

# Thai ICT Workforce Characteristics in Enhancing Learning Organization

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**Abstract.** This paper aims to present the results of a research study conducted to identify the desirable characteristics of the ICT workforce in enhancing learning organizations. The Delphi method was used to serve the research objective. Purposive sampling was used to sample the 19 ICT experts. Three questionnaires with reliable questions for the three rounds of data collection were used as the research tools for collecting data. The content analysis and descriptive statistics (median and the interquartile range) were used for interpreting the data from the Delphi method. In the first round, a semi-structured questionnaire was used and two sets of forced-choice questionnaires were employed for collecting the experts' opinions in the second and third rounds. The data from the first round were content analyzed as a basis for administering the questionnaires in the second and third round. The research findings identified three desirable characteristics of ICT workforces that can support the organization to become a learning organization, especially in Thailand. The finding found 64 characteristics which were divided into three groups: The first group was desirable knowledge skills and abilities of ICT workforces in enhancing learning organization or **Personal Mastery (PM)**, consisting of 20 characters that were divided into three groups. The second group was desirable attitudes, values, vision and personality of ICT workforces in enhancing learning organization or **Mental Model (MM)**, consisting of 18 characters that were divided into four groups. The third group was desirable **working behaviors (WB)** of ICT workforces in enhancing learning organization, consisting of 26 characters that were divided into three groups, shared vision, team learning and systems thinking. The benefits of this study will help determine the future focus on the development strategies for improving ICT workforces' potential to ensure an enhanced learning organization. Its findings will affect the method determination on developing ICT human resources of Thailand and make the workplace stable. When the workplace is stable, it will affect the capacity development of the ICT industry which leads to the improvement of the country to be become a knowledge-based society.

**Keywords:** ICT workforces, desirable characteristics, learning organization

## Introduction

Thailand is affected by world situations. The lifestyle of the Thai people has transformed to become a "Knowledge-Based Society". Information and communication technology (ICT) has played important role as a basic structure leading the country to a "Knowledge-Based Society". Nevertheless, Thailand has not been successful, because the Thai people still have problem of ICT accessibility. One of the main causes is because of "problems in ICT industry operation". The National Statistics Department (2008) found that the expansion of ICT industry is confronted with the problem and it is not enough for marketing demand because of the limitation in "efficient ICT workforces". The qualifications sought by the entrepreneurs include interpersonal skill, ability to work as a team, creativity, and ability to use foreign languages. These problems have an effect on the development of ICT entrepreneurs, because the workforces are not able to develop and improve the ICT service that is attributable to ICT accessibility. These causes make the index of ICT accessibility of Thai people to be at a medium level. Therefore, the reinforcement of ICT staff qualifications which may affect the transforming of Thailand to become a "Knowledge-Based Society" is needed.

McClelland (1973), an American educator, found that an excellent autobiography and educational background are not always the indicator of individual success. The study "Testing for competence rather than intelligence" concluded that "the performance of a person depends on internal factors" Bhanthunavin's (2000) study described the three groups of characteristics affecting human



behaviors as *Strong roots* submit to three basic characteristics, namely, intelligence, social perspective and mental health. *A healthy tree trunk* proposes five psychological characteristics of desirable behavior, namely, future orientation and self control, need for achievement, moral reasoning ability, internal locus of control of reinforcement, and achievement motive. *The part of flower and fruit* refers to the behaviors of a good person and the behaviors of a good and intelligent person.

Additionally, Ward's (1997) study supported the view that the quality of human capital in the modern workplace is beyond education and training. The entrepreneurs prioritize the attitude, adaptation, and team work. These have become the main factors for recruitment and courses designed for human resource development (HRD). This is also consistent with Peter Senge (1997) explained the relationship between the individual and organization by referring to five disciplines, as systems thinking also needs the disciplines of building shared vision, mental models, team learning, and personal mastery to realize its potential. Building shared vision fosters a commitment to the long term. Mental models focus on the openness needed to unearth shortcomings in our present ways of seeing the world. Team learning develops the skills of groups of people to look for the larger picture beyond individual perspectives. And personal mastery fosters the personal motivation to continually learn how our actions affect our world.

In order to move Thailand into being a "Knowledge-Based Society", it should start with finding out the elements related to the required characters of ICT workforces. Such knowledge will affect the method determination on developing ICT human resource of Thailand and make the workplaces stable. If the workspaces were stable, it will affect the capacity development of the ICT industry which leads to the improvement of the country to be a knowledge-based society. TDRI (2008) reported that this investigation can be undertaken by distributing questionnaire to inquire about the satisfactory characteristics from stakeholders, such as experts, employers, and policy makers. And the Delphi technique is a systematic method which is used to survey the opinions of experts located in different geographical areas whose opinions are important for decision analysis. Many researchers have used different variations of the Delphi technique to rank and rate the relative importance of the desired attributes and characteristics (Snook & Underwood, 1999).

This research study aimed at investigating ICT workforce's characteristics that contribute to learning organization. Consequently, the characteristics are applied into the five disciplines including personal mastery, mental models, shared vision, team learning, and systems thinking by Peter Senge. The quantitative Delphi research method was used in the data collection. The data were analyzed in order to clarify the desired characteristics of ICT workforces that enhance learning organizations. It is anticipated that the results would be beneficial to HRD and the development of Thai ICT industrial organizations.

