the problem of inadequate utilization of knowledge storage due to the requirements of the ISO9001 standard system. Organizations in the ceramic industry must maintain all quality control-related documents. The organizations have a large amount of data storage, but they do not use that data to analyze or create benefits properly, which is a great loss of opportunity. 2) the problem of accessing knowledge and data stored in computer databases. It is arisen from the lack of communication and restriction of the rights to access on personnel who use the information of stored knowledge.

Knowledge Using & Applying

The results of the analysis of questionnaires and in-depth interviews revealed that most organizations in the ceramic industry were knowledge acquisition, knowledge using from experience and explicit knowledge, reviewing after knowledge using and improving knowledge sharing by using pictures, manuals, documents, textbooks, photos, or videos etc. Furthermore, there were many activities to promote the use of knowledge among personnel and to apply knowledge to work, including stimulating and encouraging personnel to apply their knowledge to work development and fix the problems to reduce mistakes and work efficiently. Most organizations in ceramic industries use 3 KM tools for Knowledge Using & Applying: 1) setting user group, 2) defining experts and 3) learning review.

However, for the view of the management, results from in-depth interviews point out that the organizations in the ceramic industry have already well managed in many issues. These issues are: 1) organizing activities to promote the use of knowledge; at present, there are various promotional activities such as suggestion activities, 5S activities etc., which are useful in helping to promote knowledge management. 2) appointing personnel who are clearly responsible for transferring knowledge for useful purposes. It is the responsibility of supervisors, foremen and engineers to transfer knowledge to personnel in the team.

In addition, the management analysis in the ceramic industry also pointed out problems affecting the use and application of knowledge were as follows: 1) for the problem of document newness, it is sometimes found that the invalid documents in the operations area which make employees confused and misunderstood, and 2) for the problems of knowledge access in computer systems, the computer access is limited for only some employees, not the whole organizations.

Knowledge Sharing & Transferring

The results indicated that at present, personnel can access knowledge databases. They also search for information and knowledge in the department easily and many companies in the ceramic industry regularly organize activities for knowledge transfer such as group meetings, best practice transferring, and finding assistants to enhance knowledge and experiences sharing within the organizations, etc. The most organizations use 3 knowledge sharing tools: storytelling, learning review and central storage.

In some respects of the management, it is seen that the current knowledge sharing and transfer among the organizations in the ceramic industry is good. It differs from the analysis results from the questionnaire on 1) knowledge sharing and transfer is supported by the manager in the department, 2) transferring the knowledge stored in the form of manuals, documents, textbooks, photos or videos, 3) creating an atmosphere to promote learning of personnel 4) using information and communication technology to support knowledge sharing such as the Internet, websites, applications, and 5) create incentives and inspirations for knowledge sharing such as certificates, prize money, prizes, etc.

5.2 The Important Factors for Success of Knowledge Management

The results from the questionnaire show three factors which were important for knowledge management: Organizational Culture (3.65), Leadership (3.68), Happy Workplace (3.58) and two steps which have moderately important for knowledge management factors: Information Technology (3.49) and Policy & Strategy (3.40). On the opposite site, the result from in-depth interviews were shown in different ways-- all five factors are the most important for knowledge management process for Personnel of Ceramic Industries in Thailand.

Table-7: Important Factors of Knowledge Management (Date from questionnaire)

Important Factors of Knowledge Management	Average	S.D.	Degree of Important
Information Technology	3.49	0.74	Moderately important
Organizational Culture	3.65	0.68	Important
Leadership	3.68	0.75	Important
Policy and Strategy	3.40	0.89	Moderately important
Happy Workplace	3.58	0.59	Important

Information Technology

The results of information technology factor analysis through the questionnaire survey and in-depth interview show that information technology can support knowledge sharing in organization. The ceramic industry sector uses information technology to store knowledge that can be easily applied to work or solve the problem.

Weak points or obstacles for the application of information technology in ceramic industry are: 1) Data access problems in organizational databases. The personnel are restricted from accessing data. 2) There is less use of information technology to store production data & the data collection do not update and ready to use. 3) Problems in the skills of workers in using technology. Workers are not developed in the use of technology such as computers, tablets, mobile phones, smart phones etc.

