

## The Needs of Job Characteristics in ICT Support for Private Business Sectors in Thailand

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### บทคัดย่อ

การระบุหน้าที่ความรับผิดชอบของตำแหน่งงานต่างๆ เป็นสิ่งที่จำเป็นสำหรับองค์กรที่มีความต้องการจ้างบุคลากรเข้ามาปฏิบัติงานซึ่งต้องมีการกำหนดถึงคุณสมบัติพื้นฐานและระบุความเชี่ยวชาญเฉพาะด้าน ประกอบด้วย ระดับการศึกษา ทักษะ ประสบการณ์ทำงาน บุคลิกลักษณะ และความสามารถพิเศษ เป็นต้น สำหรับสายงานด้านเทคโนโลยีสารสนเทศและการสื่อสาร (ไอซีที) เป็นงานที่ต้องมีการกำหนดคุณสมบัติและความเชี่ยวชาญเฉพาะด้านเพื่อตรงกับความต้องการ และเหมาะสมกับหน้าที่ความรับผิดชอบของตำแหน่งงานที่องค์กรระบุไว้ การศึกษาครั้งนี้เป็นการศึกษาถึงความต้องการด้านคุณสมบัติสำหรับสายงานสนับสนุนด้านไอซีทีของภาคธุรกิจเอกชนในประเทศไทย ผลการศึกษาแสดงให้เห็นถึงความต้องการบุคคลเข้ามาปฏิบัติงานด้านไอซีทีที่มีคุณสมบัติตรงกับความต้องการของภาคธุรกิจเอกชนในประเทศไทยในตำแหน่งสายงานสนับสนุน ด้านไอซีที อีกทั้งเพื่อเป็นทิศทางในการพัฒนากรอบทักษะในการปฏิบัติงานของบุคลากรสายงานวิชาชีพสนับสนุนด้านไอซีทีในประเทศไทยต่อไป

**คำสำคัญ:** สายงานสนับสนุนด้านไอซีที คุณสมบัติของสายงานสนับสนุนด้านไอซีที สายงานสนับสนุนด้านไอซีทีสำหรับภาคธุรกิจ เอกชน

### Abstract

Job descriptions have been required when the organizations need to hire people to work in their organizations which define basic qualifications and specialists. In job descriptions, they should compose with level of education, skills, working experience, personality and ingenuity. For information and communication technology (ICT), they also need to define job qualifications and including specialists which must be matched with job descriptions for the positioning in organization's needs. In this study, we studied the needs of job qualifications in IT Support of private business sectors in Thailand. The results in this study showed that the popular ICT business organizations in Thailand have been defined job descriptions and job qualifications by including sub-positions detail. The overall of this study results can create a guideline of ICT support skills framework in Thailand.

**Keywords:** ICT support, Qualification of ICT support, ICT support for private business sectors.

### 1. Introduction

Thailand aimed to enhance concerted and collective cooperation in building of the Information society and to increase the region's connectivity and competitiveness, strengthening on human resource cooperation, in particularly on regional standardization of ICT human capital both skills and competencies. In this study, we aim to study in the elements of ICT support positioning; to study the requirement of job qualifications of ICT support positioning in private business sectors; and to create a guideline of ICT support skills framework.