### Research objectives

There were two research objectives of this study:

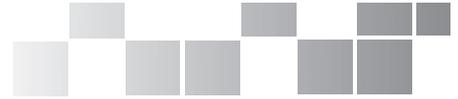
1. To identify the desirable characteristics of ICT workforces in enhancing learning organization.
2. To study the components of desirable characteristics of ICT workforces in enhancing learning organization.

However, this research article presents the findings for only first objective that was conducted by the Delphi method with three rounds of data collection.

### Research Methodology

This research study aimed at investigating ICT workforces' characteristics that contribute to the learning organization. The research design of this study employed a quantitative method approach, because the objective focused on finding evidence that appeared in that society, but were not clear to us. Therefore, this evidence had to be found and applied in order to solve the problems.

The Delphi method was used to conduct this research and collect the data, as it is a systematic method which surveys the opinions of experts located in different geographical areas whose opinions are important for decision analysis. Three rounds of data collection were used to investigate the



desirable characteristics of ICT workforces in enhancing learning organization. Content analysis, median (M) and interquartile range (IQR) were used to analyze the data. The data collection process was conducted from September 2010 - February 2011.

The setting of this research was ICT workforces who work in ICT firms located in Bangkok. Purposive sampling was applied for select the participants, of whom there was a total of 19. According to MacMillan (2003), if there are not less than 17 experts, the decreasing rate will not change as shown in the following table. The selection was specific and conducted by choosing only the ones who consented to join the research. The chosen participants have the qualifications according to the criteria as having experience in ICT work for at least 10 years and occupy positions of management level in ICT workplaces. The participants of this study were limited to ICT workers who worked and stayed in Bangkok and the perimeter, and the data were collected during September 2010 to March 2011. This research studied the overall characteristics of ICT workers. It did not separate the characteristics of ICT workers by jobs, for example: hardware, software, or IT and telecommunication services.

Three rounds of data collection were used to investigate the desirable characteristics of the ICT workforce in enhancing learning organization. The research instruments were two questionnaires: an open-ended questionnaire and a forced-choice questionnaire. The research study was developed by reviewing the related literature in order to identify issues concerning the characteristics of ICT workforces and the learning organization. The questionnaire was developed by examining the quality of the instrument by the experts who were introduced by the research advisor. Content analysis was used to analyze the data from the first round. The second and the third rounds were analyzed by calculating a percentage level of being important or very important for each questionnaire item. Descriptive Statistics were used for analysis of the Median and Interquartile Range. The research process is shown in Figure 1.

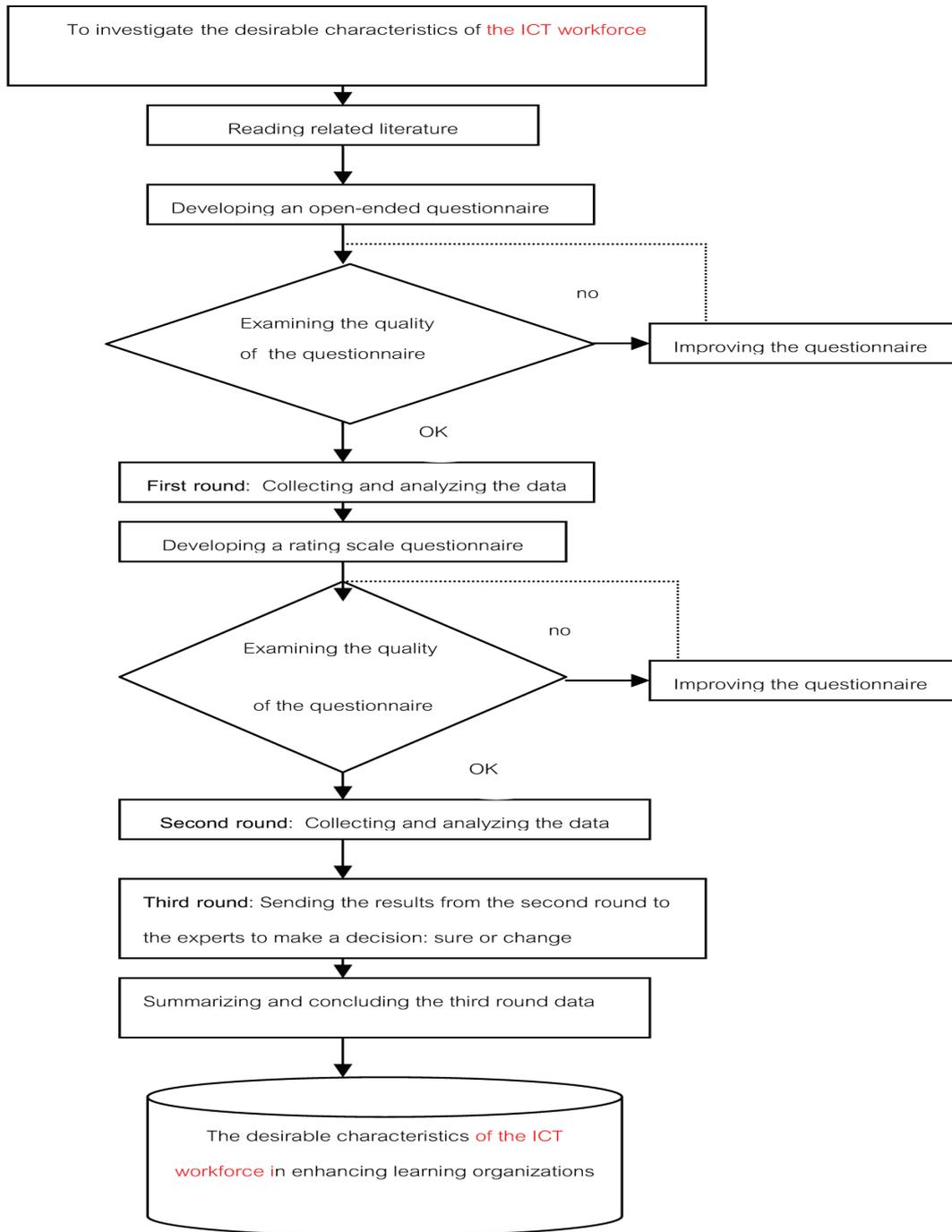
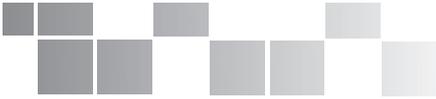


