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Knowledge Management Process Influencing Core Competencies of Supervisors in the Electricity Generation Process

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Abstract:- The objective of this research were to investigate Structural Equation Modeling (SEM) and to study the influence of Knowledge Management (KM) on the core competencies of supervisors in the electricity generation process. The paper focuses in particular on the relationship between the KM process and the core competencies of supervisors. The paper is based on personal interviews. Data was collected from 635 supervisors involved in operation and maintenance of power plants utilizing a case study done in Thailand. A framework of the SEM of KM influencing the core competencies of supervisors was developed from a detailed literature review in an attempt to define the relationship between the KM process and the core competencies of supervisors in the electricity generation process. The applicability and validity of the framework were verified by quantitative research methods. Findings -The paper finds that hypotheses were tested using the SEM. Test of hypotheses revealed that the KM process positively and significantly influenced the core competencies of supervisors in the electricity generation process. These findings tend to corroborate our conceptual model and are also in line with the existing literature. The KM process was found to significantly affect the core competencies of supervisors, indicating the importance of the context and background of the KM process performing together in cases that affect the core competency. Originality/value -This paper enhances understanding of the influence of the KM process on the core competencies of supervisors.

Keywords:- Knowledge Management (KM) Process, Competencies of Supervisors, Structural Equation Model (SEM), Power Plant

I. INTRODUCTION

Nowadays, many organizations have placed a greater importance on the competencies of personnel, having defined it as the most important factor in development of organization. Sanchez et al. (1996) has emphasized the role of organizational learning as an enabler in the process of capacity building competence. Competence enables people to express behaviors that will lead to better performance and result in an overall improvement of the organization. According to Foss (1996), who focuses on the methods and says that companies can create a conceptual framework is a set of competencies or abilities of the company to accumulate, protection and development capabilities, which is the key to competitive advantage. Obtaining excellent results in the electricity generation process of each power plant depends on the capability of personnel in troubleshooting, in order to avoid capacity shortages during the demand peak period (Peak Load) or during periods of normal electricity usage.

Therefore, the competency of personnel responsible in the processing of electricity necessitates the need for continuous development. Capability gained from learning to practice; learning from sharing with colleagues or experts; and training, both formal and informal within their own agency, define this stage in knowledge management (Saisuthanawit, 2012). Knowledge management (KM) is an appropriate tool in helping organizations change their patterns and methods (Thailand Productivity Institute, 2004). It is defined as a process of an organization and specific requirements for the capture, management application, and sharing of knowledge to connect the personal knowledge base and to improve organizational effectiveness (Davenport and Prusak, 1998). Awad and Ghaziri (2004) said that KM has generated a new variety of personnel within companies, specifically, knowledge workers or personnel possessing certain capabilities. KM has given rise to the idea of creative work by having people within the organization work together to develop new forms. This is done In order to achieve organizational effectiveness by increasing responsiveness, innovation, capability, development of personnel, and improved performance (Panich, 2004). The Electricity Generating Authority of Thailand (EGAT), by the Deputy Governor-Generation (DGG), is responsible for the control of power plants around the country including all thermal power plants and hydropower plants. Emphasizing the importance of knowledge management to increase the competencies of personnel can lead to a resulting excellence within the

organization. This is consistent with Boyett J.H. and Boyett J.T. (2001) who said that knowledge management is a matter of increasing the effectiveness of the organization and helping create richness and success within the organization. This is accomplished by using those people who have the knowledge along with the ability to apply knowledge, resulting in innovation and leadership within an organization.

Thus, the research was designed to investigate the causal relationship of the KM process that influences the core competencies of supervisors in the electricity generation process. This will lead to performance excellence and to use data in development and management knowledge, coupled with the quality of the administrators and practitioners in the plant, and it will be useful as a basis for the development of KM process in order to facilitate the core competencies of supervisors in the electricity generation process. Plans are established to improve the policy in the power plant to maximize value within the context of the organization's own efficiency and effectiveness. It can also be used as a practical philosophy in power plant and can be used by organizations to achieve mission goals and the vision of the organization. The objective of this research was to investigate the SEM correlation of the KM process influencing the core competencies of supervisors and to study the influence of the KM process affecting core competencies of supervisors in the electricity generation process.