### 1.1 Demands in private business sectors

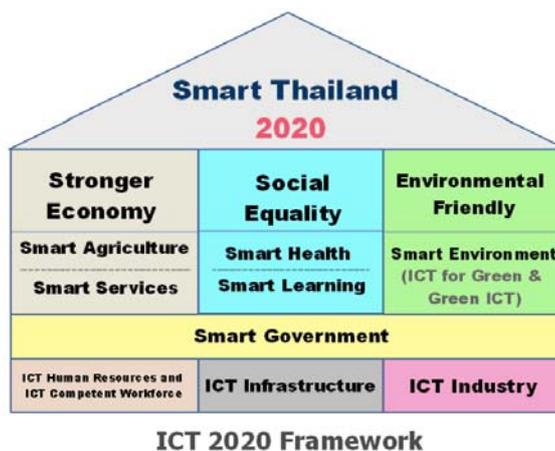
The Thai economy has become steadily more dependent on its export sector – specifically, of manufactured goods. Despite the problem caused by a drop in global demand, Thai exports are expected to generate 80% of GDP by 2030. (ITU, 2010) After suffering a period of political instability and a rash of natural disasters, the Thai economy looks set to recover enough to hit its growth target this year. The Thai labor market has suffered from relatively low increases in productivity and now faces a gradually ageing population. This puts some pressure on Thailand’s economic policy makers, as they seek to transition away from a low-cost manufacturing economic model to a more technology-dependent model that drives up wages. High-skilled labor opportunities are set to increase in the short term. The government has recently given top priority to virtually all high-technology manufacturing, stimulating an increase in demand for engineers, scientists and researchers of various disciplines. (Roberts, 2002) According to the Economist Intelligence Unit, this is likely to put additional pressure on an already tight labor market. Shortfalls of up to 250,000 workers across the board have been reported. This partly reflects the fact that growth in human capital has not managed to keep up with economic growth, but at the graduate level is also due to a skills mismatch. Although only 4% of surveyed employers perceived a shortage of overall graduate numbers, nearly 20% indicated difficulties in filling professional positions. Graduates represent over 90% of individuals searching for jobs for three months or longer. Information and communication technology graduates and engineers, key to expanding high-technology industries, are in particular short supply. A further concern among employers is the lack of required generic and technical skills among applicants, leading to intense competition for the few good candidates. It appears that local universities have problems producing students with the skills required in the job market. (Roberts, 2002) For production area (Business trade and services) relies on ICT to increase efficiency in the working process in term of decreasing production cost and helping create market for products and services. Therefore, the development of ICT users capacity in both manufacturing and business is mandatory (Table1). The public sector has supported and promoted the usage of ICT to strengthen the business. (Partnership on measuring ICT for development, 2011)

**Table 1 Number of employees using computer, internet in establishment; National statistical office**

Economic Activity	No. of establishment using computer	Employees using computer		No. of establishment using Internet	Employees using Internet	
		Number	Average per establishment		Number	Average per establishment
Total	507,447	2,664,335	(5.25)	339,452	1,421,779	(4.19)
Business Trade and Services	417,350	1,740,720	(4.17)	276,192	910,059	(3.30)
Manufacturing	63,311	632,220	(9.99)	41,952	321,542	(7.66)
Construction	11,178	51,649	(4.62)	9,047	36,614	(4.05)
Other Land Transport and Activities of Travel Agencies	14,419	67,918	(4.71)	11,082	45,863	(4.14)
Hospital	1,234	171,827	(139.24)	1,179	107,701	(91.35)

## 1.2 Thailand ICT policy framework

In the long-term ASEAN community level, Thailand has been preparing its way to prepare the country for ASEAN community which knowledgeable and versatile workforce will be required through the Thailand ICT Policy Framework (2001-2010) or IT 2010 and ICT 2020 policy framework aiming to enhance the economy and quality of life of the Thai people and lead Thailand towards a knowledge-based economy and society by using ICT as a driving force for creating knowledge, creativity and innovation in goods and services. (Environment program regional resource centre for Asia and Pacific, 2004)



**Figure 1. Smart Thailand 2020**

In the ICT 2020 policy framework, Thailand foresees for smart development, with a knowledge and wisdom-based economy and society. The “Smart Thailand 2020” vision as illustrated in figure.1 states that ICT is a key driving force in leading Thai people towards knowledge and wisdom and leading society towards equality, stronger economy and environment sustainability. (Environment program regional resource centre for Asia and Pacific, 2004)

## 1.3 ICT skills and competency

“A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context. For example, the ability to communicate effectively is a competency that may draw on an individual’s knowledge of language, practical IT skills and attitudes towards those with whom he or she is communicating”. (Thailand, National statistical office, 2011)

## 1.4 Skills framework for the information age (SFIA)

The skills framework for the information age (SFIA) is a model for describing and managing competencies for ICT professionals for the 21<sup>st</sup> century, and is intended to help match the skills of the workforce to the needs of the business. It maps out the range of skills as a two-dimensional table, by tagging each skill with a category and responsibility level. These categories are divided into six main areas: Strategy and planning; Business change; Solutions development and implementation; Service management; Procurement and management support; and Client interface. While on the second dimension, level of responsibility, there are seven levels, in ascending order: Follow; Assist; Apply; Enable; Ensure and advice; Initiate and influence; and Set strategy, inspire and mobilize. Each of these responsibility levels has a generic description showing the level of autonomy, influence, complexity, and business skills required. (Thanachart, 2013) SFIA’s aim is to provide a management tool to help those who are the definitions provide precise statements of the various levels of