Figure 1. The research process

Figure 1 shows the three rounds of data collection. In the first round, the open-ended questionnaires were sent to the 19 experts, so that they could express their opinions freely. Then, the data was analyzed in respect of the types of items and the items themselves, in order to construct a five-point rating scale questionnaire.

In the second round, the rating scale questionnaires were returned to the experts who rated the necessity levels of ICT workforce characters. From the data collected in the second round, the five-level rating scale questionnaires were sent to each expert to answer every item according to the levels of necessity of each character. The collected data were analyzed by analyzing the median (M) and interquartile range (IQR) of each character in order to make the third round questionnaires.

In the third round, the data collected in the second round were calculated for medians and interquartile range of each item. The medians and interquartile range of each item were presented, as well as the former answers of the experts in the second round, so the experts knew the similarities and the differences between their answers and other experts' responses. The purpose of this technique was for the experts to consider the information provided to them, to make a decision, assure themselves, and to change their own answers, if necessary. If the experts were sure of their answers, but their answers had values outside the interquartile range, the experts were asked to give a supporting reason.

The results of the research are presented below. The desirable characteristics of the ICT workforces were inferred based on the consensus of the experts' opinions.

## Results

This section aims to identify the desirable characteristics of ICT workforces in enhancing learning organization using the Delphi Technique by gathering the opinions of 19 ICT experts on the characteristics of ICT workforces in enhancing learning organization for three-rounds of data collection. The results are shown in Table 1.

Table 1 The desirable characteristics of Thai ICT workforces.

Character/round	Round 1	Round 2	Round 3	Final Results
Personal Mastery				
• Knowledge	30	30	29	20
• Skills				
• Abilities				
Mental Model				
• Attitudes	34	34	32	18
• Value				
• Vision				
• Personality				
Work Behavior				
• Share Vision	44	44	39	26
• Team Learning				
• System Thinking				
Total	108	108	99	64

Table 1 presents the results of the desirable characteristics of ICT workforces in enhancing learning organization produced three characters which were Personal Mastery, Mental Model and Working Behavior. Personal Mastery consisted of knowledge, skills and abilities. Mental Model consisted of attitudes, values, vision and personalities. Working behavior consisted of sharing a vision, team learning and systems thinking.

In the first round, the data were collected from informants who specialize in hardware, software, information and technology services and telecommunication services by the open-ended questionnaires and content analysis was used to interpret the data. All the of results are categorized into three parts: **the personal mastery (PM)**, including the desirable knowledge skills and abilities of ICT workforces in enhancing learning organization , **the mental model (MM)**, including the desirable attitudes, values, perception sand personality of ICT workforces enhancing learning organization, and **the work behaviors** of ICT workforces, including shared vision, team learning and systems thinking. The research results are presented below:

- The personal mastery of the ICT workforces that is required for the learning organization consists of 3 parts: in total 29 characteristics, fifteen characteristics of the desirable knowledge, seven characteristics of the desirable skills and seven characteristics of the desirable abilities.
- The mental model of the ICT workforces that is necessary for the learning organization consists of 4 aspects: in total of 33 characteristics. The 33 characteristics were divided into 6 characteristics for attitudes, 10 characteristics for values, 8 characteristics for vision, and 9 characteristics for personality
- The desirable work behaviors (WB) showing that the ICT workforces could encourage the learning organization were 44 characteristics categorized into 3 parts. The 15 characteristics were divided in the shared vision section. The 20 characteristics were related to team learning and the 9 characteristics were related to systems thinking.

The results of the first questionnaires were gathered and analyzed to create the second round questionnaires which had 5 rating scales. Then, the questionnaires were applied with the specialists for the second round.

After gathering the data from 19 experts in the second round, the data were analyzed and the third round questionnaires were developed. Then, the questionnaires were sent to the same 19 experts to answer again. The researcher took the recent data to analyze by analyzing the median (M) and *the interquartile range* (IQR) of each character. The specialists' opinion, the non-consensus questions, were removed which were undertaken since the consensus rate was 2.00. After removing those questions, there were 99 items out of 109 items from the second set of questionnaire and they were then revised.

The results obtained from the third-round questionnaires revealed which characteristics are necessary for the ICT workforce to have the researcher found 64 characteristics which were divided into three groups as:

- The desirable knowledge skills and abilities of ICT workforces in enhancing learning organization or Personal Mastery variable, consisting of 20 characters that were divided into three groups. The researcher showed the research model of Personal Mastery.
- The desirable attitude, value, vision and personality of ICT workforces in enhancing learning organization or Mental Model variable, consisting of 18 characters that were divided into three groups.
- The desirable working behaviors of ICT workforces in enhancing learning organization or Working Behavior variable, consisting of 26 characters that were divided into three groups.