II. THEORETICAL AND RESEARCH MODEL

A. Core Competency of supervisors

The competency is described as a hidden attribute within the individual and how this attribute affects a person so they can be driven to increase their performance on the job at a higher rate of responsibility and exceed the criteria and goals set (McClelland, 1970; Boyatzis, 1982) or achieve well accepted standards by personal training and development (Parry, 1997), which is cause-driven by an underlying characteristic of personnel which includes knowledge, learning skills (know-how), attitude, personality, social motivation, pattern of thought, thinking method, feelings and actions that allows it to confront and resolve a situation or problem that is real (Boyatzis, 1982; Dubois and Rothwell, 2004; Cernusca and Dima, 2007).

The scholars such as Prahalad and Hamel (1994) divide core competencies into two categories: (1) organizational competency and (2) personal competency. The organizational competency or the competencies of the organization is what the organization does best in order to meet strategic goals and guidelines for the various processes that give the organization a competitive advantage in the economy. This must be linked with the vision, mission, organizational culture and values of the organization, on the other hand the core of the individual (personal competency) is what makes the position of their responsibility than others. In particularly, this study is focused on personal competency rather than organizational competency because all employees are prime in every organization as well as they need to increase individual's capacity (Awad and Ghaziri, 2004) to take competitive advantage. The need to consider personal's core competency that is required in each of the individuals with the ability to work, including skills, thinking skills, strategic thinking skills, learning continuously, teamwork and team transformation, creative thinking, creativity and innovation, risk management, potential for success, acts of self-confidence or leadership, a responsible attitude to culture, knowledge, etc. There are many examiners who classified personal core competency by dividing the elements of competencies into different number of groups, (Office of the Civil Service Commission: OCSC (2010), Santhong (2005), Kongkhasawadh (2005), EGAT (2010)) For that reason, the researchers decide on elements of the core competencies that the academics and EGAT has determined the essential core competencies of supervisors who worked in EGAT should be measured, which include:- 1)Creativity; 2)Learning and application of knowledge; 3) Adherence to responsibility and success; 4) Teamwork; 5) Problem-solving; 6) Decision-making; and 7) Adherence to ethics, integrity and transparency, respectively. The description of core competencies of supervisors is shown in Table 1.

Table 1 Description of elements of core competencies of supervisors

No.	Element of core competency	Description
1	Creativity	It demonstrates the creative thinking, ordering to make the task more efficiently, imagine to demonstrating the idea that different from the usual practice and the benefits involved, able to communicate the idea, any suggestions on how to work as well as new techniques and processes, an innovation to improve operational efficiency continuously.
2	Learning and application of knowledge	It demonstrates able to learn from personal own experience and others, both from Internal and external organizations and from learning resources worldwide to bring knowledge application and development of people in organizations, both academically and new technologies including creation and use knowledge from experience to develop themselves continuously.

No.	Element of core competency	Description
3	Adherence to responsibility and success	It demonstrate an understanding of their role; responsible for the performance and decisions of their own; recognize the shared responsibility for the agency; committed to achieving the goals and vision; despite the limitations, barriers and under pressure.
4	Teamwork	It is able to effectively work and complete assignments in group settings; works cooperatively, with a positive attitude with others to achieve common goals. Treats others with dignity and respect and maintains a friendly demeanor; values the contributions of others.
5	Problem-solving	It demonstrates able to identifies and analyzes problems; weighs relevance and accuracy of information; generates and evaluates alternative solutions; makes recommendations.
6	Decision-making	It demonstrates able to make decisions in various situations effectively; understand the consequences or potential consequences of the decision.
7	Adherence to ethics, integrity and transparency	It has concern for the degree of trustworthiness, transparency and ethical behaviors with consideration for the knowledge one has of the impact and consequences when making a decision or taking action.