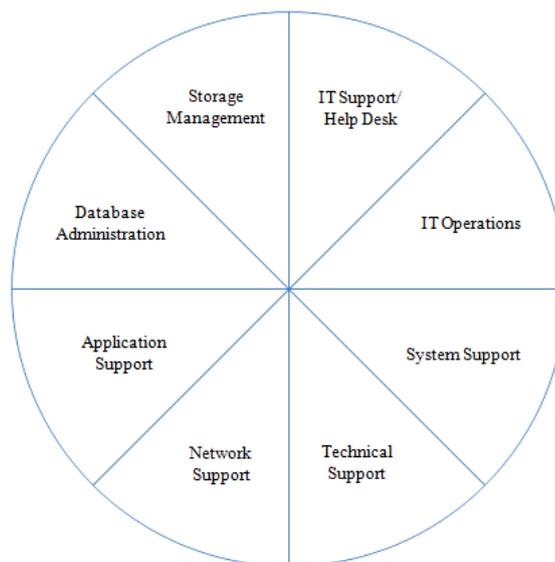
skill required. The IT industry contains a wealth of information, formal and informal, supporting each skill. This covers many complex aspects, processes and methods that may relate to the skill. SFIA's purpose is not to include that information, but to provide a management tool that helps managers make sense of the complexity. SFIA's descriptors are not, in general, described in terms of technologies or products. (OECD, 2013) The major benefits of applying SFIA framework emphasizes on ICT professional can use the SFIA framework to evaluate themselves; the SFIA framework can provide competency and skills standard that use to recruit and define suitable wage; and the SFIA framework can be fulfilled competency and skills gap. Many business organizations have opened many vacancies positioning jobs which define job characteristics, job descriptions and job qualifications. These aspects can be defined what kind of people that organizations need. Also, the organizations can be used job characteristics, job descriptions and job qualifications as a guideline to develop human resource which can help the organizations to have qualify and right people to do their jobs. In Thailand, we have been progressed to set ICT national framework which have been not covered to ICT support careers.

## 2. Methods

We used survey research to assess thoughts, opinions, and feelings of ICT professionals. Questionnaires was conducted and designed based on the secondary data via online web-based jobs. Ten ICT business companies had been selected as representative sampling group. The descriptive statistics were used to analyze the data. Also, content analysis was used to analyze for classification the characteristics of ICT support career.

## 3. Results and Discussion

The results in this study reported that there are eight ICT Support careers in private business sectors have been classified in Thailand, IT support/help desk, IT operations, System support, Technical support, Network support, application support, Database administration, and Storage management (Figure 2).



**Figure 2. ICT support career in Thailand**

From data analysis (Jobstreet.com, JobThai.com, JobTH.com, Jobkk.com and Jobthaiweb.com), we found that job characteristics in ICT support careers for private business sectors are shown on table 2, 3, 4, 5, 6, 7, 8 and 9.

**Table 2. IT support/help desk: ICT support career in Thailand**

<b>Position name:</b> IT support/Help desk		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Provide effective IT assistance across all aspects of the business</li> <li>- Support and maintenance server, Operating systems, PC, Notebook, Device client</li> <li>- Provide exposure to a broad range of IT-related projects and activities</li> <li>- Help to troubleshoot and support application and customizations</li> <li>- Provide report incident and task status everyday</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female <span style="float: right;">- Not over35 years old</span></li> <li>- Have experience 1 – 5 years</li> <li>- Vocational Certificate- Bachelor's Degree in Computer Science or any related field</li> <li>- Certificate: Cisco, ITIL, Microsoft Certified Professional is advantage</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Computer</li> <li>- Operating System</li> <li>- Management and Planning</li> <li>- Network</li> <li>- Database System</li> <li>- Service</li> <li>- Make a report</li> <li>- Technical for solution</li> <li>- Utilization and development</li> </ul>	<ul style="list-style-type: none"> <li>- Good command of English</li> <li>- Computer, Application Software</li> <li>- Network</li> <li>- Operating System</li> <li>- IT Infrastructure</li> <li>- Database System</li> <li>- Analysis and Technical</li> </ul>	<ul style="list-style-type: none"> <li>- Service mind</li> <li>- Teamwork</li> <li>- Good human relation</li> <li>- Perform well under pressure</li> <li>- High sense of responsibility</li> <li>- Willing to learn</li> <li>- Readiness to travel upcountry</li> </ul>