The desirable characteristics of the ICT workforces to support the learning organization which consists of three main desirable characteristics and 10 sub-desirable characteristics are shown in Figure 2.

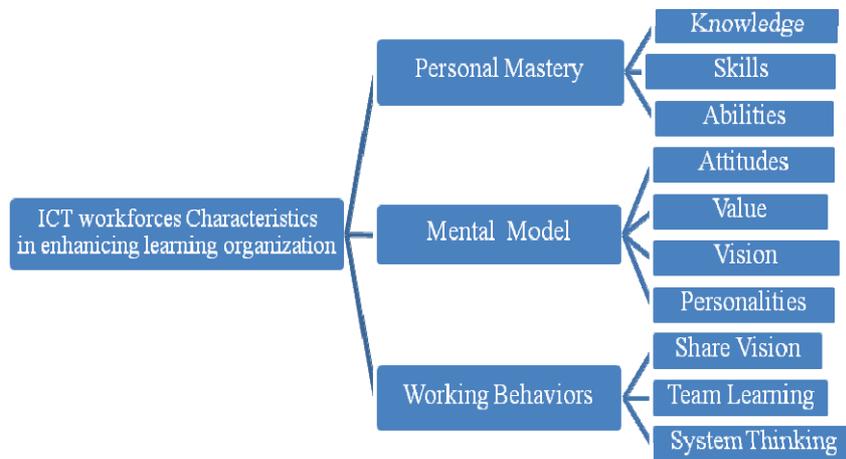


Figure 2. The desirable characteristics of ICT workforces in enhancing learning organization

Each desirable characteristic has a set of behaviors that are reflected in the ICT workforces in the learning organization. The first set of desirable characteristics, **Personal Mastery**, refers to the knowledge, skills and abilities which show that ICT workforces have courage and are able to create excellent work. The results have shown that the **knowledge** of ICT workforces can be classified into two dimensions as how to gain knowledge and what is the knowledge that ICT workforces should know. The study has found that ICT workforces should be cured of their knowledge and experience by themselves. The knowledge that they should know is computer systems, network systems, and software systems. However, it is noteworthy that the experts' opinion has the same manner as that ICT workforces may not have graduated with ICT skills. In addition, experts have commented that management knowledge is essential to practice and is able to contribute to the operational of ICT workforces in order to reach the goals and coordinate with other departments within the organization.

**The skills** that are needed for ICT operational to support the learning organization include critical thinking and observation. Communication skills and technical skills may also be essential. The workforces will have many skills by considering the sensitivity and the operational mistakes. **The ability** that supports the ICT operation in a learning organization is divided into two groups; the ability is not related to ICT work and the ability is related to ICT work. If the ability is not related to ICT work, it can be observed by the ability to forecast the external business environment, the ability to organize work, and performance targets that are also involved in management. The ability is related to the ICT work and should be noticed from the ability to access information associated with the job. The ability of the technology is appropriate for the work and goals of the organization. The ability is to enhance and create the work that responds to problems and needs of the organization goal. These desirable characteristics can be summarized and presented in Figure 3.

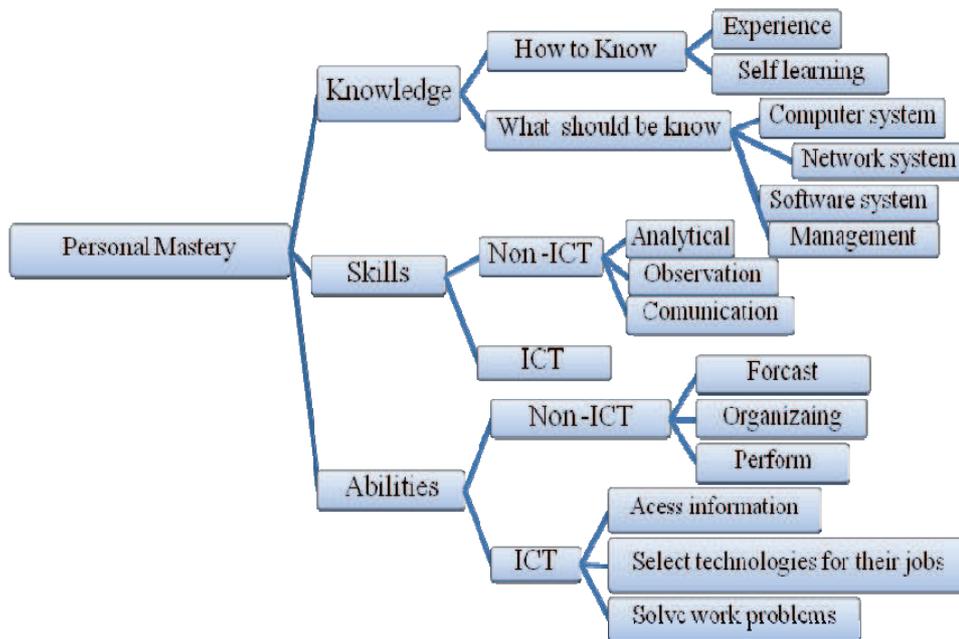


Figure 3. The Personal Mastery of desirable abilities, knowledge, and the skills of ICT workforces