B. Knowledge Management Process

Knowledge means experience, value, information, expertise and intuition used to set the environment and the framework. For evaluating to get experienced and new information have different methods for different people. Knowledge is obtainable from the document, work experience in the practices and beliefs of the organization (Davenport and Prusak, 1998). Personal knowledge in organization is required to manage efficiently. KM increases the effectiveness of the organization and helps create vitality and success within the organization by using the knowledge and ability to apply knowledge for innovation and leadership within organizations (Boyett J.H and Boyett J.T., 2001). Knowledge management is an activity that involves the process of knowledge creation, knowledge storage and sharing, identifying current conditions, requirement, and improve processes that will affect KM for the better. To achieve the requirements, was presented model of the process in the practice of KM processes. There are several literatures which divided the elements of KM processes. These examples are shown in Table 2.

Table 2 Literatures of the classification of knowledge management process

No.	Authors	Classification of KM Process
1	Marquardt (1996)	(1) Knowledge acquisition, (2) Knowledge creation, (3) Knowledge storage, and (4) Knowledge transfer and utilization
2	Davenport and Prusak (1998)	(1) Access to data, (2) Building data (3) Embedding of data and (4) Transfer of data
3	Wiig (2002) and Sveiby, (1997)	(1) Knowledge acquisition, (2) Knowledge storage and retrieval, (3) Knowledge transfer and utilization, (4) Knowledge transfer/distribution /sharing, and (5) Knowledge creation
4	Probst, et al. (2000)	(1) Knowledge identification, (2) Knowledge acquisition, (3) Knowledge development, (4) Knowledge sharing/distribution, (5) Knowledge utilization, and 6) Knowledge retention.
5	Nonaka and Takeuchi (2001)	(1) Determining, (2) Quest, (3) Creating, (4) Screening, (5) Sharing, and (6) Using
6	Kucza (2001)	(1) Identification of need for knowledge, (2) Knowledge pull, (3) Knowledge push, (4) Creation of knowledge, (5) Knowledge collection and storage, and (6) Knowledge update
7	Wiig (2002) and Sveiby, (1997)	(1) Knowledge acquisition, (2) Knowledge storage and retrieval, (3) Knowledge transfer and utilization, (4) Knowledge transfer/ distribution/sharing, and (5) Knowledge creation
8	Beesley and Cooper (2008)	(1) Knowledge creation, (2) Knowledge acquisition, (3) Knowledge transfer, and (4) Knowledge adoption

As a result, the researchers conclude that the synthesis elements of knowledge management process. There are many elements together. This study was concerned to use the component which were included: - 1) Knowledge identification - Identify needs and determine what they want to know; 2) Knowledge acquisition - Knowledge is useful both from within and outside the organization. It is the ability to learn by most people in organization; 3) Knowledge creation is to create new knowledge and it is able to use knowledge in different ways. 4) Knowledge sharing - The knowledge of the persons in the organization and shared throughout the organization both formal and informal; 5) Knowledge storage - Knowledge is stored and maintained in different ways and can be searched according to their needs properly and timely recorded in the database; and 6) Knowledge transfer – This process is necessary for the organization to learn to do better. Knowledge is distributed and transmitted quickly and approximately throughout the organization (Davenport and Prusak, 1998; Marquardt. 1996; Probst and Other, 2000; Nonaka and Takeuchi, 2001; Kucza, 2001; Wiig, 2002; Sveiby, 1997; Beesley and Cooper, 2008).

