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The Development of an Adaptive Model of Competence for the Electronics Industry in Thailand

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ABSTRACT

The purpose of this research was to develop an adaptive model of competency development for the electronics industry in Thailand. The study involved a questionnaire, interviews and observations. Eighty nine individuals completed the questionnaire. Interviews were conducted with 10 managers with high experience in competency development from five renowned companies which practiced competency development. Observation was conducted in the five companies. Our adaptive model consists of the following elements: (1) five electronics competency levels which can be compared to Thailand Vocational Qualification, (2) competencies development, and (3) a training model. The training model was composed of a training program, training module, 4H (head, hands, habits, and health) assessment, as well as monitoring and follow-up. This model is particularly well-suited to the electronics industry in Thailand; however, we suggest that it may be useful in other contexts as well. In countries such as Thailand where there are shortages of specialized labour, models such as ours will play an important role in filling gaps and providing the expertise needed for industry.

Keywords: Adaptive Model/Competency Development/Electronics Industries/Sustainability

INTRODUCTION

The issue of competence is of particular importance and relevance in Thailand and especially in the field of electronics. The electronics field in Thailand is important for economic growth, sustainability and Thai society in general because it yields the highest GDP and the highest expandable export figure. The Thai government has adopted a policy to make Thailand the electronics field centre of Asia by improving policies and rights to promote investment from aboard through Foreign Development Investment Project in 2007 so that Thailand could compete with other countries (Office of Industrial Economics 2007). Since knowledge and technology in the sciences have changed dramatically, personnel in the electronics field must improve their competence and organization. In fact, the Board of Investment (BOI) realized this importance and enacted a policy to promote

competence development entitled “Skills, Technology and Innovation (STI) incentive package” whose objectives were to let electronics companies do research and plan or improve their human resources.

In this era of globalization, the development of competence is crucial to human resource development and to quality assurance, not only in Thailand, but around the world. According to Linton and Walsh (2000), the effective management, acquisition and development of technological competence is a subject of widespread concern. In fact, the industrial organization of developing countries such as Europe and Australia will increasingly concentrate on the competency of quality and standards of their employees (Australian National Training Authority 1996 & Stewart and Winter 1995). The quality and standards of competency can be applied as a basis for job descriptions, assessment and reward, a benchmark to development, to identify training needs and to develop training programs (Office of standard for vocational and professional 2005).

The word “competence” comes from Latin which is “competere” which means aptitude, expertise, experiences, and other characteristics of competence in performing an activity or in participating in a specific matter (Giraldo & Acuńa 2005). In addition, competence has acquired new meaning in psychological and educational settings and relates to three aspects: 1) achievement, 2) proficiency, and 3) knowledge of a particular domain. However, none of the three concepts is a competence; the competence emerges as a unity when the concepts are joined in a particular action (Tobón 2004).
According to ISO 9000:2000, competence can be defined as a demonstrated ability to apply knowledge and skills (Blank 1982) and, as Lloyd and Cook (1993) argue, competence is the ability to perform activities to the level expected within employment. Janwongpaisan (2006) also defined it as “Skills, knowledge and attribute of a person essential to their work and to their work achievement.”

White and McClelland (Janwongpaisan 2006) were the first to propose the idea of competence in journals related to human resource development, explaining the relationship of excellent performer and the level of knowledge, skills, and abilities to the world.

In spite of the importance of competency development particularly for Thailand and for the electronics industry, we do not have any models for competency development in this country.

OBJECTIVES OF THE STUDY

The objective of the study reported in this paper was to create an innovative and adaptive model of competency development for electronics industries in Thailand. We have chosen electronics as a case; however, competency is important in all industries and especially in developing countries such as Thailand.

OUTCOMES OF THE STUDY

The results of this study will be of use to trainers who can apply the results of this study to the development of learning innovation appropriate for organizations concerned with competence development. They can apply the model for quality competence development of learning innovation in their organizations; for example, using a system for competence development and promotion. The data in the system would provide trainers with information to give suitable training to fill staff’s competence gap which is an obstacle in their career path. Organizations and/or relevant institutes can apply the results of this study to the establishment of policy in order to develop, train, and/or evaluate staff’s competence. These types of policies may increase staff’s attitude towards career and collaboration in organizations.