The second set of desirable characteristics, the **Mental Model**, refers to the attitudes, values, vision and personality of ICT workforces, which means that ICT workforces will be able to overcome barriers, know how to change, and adjust themselves with another workforce. The results have shown that the desirable characteristics that reflect the workforces have **an attitude** to support in learning organization, including self-esteem and be proud of the organization, the pleasure and willing to work, although there is time limitation, be hard working, and looking at the crisis as an opportunity. **The values** that the workforces should be encouraged in a learning organization are self motivation, public mindedness, team work and working beyond the standard. **The vision** can be reflected that the ICT workforce can link up with its own goals of the organization, which will result in the ongoing development, such as the multi-dimensional perspective, and to be understood and seen for what it is. **The personality** of ICT workforces are able to convince people and lead them to overcome operational difficulties. The experts pointed out that ICT workforces should have an assertive self-confidence, credibility and leadership in the way of influencing the minds of others and are willing to practice. Meanwhile, it should be a polite, calm and humble. These desirable characteristics can be summarized and presented in Figure 4, the desirable attitudes, values, vision and personalities of ICT workforces or Mental Model.

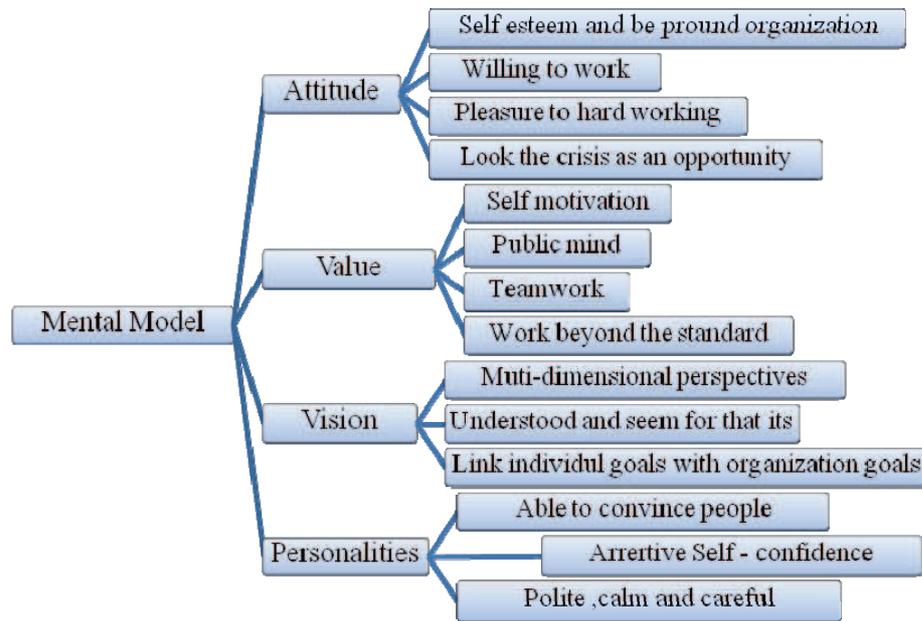


Figure 4. The Mental Model of desirable attitudes, values, vision and the personalities of ICT workforces

The last set of characteristics of ICT workforces that the experts believed are necessary to encourage and support the learning organization was Working Behavior: (1) The behavior has shown that ICT workforces have awareness and participation to create and sustain a vision of the agency or to Share Vision. (2) The behavior has shown that ICT workforces share information, knowledge, and techniques with colleagues. As a result, they may learn and develop personal capacity and performance together across the organization or team learning, and (3) The behavior has shown that ICT workforces and computer work together to find a solution, analyze the problems, and development work which is shared between various segments of the agency or the Systems Thinking.

Behavior has shown that ICT workforces have an awareness and participation to create and sustain a vision of the organization or **Share Vision**, consisting of the behavior of ICT workforces which have an awareness and consideration of the external environment and the work process of the organization. In addition, they should recognize and acknowledge the needs or goals of the organization. This will contribute to understanding the changes in technology and the work process. And if the workforces are recognized and realized the context of the above, this may be cause for pleasure that he/she was responsible, according to his/her aptitude, and achieve the goal. The study also found that the behavior may reflect that the workers are willing to carry on the vision of the organization which may be noticed from the involvement with the rules and regulations for ICT. Collecting and recording the advantages and disadvantages of ICT and the efforts have contributed to the improvement of the mistakes. It is noteworthy that the behavior reflects that ICT workforces focus on the vision of the organization in two parts: the awareness and the action. The author summarizes the concepts in Figure 5.