C. Research Framework

Knowledge Management Processes and Core Competencies of Supervisors

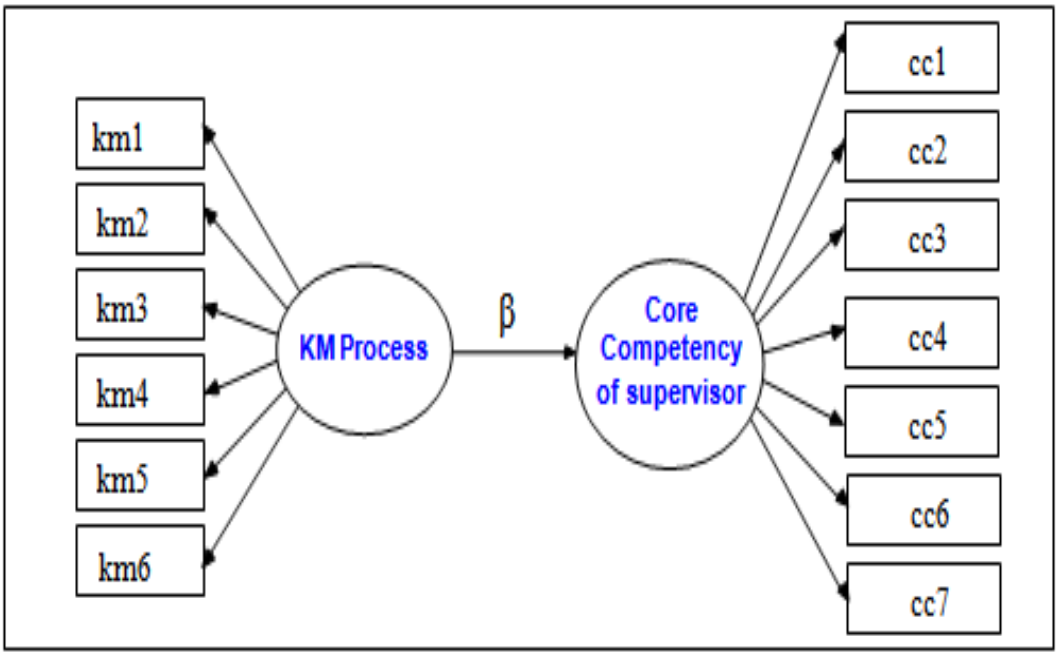

Fig.1: Conceptual framework of research

Conceptual framework in this study is shown in Fig 1 as follows. The figure expresses the relationship between KM processes and Core competencies of supervisors. This model was shaped from two comprehensive variables, including KM process and Core competencies of supervisors. The KM Process is represented by many observed variables consisting of knowledge identification, knowledge acquisition, knowledge creation, knowledge sharing, knowledge storage, and knowledge transfer. The core competencies of supervisors are shown as a dependent variable. The hypotheses of this study are developed as KM Process which had directly effect on core competencies of supervisors in electricity generation process (β).

III. RESEARCH METHODOLOGY

This research tries to employ a quantitative survey in order to fulfill research hypothesis for electricity generation process in the power plant. However, this paper only focused on the theoretical aspect of the research topic. This article uses the model of Structural Equation Modeling (SEM). This model focused on the particular relationship between the KM process and the core competencies of supervisors.

D. Population and sample group

This research covered the population and sample as follows: The population of this study consisted of 1,555 supervisors in the electricity generation process of EGAT power plants in Thailand in the year 2012. The sample of this study consisted of 635 supervisors in the electricity generation process of the power plant. It applied the Table of Krejcle and Morgan (1970) by using stratified random sampling from five power plants: Maemoh Power Plant; Bangpakong Power Plant; Sirikit Dam Hydro Power Plant; Phumiphon Dam Hydro Power Plant; and Srinakarin Dam Hydro Power Plant.

E. Research Instrument

The instrument of this study was a questionnaire consisting of 3 main parts as follows: Part 1- the checklist of general information personal questions; Part 2 - the rating scales of implementation KM process in electricity generation process. It contained 35 questions with 5 rating scales and its reliability was 0.9707; Part 3 - the behaviorally anchored rating scales (BARS) of core competencies of supervisors and competency dictionary together (Rusameethamshoat, 2005) measured the behavior of the supervisors concerning the behavior to reflect level of core competency according to EGAT's Human Resource (HR) framework, which are creativity, learning and application of knowledge, adherence to responsibility and success, teamwork, problem-solving, decision-making, adherence to ethics, integrity, and transparency. There are 7 questions 5 levels rating scale of core competencies which had reliability of 0.9218.