Organizational Culture

The results of the questionnaire analysis and in-depth interview show that currently, for organizations in the ceramic industry, there are guidelines to create a culture in the organization by using three principles: 1) Supervisor and Manager should be a role model 2) The use of storytelling techniques and 3) provide constructive feedback. The results of the questionnaire and in-depth interview show that most organizations in the ceramic industry have encouraged personnel in knowledge sharing. They have conducted through various channels such as books, websites, intranets, reports, etc. They have encouraged personnel to have creative initiatives, dare to think new things. They create the knowledge sharing environment.

Leadership

The results of the questionnaire revealed that leadership in the ceramic industry is important for knowledge management in the organizations. Leaders are the people who promote, motivate, and encourage employees for knowledge sharing. The organizations encourage employees to develop themselves continuously, in addition, leaders have to monitor and supervise the success of knowledge management.

The research findings show that the leadership problems are as follows: 1) The leadership role in knowledge management of some organizations is unclear. The leaders of organization have not clearly announced that the organization will drive on knowledge management. 2) Organization leaders thought that knowledge management didn't be a priority by focusing on the number of outputs and production volumes rather than skilled development.

Policy and strategy

The results of the questionnaire analysis and in-depth interview show that 1) The organizations are unclear in setting short-term & long-term goals, knowledge management policies, and lack of activities to promote, support and implement knowledge management, and employee do not understand clearly about the goals and policies of knowledge management.

In addition, the results from the in-depth interviews show that at present, the policy and strategy of knowledge management is set by individual departments in organizations, not centralized. Therefore, knowledge management is not a shared policy and strategy in the organization.

Happy Workplace

The organizations, that's a happy workplace, is usually a productive, flexible, and resilient workplace. Employees in a happy workplace are more satisfied and healthier. The results of the questionnaire survey and in-depth interview show that at present employee are happy, so they want to work and learn new things every day. In the ceramic industry, the organizations encourage the team spirit to achieve personal goal and department goal. The supervisors support and encourage employees for skill development. Although the employee work hard, but they still have times to spend with their families for relaxing, traveling, and doing activities with their family.

Table-8: the evaluation of the developed knowledge management model

Criteria	Average	S.D.	Level of agreement
1) 4C Model was appropriate for Ceramic sanitaryware manufacturers in Thailand	4.83	0.37	Strongly Agree
2) 4C Model was aligned with the operations of Ceramic sanitaryware manufacturers in Thailand	4.92	0.28	Strongly Agree
3) 4C Model was clear, ease to understand & apply for Ceramic sanitaryware manufacturers in Thailand	4.83	0.37	Strongly Agree
4) 4C Model was concise and complete for Ceramic sanitaryware manufacturers in Thailand	4.67	0.47	Strongly Agree
5) 4C Model was acceptable for Ceramic sanitaryware manufacturers in Thailand	4.75	0.43	Strongly Agree
Evaluation Score -Average	4.80	0.22	Strongly Agree

6. Conclusions

From the findings, the knowledge management model for personnel of ceramic industries in Thailand for the success of knowledge management is consisted of three components:

Component-1: Knowledge management process that's consisted of Knowledge Creation & Acquisition, Knowledge Collection & Storage, Knowledge Using & Applying, and Knowledge Sharing & Transferring.

Component-2: Important factors of Knowledge management that' consisted of five main factors: 1) leadership, 2) organizational culture, 3) information technology, 4) policy and strategy and 5) happy workplace.

Component-3: KM tools that support Knowledge management process: 1) Brainstorming, 2) Setting Guru group, 3) After Action Reviewing, 4) Knowledge Bank, 5) Category, 6) Central Storge, 7) Setting User group, 8) Defining Experts, 9) Learning Review, 10) Storytelling.

After the process of knowledge management model development for personnel of ceramic industries, Thailand. by the experts participated in focus group discussion. We propose the knowledge management model of ceramic industries, Thailand for the success of knowledge management were consisted of four main components (4C model): Create-Collect-Carry Out-Communicate.

Create means knowledge creation & acquisition by using three key KM tools: brainstorming, setting guru group, and after-action reviewing that aligned with the McElroy KM Cycle (1999) and the Bukowitz KM Cycle (2000).

Collect means knowledge collection & storage by using three key tools: knowledge bank, category, and central storage that aligned with the Zack KM Cycle (1996), the Wiig KM Cycle (1993).

Carry Out means knowledge using & applying by using three key tools: set user group, define experts, and learning review that aligned with the Wiig KM Cycle (1993) and the Bukowitz and Williams KM Cycle (2000).