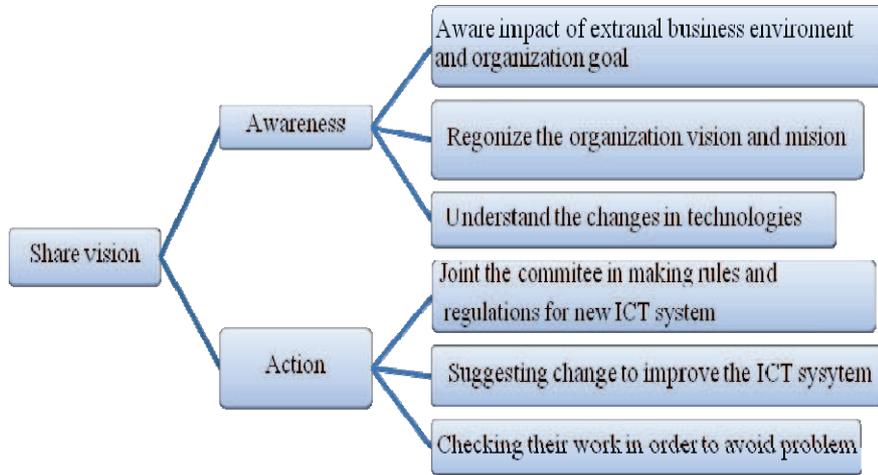


Figure 5. The shared vision working behaviors

Behavior shows that ICT workforces share information, knowledge and techniques with colleagues. As a result, they may learn and develop personal capacity and performance together across the organization or team learning, which includes understanding of their functions, recognizing the technological capabilities of individuals in different departments, recognizing that, without the exchange of knowledge between each other, they will not be able to achieve operational objectives, or be aware of the technological capabilities of individuals in different departments and trying to run multiple tasks and exchange information on how it works. If there is a common error, they find the cause and find out the problem solution. In addition, ICT workforces show in their behavior by listening to the others' opinions and congratulations on the success of any person. This exposition will help to reduce the differences and gaps between themselves in sharing knowledge. The behavior of ICT workforces who are willing to share and learn together may be classified into two groups. The behavior is not displayed and the expressive behavior. The author has summarized these behaviors and presented them in the following Figure 6.

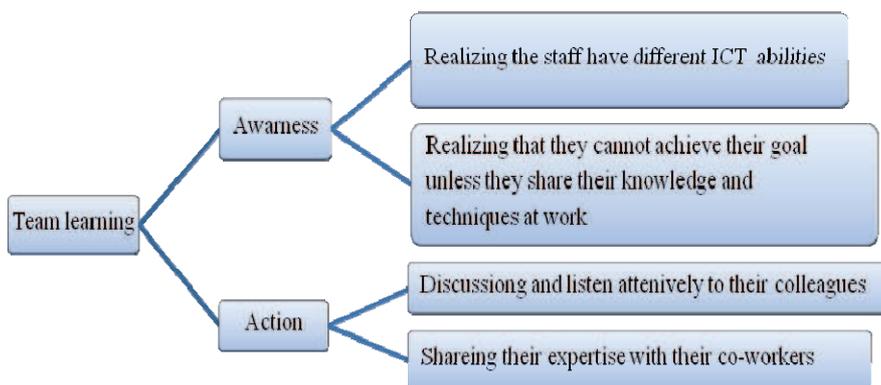


Figure 6. The team learning working behaviors

Behavior has shown that ICT workforces share ideas, analyzeto find a solution, and develop between department of the organization or the System thinking which includes the performance that can analyze the technology problems and realize that the problems in the workplace can occur at any time. They recognize that the solution requires cooperation from all parties. Attending to comment and analyze the problems of the organization, they attempt to explain the reasons and the need for the

organization to update or change the technology which has been used by their colleagues and dare to present problems and solutions to executives who have decision power. This behavior reflects the fact that the workforces can think and analyze system-oriented concepts which can be summarized and presented in the following Figure 7.

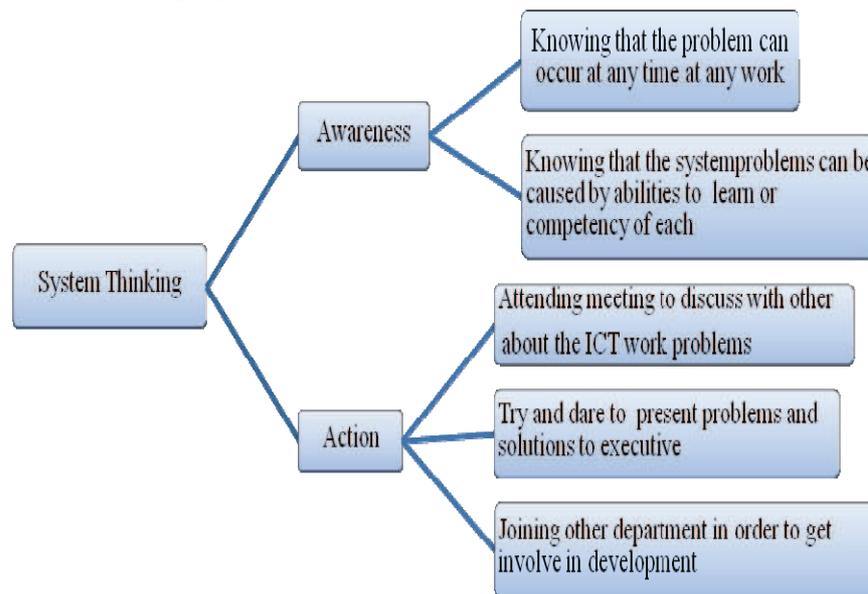


Figure 7. The systems thinking working behavior

The results of this research study can be summarized by inferring that there are three main characteristic supporting a learning organization. All of them can be observed by ICT workforces' working behaviors and traits. The working behaviors were separated into two level: awareness and action and the traits were separated into two groups: ICT and Non-ICT. The results of this study will be discussed in the next section.

## Discussion

The results indicate the learning organization would not exist without the three components of the desirable characteristics as ICT workforces' competencies or Personal Mastery, ICT workforces' psychological characteristics or Mental Model and the ICT workforces' Working Behaviors. These results are consistent with the research by Bhanthumnavin (2000) and the work of Peter Senge (1990).