F. Data Collection and Analysis

The researchers submitted 680 questionnaires, by sending express mail (EMS) to the sampling group. The period of the study was in March-June 2012. There were 635 questionnaires (93.38%) returned to the researchers. The researchers proceeded as follows: 1) Analyzed general information by using frequency and percentages; 2) Analyzed with mean and standard deviation (S.D.) tools in the level of implementation KM process in electricity generation process and level of core competencies of supervisors in electricity generation process. Then, the researchers presented the findings in tables with explanations in interpretation of the mean value; 3) Analyzed the correlation coefficients, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA); 4) Analyzed the structural equation model of the relationship between KM process and core competencies of supervisors in electricity generation process used through SPSS, AMOS.

IV. RESULTS AND DISCUSSION

The analysis reveals that measurement model and structural equation modeling (SEM) as follows:

G. Analysis of Measurement Model

1. Researchers used an exploratory factor analysis (EFA) Purposely: 1) whether questionnaire developed by the same element or not; and 2) to cut questions that have no relationship to each other within the group. Criteria were used to cut the variable factor (factor loadings) of less than 0.50 from the elements. (Hair et al., 2006)
2. Research was conducted through confirmatory factor analysis. (CFA) purposely 1) to determine whether the observed variables is a good representation of the latent variables or not; and 2) to determine the construct validity and construct reliability, (ρc) of structural relationships between latent and observed variables. However, researchers was conducted confirmatory factor analysis with samples.

Results of the study, shown in Table 4 and Table 5, found that all the observed variables have construct validity (standardized loading estimate (λ) should be greater than 0.50, (Hair, Black, Babin, Anderson, & Tatham, 2006) and construct validity is considered worthy (ρc ≥ .70) (Hair et al, 2006).

Table 4 Results of the CFA core competencies of supervisors model in electricity generation process.

Core Competency of Supervisors	λ	S.E.	C.R. (t-Value)	ρ_c	R^2
Learning and application of knowledge (cc2)	0.766***	.124	11.158***	.827	0.586
Teamwork (cc4)	0.701***	.093	12.830***		0.492
Adherence to responsibility and success (cc3)	0.642***	.160	10.753***		0.413
Problems solving (cc5)	0.636***	.101	10.637***		0.405
Decision making (cc6)	0.624***	.105	9.989***		0.389
Adherence to ethics, integrity and transparency (cc7)	0.542***	.090	11.456***		0.294
Creativity (cc1)	0.537***				0.288
χ^2= 8.640, χ^2/df = 1.080, df = 8, P = .374, GFI = .996, CFI = 1.00, RMSEA = .011, RMR = .007, AGFI = .986 (Remark: *** p < .001.)					

Table 5 Results of the CFA knowledge management process model.

Knowledge Management Process	λ	S.E.	C.R. (t-Value)	ρ_c	R^2
Knowledge Sharing (km4)	0.876***			.916	0.768
Knowledge Creation (km3)	0.839***	.035	26.716***		0.705
Knowledge Transfer (km6)	0.835***	.036	26.405***		0.698
Knowledge Identification (km1)	0.785***	.035	23.999***		0.616
Knowledge Storage (km5)	0.752***	.043	22.181***		0.566
Knowledge Acquisition (km2)	0.730***	.034	20.855***		0.532

Knowledge Management Process	λ	S.E.	C.R. (t-Value)	ρ_c	R^2
χ^2 = 7.017, χ^2 /df = 1.403, df = 5, P = .219, GFI = .996, CFI = .999, RMSEA = .025, RMR = .002, และ AGFI = .985 (Remark: *** p < .001)					

H. Structural Equation Modeling : SEM

After the validity and reliability of the observed variables in each component and the later stages, the research was conducted path analysis using AMOS. The relationship between KM process and the core competencies of supervisors in the electricity generation process are exhibited in Fig 2 as below.