**Table 3. IT operations: ICT support career in Thailand**

<b>Position name:</b> IT operations		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Building, installing, configuring and maintaining Windows</li> <li>- Manage design and support of peripherals and components production environment infrastructures</li> <li>- Interface, design, plan and implementation of enterprise scale new technology and infrastructure</li> <li>- Work closely with development and operational support teams</li> <li>- Maintain audit, procurement and service report</li> <li>- Working with project management office to manage, plan and deliver the service</li> <li>- Support for technical support team</li> <li>- Delivering root cause analysis, Workarounds and solutions for all technical problems</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female <span style="float: right;">- 25 - 30 years old</span></li> <li>- Have experience 0 – 5 years</li> <li>- Vocational Certificate - Bachelor's degree in computer science or any related field</li> <li>- Certificate: Cisco, ITIL, Microsoft Certified Professional is advantage</li> </ul>		

<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Hardware and Software</li> <li>- Network</li> <li>- Operating System</li> <li>- IT infrastructure architecture and components</li> <li>- Security concept</li> <li>- Enterprise peripherals</li> </ul>	<ul style="list-style-type: none"> <li>- Good command of English</li> <li>- Implement of IT Infrastructure</li> <li>- Prioritization process Troubleshooting</li> </ul>	<ul style="list-style-type: none"> <li>- Service mind</li> <li>- Teamwork</li> <li>- Perform well under pressure</li> <li>- High sense of responsibility</li> <li>- Readiness to travel upcountry</li> <li>- Willing to learn for new technology</li> </ul>

**Table 4. System support: ICT support career in Thailand**

<b>Position name: System support</b>		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Oversee day-to-day systems operation ensuring performance is in line</li> <li>- Supporting, Manage and problem solving</li> <li>- Co-operate with teams for service request</li> <li>- Maintain and report system capacity response models and system capacity plans</li> <li>- Develop application testing, system testing concept, and/or software testing methodologies</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female</li> <li>- Not over 30 years old</li> <li>- Have experience 2 – 4 years</li> <li>- Bachelor's Degree or higher in Computer Science or any related field</li> <li>- Certificate: -</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Computer hardware and software</li> <li>- Network</li> <li>- Operating system</li> <li>- Software development life cycle</li> <li>- Standard of CMM, CMMI is a plus</li> <li>- Technical and business</li> <li>- Open source tools</li> </ul>	<ul style="list-style-type: none"> <li>- Good command english, both spoken</li> <li>- Programming</li> <li>- Database system</li> <li>- Operation system</li> <li>- Business</li> <li>- Communication</li> <li>- Problem solving</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded</li> <li>- Good interpersonal</li> <li>- Good presentation</li> <li>- Teamwork</li> <li>- Performance oriented and work well under pressure</li> </ul>

**Table 5. Technical support: ICT support career in Thailand**

<b>Position name: Technical Support</b>
<b>Job description</b>
<ul style="list-style-type: none"> <li>- Responsible for perform and maintenance</li> <li>- Perform equipment and tool maintenance</li> <li>- Support field service engineer</li> <li>- Service equipment as required to ensure proper operating condition at the job site</li> <li>- Support operation team</li> <li>- Provide quality customer service</li> </ul>

<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female <span style="float: right;">- Over 22 years old</span></li> <li>- Have experience least 1 years</li> <li>- Vocational Certificate- Bachelor's Degree in Computer Science or any related field</li> <li>- Certificate: -</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Database system</li> <li>- Network infrastructure</li> <li>- Computer hardware, software</li> </ul>	<ul style="list-style-type: none"> <li>- Good written english, both spoken</li> <li>- Technical for repair PC and notebook</li> <li>- Software and hardware</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded and teamwork</li> <li>- Good interpersonal and good learner</li> <li>- Performance oriented and work well under pressure</li> <li>- Enthusiasm</li> </ul>