Bhanthunavin proposed three groups of characteristics that affect human behaviors: *Strong roots* are a metaphor for three basic characteristics namely, intelligence, social perspective and mental health. *A healthy tree trunk* refers to five psychological characteristics of desirable behaviors, namely, future orientation and self-control, need for achievement, moral reasoning ability, internal locus of control of reinforcement, and achievement motive. *The part of flower and fruit* refers to the behaviors of a good and intelligent person.

Peter Senge (1997) explained the relationship between the individual and the organization by five disciplines as systems thinking also needs the disciplines of building shared vision, mental models, team learning, and personal mastery to realize its potential. Building shared vision fosters a commitment to the long term. Mental models focus on the openness needed to unearth shortcomings in our present ways of seeing the world. Team learning develops the skills of groups of people to look for the larger picture beyond individual perspectives. And personal mastery fosters the personal motivation to continually learn how our actions affect our world.

Two previous studies supported these research findings, because there are similar characteristics of ICT workforces be related basic characteristics of human behavior and the learning organization and the relationship between human behavior and organization can be described by the HRD concepts Individual Development, Career Development and Organization Development.

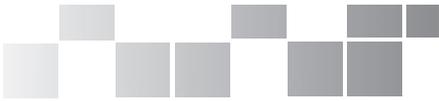
Herr and Cramer (1996) indicated that lifelong psychological and behavioral processes, as well as contextual influences, shape one's career over the lifespan. As such, career development involves the person's creation of a career pattern, decision-making style, integration of life roles, values expression, and life-role self concepts. Johnson (1976) said that organization development deals with a total system and in the context of the total system that consists of individuals, organization structures, organization norms, organization values, and products that are not considered in isolation. If the organization would like to increase its quality and growth, it will focus on the processes of organizations and the behavior of individuals in organizations and groups. Then, Bradford and Burke (2005) suggested the six-step model to develop the organization that is related to organization members, organization structure, organization culture and the relationship between individual and unit.

There are many studies of ICT role and ICT workforces whose findings are consistent with these results. Idowu, Adagunodo and Idowu (2004) said that ICT competencies play an important role in developing a nation and pointed out that knowledge, skills and confidence with computer technology are assets for those who want to enter into the competitive employment market. Then, Connor, Dench and Bates (2002) have identified the new and specific technical skill, computer literacy and IT skills, multi-skilling and greater flexibility, the ability to deal with change, an ability to continue learning, re-skilling, and the greater importance of personal and generic skills are key themes of skill trends. The Thai researchers, Tientong and Nawichien (2010) found 10 factors which affect ICT competency, including leaning ability, career opportunity, knowledge of computers, computer system and information and technology, communication skills, and ability to develop themselves by research and self-access learning.

However, the ICT workforces are the specialized human resources who have an influence in the ICT industry and the knowledge-based society. It must be necessary to develop them to be a good workforce and this research was conducted to find out the desirable characteristics of ICT workforce in enhancing learning organization. It found that there are three component characteristics which affected a learning organization, namely, Personal Mastery, Mental Model and Working Behaviors. The behaviors which indicated the good ICT workforces consisted of the general abilities, ICT abilities, ICT knowledge, supporting skills to accomplish their work and the mode of psychological or the mental model, consisting of the self-concept: motivation and inspiration, and the social concept, referring to how do ICT workforces adapt themselves to fit with their environment. The last model is the working behavior which was indicated by how ICT workforces share and participate in the organization's goal and mission, how ICT workforces do their work and their relationship within their team.

### **Implications and Recommendations**

This study aimed to investigate the needed characteristics for ICT workforces that can support learning organization. Nowadays, it is recognized that technology's advance has impacted on our routine lives. It has become a part of business management, education, and many activities. Moreover, the success of the organizations and individuals are the results of technology capabilities. However, the survey from the National Statistics Institute (2008) showed that many organizations have problems which are affected by the abilities of their employees that are not equivalent to their jobs. Thus, this is the encouragement for the researcher to investigate the needed characteristics for ICT workforces that can support the learning organization. As mentioned by Peter Sege (1997), Learning Organization is the process to create the changes in an organization that has clear objectives and that the people are the center of creating change.



According to the above meaning, Learning Organization is the way that make the organization and its employees have an effective and efficiency working process, because the five disciplines of learning organization (personal mastery, mental model, share vision , team learning and systems thinking) can stimulate personal capabilities, integrate teamwork, and support the objectives-based operations. The results of developing a learning organization by these five disciplines lead to the understanding and realizing of employees in preparing themselves for changes. Moreover, it creates the opportunities for the employees to work in teamwork, empowerment, and support the imitative atmosphere and innovation. This situation will strengthen the organizations to be ready for competitiveness. Additionally, the concept of learning organization accords to the principle of HRD, which is composed of Individual Development, Career Development and Organization Development. To create the developing organization, it must have interrelations among these components. It means that when the employees are supported to develop their capabilities, this will help them to respond to their duties effectively and also affect their career development. Moreover, the organization will achieve more productivity that leads to the continuous and sustainable growth of the organization.

On the other hand, if the people have the needed characteristics, but they cannot link their characteristics to business goals and success, the organizational productivities will not occur.