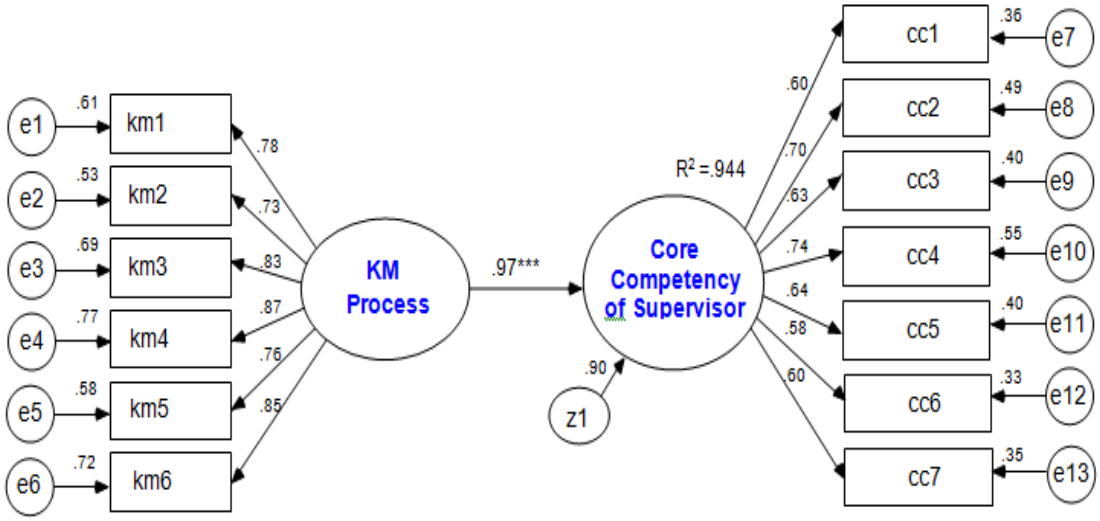

Fig 2: Results of structural equation modeling analysis of the relationship between variables. (n = 635)

Table 6 Summary relationship of latent variables and summary of hypothesis testing

Relationship	β-value	S.E	C.R. (t-Value)	p-Value	Influence	Result
KM Process ➔ Core Competency	0.971	0.060	15.880	p<.001	Direct Effect	Supported (significant)
R^2 (Core Competency = 0.944)						

From Fig 2, the statistics show that $\chi 2$= 54.430, df= 37, $\chi 2$/df= 1.525, RMSEA= .029, CFI= .997, and GFI= .987 It is therefore concluded that the SEM of the relationship between KM process and core competencies of supervisors consistent with the empirical data. The statistics that passing the required minimum Chi-square ($\chi 2$) no significant, $\chi 2$/df < 2.00 (Byrne, 1989, p. 55) ,GFI >.90 (Hair et al., 2006, p. 751) , CFI >92 (Hair et al., 2006, p. 753) and RMSEA > .07 (Hair et al., 2006, p. 753) Therefore, the researchers concludes that the SEM of the relationship between KM process and core competencies of supervisors in the electricity generation process is consistent with the empirical data. In addition, Table 6 shows that the relationship between latent variables positively correlated with the core competencies of supervisors. The results of SEM can be prepared as follows.

Equation 1 Core Competency = 0.971(KM Process), (0.060), 15.880***, R2 = 0.944 (*** p < .001)

From equation 1 found that KM process has a positive impact on core competencies of supervisors with statistical significance at p = 0.001. The variability of supervisor's core competencies can be explained by 94.4 percent, and showed the analysis of the influence of KM process on the core competencies of the supervisors in the electricity generation process. Researchers found that KM process has direct positive influence on the supervisors core competencies of the statistical significance level at .001 (β = .971, p <.001). Subsequently, the research hypotheses, KM process in the electricity generation process has a positive direct effect on the core competencies of the supervisors shown in Table 6. This means whether the power plants has to process-driven knowledge management continuous or not the personnel in electricity generation process will have improved performance both in terms of knowledge, skills and attributes that can be distinguished as well. It

represents the power plant has developed the capacity for personnel to learn from the work (Learning by Practice) and learn from the sharing in the job (Learning by Sharing) increasing as well.