**Table 6. Network support: ICT support career in Thailand**

<b>Position name:</b> Network Support		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Perform network refreshment, installation and migration</li> <li>- Implementation, configuration and maintenance system according to standard identify and comply with security guideline related Network</li> <li>- Supporting day-to-day operation incident and change</li> <li>- With pro-active tool, monitor, evaluate (performance, availability and reliability) and suggest for network health status and improvement</li> <li>- Investigating and coordinating with peers/cross team to perform root cause analysis</li> <li>- Collecting history of performance data to produce and suggesting for capacity planning</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female <span style="float: right;">- Not over 30 years old</span></li> <li>- Have experience least 2 – 3 years</li> <li>- Bachelor's degree in computer science or any related field</li> <li>- Certificate in data network for example CCNA, CCNP, CCIE or other will be an advantage</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Network (LAN/WAN)</li> <li>- Networking system,</li> <li>- Network security</li> </ul>	<ul style="list-style-type: none"> <li>- Good command english</li> <li>- Planning and control of equipments and applications</li> <li>- Solve problem</li> <li>- Network security</li> <li>- Business</li> <li>- Data management and analysis</li> <li>- Database management</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded</li> <li>- Good interpersonal</li> <li>- Teamwork</li> <li>- Performance oriented and work well under pressure</li> <li>- Enthusiasm</li> <li>- Good learner</li> </ul>

**Table 7. Application support: ICT support career in Thailand**

<b>Position name:</b> Application support		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Analyze business and requirements for customer and back office system</li> <li>- Develop comprehensive and detailed software requirement specifications together with product management</li> <li>- Analyze requirement specifications to develop technical design documents</li> <li>- Develop well-documented software according to technical designs. Programming guidelines and coding standards</li> <li>- Analyze and implement change requests</li> <li>- Conduct unit and performance tests of the software and ensure a level of quality in line with the customer guidelines</li> <li>- Guide and provide support to team on technology, tools and good coding practices</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female - Not over 28 years old</li> <li>- Have experience 1 – 5 years</li> <li>- Bachelor's degree or higher in computer science or any related field</li> <li>- Certificate about java and database</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Programming</li> <li>- Network</li> <li>- Analysis and problem solving</li> <li>- Computer software</li> <li>- Manage and assign task</li> <li>- Customer service</li> <li>- Technical</li> </ul>	<ul style="list-style-type: none"> <li>- Programming</li> <li>- Network</li> <li>- System analysis</li> <li>- Business process</li> <li>- Computer architecture</li> <li>- Good in English communication both writing and speaking</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded</li> <li>- Good interpersonal</li> <li>- Teamwork</li> <li>- Work well under pressure</li> <li>- Enthusiasm</li> <li>- Good learner</li> <li>- Highly responsible and dependable at work</li> <li>- Fast learner to learn the new things</li> </ul>

**Table 8. Database administration: ICT support career in Thailand**

<b>Position name:</b> Database Administration		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Technical expertise for all database server</li> <li>- Consultant in the reviews, planning, testing and execution of business applications and database upgrades</li> <li>- Advise management on technical application and database issues as related to corporate business rules, practices and changes</li> <li>- Supporting day-to-day operation incident and change</li> <li>- With pro-active tool, monitor, evaluate (performance, availability and reliability) and suggest for system health status and improvement</li> <li>- Investigating and coordinating with peers/cross team to perform root cause analysis and provide a good solution for quick win and long term</li> <li>- Collecting history of performance data to produce and suggesting for performance tuning and capacity planning</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female - 27 - 35 years old</li> <li>- Have experience 2 – 5 years</li> <li>- Bachelor's degree or higher in computer science or any related field</li> </ul>		

- Certificate about database and oracle (OCA/OCP)		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Database system</li> <li>- Business applications</li> <li>- Business management</li> <li>- Technical analysis and design</li> </ul>	<ul style="list-style-type: none"> <li>- Technical</li> <li>- Database system</li> <li>- Presentation</li> <li>- Good command English</li> <li>- People management team</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded</li> <li>- Good interpersonal</li> <li>- Teamwork</li> <li>- Work well under pressure</li> <li>- Enthusiasm</li> <li>- Good learner</li> <li>- Highly responsible and dependable at work</li> <li>- Fast learner to learn the new things</li> </ul>