Communicate means knowledge sharing & transferring by using three key tools: storytelling, learning review, and central storage that aligned with Nasimi et al. (2013).

And the important factors of knowledge management consist of 5 main factors: leadership, organizational culture, information technology, policy and strategy and happy workplace that aligned with Mousa (2015).

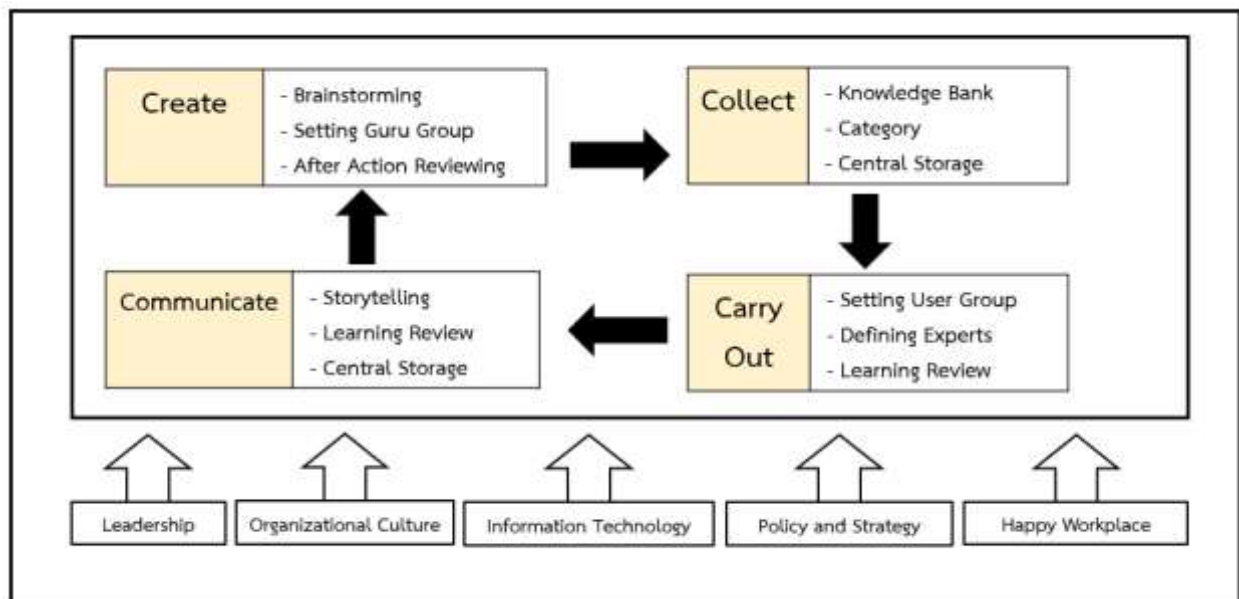


Figure 1 A knowledge management model for Personnel of Ceramic Industries, Thailand

4C Model is a model that Thai ceramic industry organizations can use as an effective organizational knowledge management model. The knowledge management model developed by researchers is appropriate and useful. The results show that the model can be well applied to factories. In addition, the knowledge management model is clear and easy to understand, and its application in the ceramic industry in Thailand and other domestic organizations.

7. Suggestions

In this research study, the researcher has suggestions for applying the research results to use in knowledge management for all personnel, in the Thailand Ceramic Industry, to be more effective:

1) In order to make the knowledge management model effective in practice, the Executives should play a critical role in initiating, promoting, supporting, and driving organizational knowledge management. Also, it includes creating an atmosphere for employees to realize the importance of knowledge management. They should act as a role model in knowledge management.

2) Organizations and departments should assign responsible people for knowledge management.

3) Managers should provide knowledge and understanding to personnel at all levels to realize the benefits of knowledge management.

Suggestions for future research

1) There should be a study of tacit knowledge in the ceramic industry. If we have a knowledge management approach, this will lead to development and dissemination as well as organizational competitive advantages.

2) The monitoring and evaluation model of internal knowledge management should be studied. The results of this study can be applied for planning. The purpose of this study is to develop an appropriate and effective organizational knowledge management system.

3) There should be a study of skills development (skilled matrix and competency development) of each key position; it is important for the ceramic industry business in order to provide personnel with the competencies that the organization needs.

4) There should be a study of the results of personnel knowledge management on the ceramic industry in Thailand such as overall performance of the organization, sales, market share, production costs, profits, and customer loyalty, etc.

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