I. CFA models of knowledge management process.

The results of the confirmatory factor analysis provide statistics standardized loading estimate (λ). Which is weight of influence of latent variables observed report as variables that reflect the knowledge management process of the most: 1) knowledge sharing 2) knowledge creation 3) knowledge transfer and utilization 4) knowledge identification 5) knowledge storage 6) knowledge acquisition, respectively. The results are consistent with the proposal of Marquardt (1996) Proposed elements of knowledge management in four steps: 1) knowledge acquisition 2) knowledge creation 3) knowledge storage and retrieval 4) knowledge transfer and utilization and Nonaka and Takeuchi (2001) Proposed that knowledge management composed of six steps: 1) knowledge identification 2) knowledge creation 3) knowledge acquisition 4) knowledge refinement 5) knowledge sharing 6) knowledge utilization, that consistent with Sveiby (2003), Wiig (2002) และ Kucza (2001) Mentioned knowledge management process can be summarized as follows: 1) knowledge acquisition 2) knowledge storage and retrieval 3) knowledge utilization 4)Knowledge transfer /distribution /sharing 5) knowledge creation knowledge creation is a cycle that needs to be done continuously.

J. CFA models of core competencies of supervisors in electricity generation process.

The results of the confirmatory factor analysis provide statistics standardized loading estimate (λ). Found that variables reflect the core competencies of supervisors in electricity generation process include 1) Learning and application of knowledge 2) Teamwork 3) Adherence to responsibility and success 4) Problems solving 5) Decision making 6) Adherence to ethics, integrity and transparency 7) Creativity ,respectively. The result concept of such thing is confirmed. [kongkhasawadh Thamrongsak (2005), Rusameethamshoat Sukanya (2005), Arphaporn Phuwitayapun (2005), Office of The Civil Service Commission : OCSC (2005), Santhong Narongwit (2005), EGAT (2010)] that focus on core competencies of personal. Furthermore, this study found that in the measurement model of core competencies of supervisors in electricity generation process. Observed variables seven competencies analysis in the Standardized Loading Estimate (λ), which reflects the construct validity (Construct Validity) and structural reliability (Construct Reliability, ρc) is determined by the standard. This means that the seven core competencies are suitable for measuring personnel competencies in the power generation process.

K. SEM relationship between KM process and the core competencies of supervisors

The results indicate that core competencies of supervisors in electricity generation process are reflected by knowledge management process, as can be seen from the direct effect of KM processes (β = .971). However, the definition of competency that OCSC (2005), defined set of competencies is a feature-oriented behavior is the result knowledge. All features (K: Knowledge S: Skill A: Ability O: Other) which make an outstanding contribution by the organization is a party to show the competencies of one by competencies. According to the definition of Boyatzis (1982) said competencies means the basic characteristic of a person, including motivation, trait, skills, self-image, social roles or cognitive, where people need to work to achieve the above criteria or exceeds the target set. In addition, Spencer and Spencer (1993) said competencies means the basic characteristic is deep within the person, include motive, trait, autoregressive concepts, knowledge, and skills. These causal relationship of features are driven people to do operational duties on any circumstances more effective than the work target set, so the researchers concluded whether the KM process has a positive direct effect on the competency of supervisors.

In addition, researchers has noted that the value of β reflects that, KM process Influencing core competencies of supervisors in electricity generation process is significantly (for β = .971), It shows that the process-driven knowledge management in electricity generation process will lead to enhanced or increasing the capacity of personnel both knowledge, skills and work behaviors in order to will lead people and organizations to achieve excellence.

V. CONCLUSIONS

The power plants of the EGAT utilize the research result information which led to an improvement in the knowledge management process such as knowledge creation, knowledge sharing and knowledge transfer. The training courses of all features have been provided for increasing supervisors' potential. The findings have led to the development of the master plan to improve the organization of learning, including the use of philosophical principles to be observed in electric power plants and industrial production as well as providing a case study of learning in practice of the KM process. Researchers has suggested that future studies should include knowledge management that effect on the performance of the operating personnel or the comparative study by industrial groups.

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