**Table 9. Storage management: ICT support career in Thailand**

<b>Position name:</b> Storage Management		
<b>Job description</b>		
<ul style="list-style-type: none"> <li>- Execute all testing activities to deliver successful testing solutions</li> <li>- Effective communication and collaboration with other project team member</li> <li>- Maintain smooth operation system roll out and provide system support</li> <li>- Proactively identifying potential problems with detail oriented</li> <li>- Implement new/upgrade existing storage management products environment</li> </ul>		
<b>Qualification</b>		
<ul style="list-style-type: none"> <li>- Male/Female - 22 - 30 years old</li> <li>- Have experience least 2 years</li> <li>- Bachelor's degree or higher in computer science or any related field</li> <li>- Certificate: -</li> </ul>		
<b>Ability of position</b>		
<b>Knowledge</b>	<b>Skills</b>	<b>Behavior/Personality</b>
<ul style="list-style-type: none"> <li>- Database system</li> <li>- Network Infrastructure</li> <li>- Computer hardware, software</li> </ul>	<ul style="list-style-type: none"> <li>- Good command English</li> <li>- Good communication in both Thai and English</li> <li>- Good Time and priority and analytical</li> <li>- Planning and control of equipments and applications</li> <li>- Solve problem</li> <li>- Network Security</li> <li>- Business</li> <li>- Data management and analysis</li> </ul>	<ul style="list-style-type: none"> <li>- Service minded</li> <li>- Good interpersonal</li> <li>- Teamwork</li> <li>- Performance oriented and work well under pressure</li> <li>- Enthusiasm</li> <li>- Good learner</li> </ul>

The results in this study revealed that job characteristics of ICT support career in Thailand should compose with basic personal information such as gender, age, level of education, and working experience in ICT support career. By classifying with positioning jobs, we found that knowledge, skills and personal behavior are necessary to ICT support career in Thailand.

#### 4. Conclusion

The recruitment processes are very important for organizations when the organizations need to hire people to work especially in ICT support career. Job characteristics, job descriptions and job qualifications are necessary that must outline clearly in each positioning jobs. Eight ICT support careers in Thailand have been classified and defined clearly job characteristics, IT support/Help desk, IT operations, System support, Technical support, Network support, Application support, Database administration and Storage management. The private business sectors can use these results to recruit people when job vacancies in organizations; also they can create a standard guideline for ICT nation skills and competencies in the future.

#### 5. References

- Environment Program Regional Resource Centre for Asia and Pacific. 2004. Sustainable Development Priorities for Southeast Asia. United Nations Environment Programme Regional Resource Centre for Asia and the Pacific : Asian Institute of Technology Thailand.
- ITU. 2010. Partnership on Measuring ICT for Development (2010). Core ICT Indicators 2010. Geneva.
- Partnership on Measuring ICT for Development. 2011. The Global Information Society: a Statistical View 2011. UNECLAC. New York.
- Patcharee Minrawong. 2008. Microeconomic variables and fiscal sustainability of Thailand. Rajamangala University of Technology Tawan-ok Research Journal. 1(2) : 58-63.
- Roberts G. 2002. Set for Success: The supply of people with science, technology, engineering and mathematics skills. HMSO : London.
- SFIA Foundation. 2013. Introducing SFIA: The Skills Framework for the Information Age (SFIA) Version 5.0. [Online]. Available: <http://www.sfia-online.org/about-sfia/introducing-sfia/> : 2013. (Accessed : October 2013).
- SFIA Foundation. 2013. IT professional capability: The Capability Mix. [Online]. Available: <http://www.sfia-online.org/about-sfia/skills-and-knowledge/> : 2013. (Accessed: October 2013).
- Thailand National Statistical Office. 2011. ICT Business Survey (of ICT in Establishment Survey). National Statistical Office : Ministry of Information and Communication Technology Thailand.
- Thanachart Numnonda. 2013. ICT 2020. Framework. [Online]. Available: <http://thanachart.org/2013> : 2013. (Accessed: September 2013).
- The definition and selection of key competencies. Executive Summary OECD 2013. [Online]. Available: <http://www.oecd.org/pisa/35070367.pdf> : 2013. (Accessed: October 2013).