As a result, HRD has to be linked to the organizational goals. Furthermore, if the characteristics of the people were evaluated by success of their jobs and goals achievement, the five disciplines mentioned above can answer these questions, because they can explain the individual, group, and organization level. Therefore, the researcher integrated the concept of characteristics development, which are individual development, to the concept of learning organization to be the frame of this study to answer the question “What are the characteristics of ICT workforces that support them in working to achieve the organization goals?”.

The results of this study might be beneficial for individual, organization, and social levels, as follows:

### **1. Individual level**

The results of this study illustrated the details of needed characteristics for ICT workforces clearly. Accordingly, if any ICT workers want to succeed in their career and be recognized in their organization, they can begin from developing themselves in order to have all 11 characteristics that were found in this study. The recruitment and selection system begin with setting the qualification of the employees and then evaluating the applicants to test their qualifications compared with the desired qualifications. In this study, these qualifications were illustrated in detail. Therefore, if ICT workforces have knowledge, it can be the map for their career success. Most career development occurred in the organization that provided the opportunity for learning to their employees and this will help the employees receive the satisfying compensation. In addition, when the employees started in the organization, they were trained in the training programs according to the organizational needs which focused on the required characteristics

### **2. Organization level**

The organization, both private and public, can apply the results from this study to the HRM or HRD system of their organization, because every organization today has to use the information technology for their communication in every level of the working process. The ICT workforces are the mechanics for driving the organization to achieve their goals. For this reason, the origin of organizational success is the ICT workforces. Consequently, the results of this study can be applied to HRM and HRD systems in the organization.

The results of this study also can be applied to the performance evaluation system. This system begins from setting the characteristics of workforces to be the criteria for selection. After that, they will run the orientation course for new employees, and develop their skills. The training program for career development can apply the results of this study in many areas: orientation, building the values and good attitudes for the employee to link with the organization goals.

### 3. Social level

The public sector can use the results of this study for setting public policies concerning information technology development, especially in the human resource area. The examples of the areas that the results of this study can be applied to are: using the desired characteristics of ICT workforces for setting the standard of an ICT workforces certification system, using the desired characteristics of ICT workforces as the criteria for testing ICT workforces in certifying their level of knowledge and evaluating job grade or adjusting the compensation. The results of the study illustrated that it is not necessary for ICT workforce to study in the normal education system, but they can learn from their experience and then get through the testing system for the certification. Thus, an accreditation system for ICT workforce is one way that accords to the HRD system for our country to transfer to become a Knowledge-Based Society.

The education sector has important roles for society, because it is the organization that produces manpower for every organization. Thus, creating qualified manpower that accords with the needs of society is the main mission of education institutes. The results of this study are useful for the education sectors in curriculum developing, designing teaching methods, and learning evaluation. The findings of the study can be the major information for designing and developing programs for producing graduates which accord with social needs. Moreover, the instructors can apply the main concepts that are the results of this study to designing the learning process to transfer the characteristics, which were found in this study, to the learners. In addition, the educational organizations can utilize the characteristics of ICT workforce that were found from this study as the criteria for evaluating the learning program.

Besides the utilization for curriculum developing, learning organizing, and research, scholars can use the results of this study as a reference for further research or creating the innovation for education that will be beneficial for HRD, especially in ICT.

The main concepts mentioned above confirmed the utility of this study in its implications. For scholars and theoretical areas, the utility of this research can be divided into two parts:

1. The results of this study expanded the body of knowledge about the needed characteristics. According to Bhanthumnavin (2000), the needed characteristics of Thai people are composed of three parts: roots (mental characters), trunk (competence), and flower or fruit (behavior) and these are called "the Theory of Ethical Tree". This theory explained these characters broadly and did not describe the details of people in each career. Thus, the results of this study extended the body of knowledge about the needed characteristics of Thai people in their career level, information technology, which is important for the country's development, because it is the tool for creating a learning society.

2. The concept of learning organization is accepted worldwide, that it can create sustainable growth for the organizations. However, this concept explained the main idea and mechanism generally which may not accord with the Thai context. Thus, the study of competence, mental, and behavior of Thai workers is important for expanding the body of knowledge about learning organization.

### Limitations of the study

Although this study was processed in the frame of research methodology strictly and was controlled by three advisors closely, there were still some limitations:

1. The participants of this study were limited to ICT workers who work and stay in Bangkok and its perimeter, and the data were collected during September 2010 to March 2011. This research studied the characteristics of ICT workers overall and it did not separate the characteristics of ICT workers by jobs, for example, hardware, software, IT services and telecommunication services. Because of its limitations, the researcher has recommendation for further researches as follows:

2. Further research should expand the area for collecting data to other areas of Thailand, such as the North, Central, South, and Eastern regions of Thailand, because the context of working in each area is different. The data that were collected from all parts of Thailand may be generalized to the ICT workers in Thailand and will support diverse learning organizations for ICT workers. Moreover, the data collected in each part of Thailand will support comparisons of the labor situations that may reflect the inequity of jobs and compensation levels.

3. Further research should study deeply each job, because there are three variables that related to working: the human beings, jobs, and organizations This research studied only the characteristics of workers that related to the business goals. Thus, further research should expand the scope of the study to other ICT areas, such as hardware and software.

4. Finally, the researcher has a recommendation about the research methodology for further research For the study of other branches of career, it may be fruitfully studies by using a combination of the Delphi technique and factor analysis, because it is the way to gather knowledge from society's base (Delphi), guru, and factor analysis. Therefore, the results of the study has the foundation from two sources of evidences, which is the way to transfer opinion to knowledge.

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