THEORETICAL FRAMEWORK

Competency

Competence and competency (Rowe 1995) and (McGettrick, May & Ward 2000) are likely to be used interchangeably. However, in terms of application, it seems that competence is mainly about skill and standard of performance. Competence focuses on "what people can do." In contrast, competency focuses on "how they do it." Therefore, the relationship or the interface between these two words when the word 'competent' is used to describe a behaviour can be seen in Figure 1 (Rowe 1995).

Competency		**Competence**
Behavior-based	←	Skill-based
Manner of behaviour		Standard attained
How the standard is achieved	→	What is measured

Figure 1: The interface between competency and competence

According to Figure 1, in order to have competency, entrepreneurs have to do what we may call 'trial and error' during their apprenticeship. In other words, they learn by themselves until they can attain modern standards. Competency is normally skill-based. Entrepreneurs apprentice to gain skills which are measured at a later time. Following the measurement, such skills are defined as standard. The skills are then considered permanent or part of the competency. The standard is achieved so that we know what is to be measured.

Figure 2 (Young 2002) links competence and competency to performance. Competence is what a person is required to do. These are job activities or functions and tasks. Competency consists of what a person is like (personal characteristics) and what they can do (behaviour). Both competence and competency are required to achieve what a person must accomplish, that is to say, job performance.

This means that behaviour and skill are not enough to have effective performance. A person needs to possess personal characteristics which are composed of motive, trait, image/role and knowledge.

Different personal characteristics, therefore, affect the behaviour and skills of such person through their performance. In order to achieve high performance, we need to measure two competencies which are core competencies and soft or 'technical' competencies. The concise description of competence, competency and performance is shown in Figure 2.

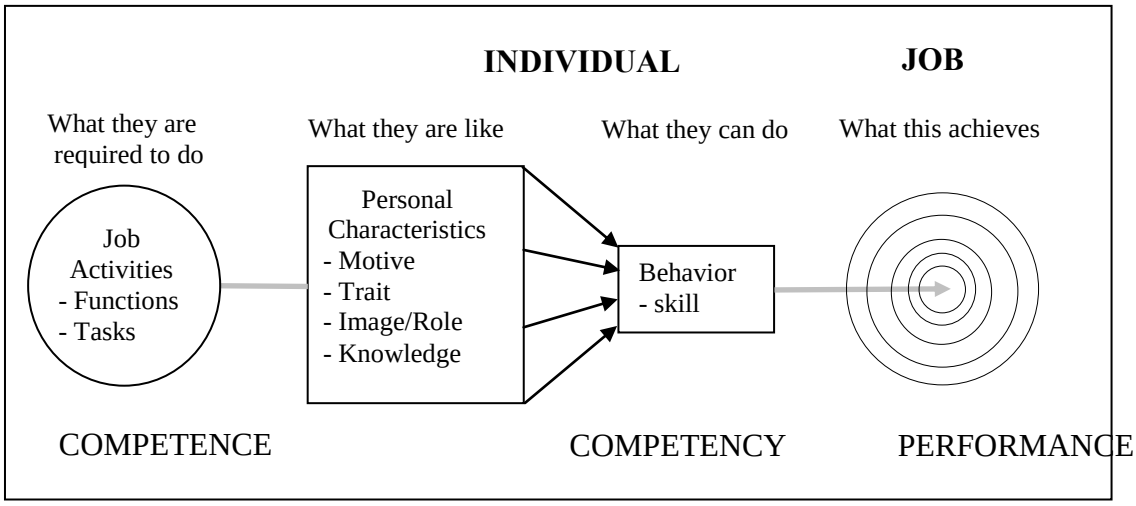

Figure 2: Linking competence and competency to performance

Plonka, Hillman, Clarke, and Taraman (1994) revealed that there are four core competencies as follows: (1) know oneself and work with others, (2) design, build, and run high value-added manufacturing systems, (3) solve unstructured problems, and (4) lead change. Ng, Chan and Wong (2006) classified main competency into three levels based on and Engineering Competency Development (ECD's framework, 2006): basic, intermediate and advanced. McGettrick, May and Ward (2000) also classified competencies into three levels: supervised practitioner, practitioner, and expert.

Moreover, competencies must: (1) be attractive, challenging, and rewarding to employees (2) guide and assist managers to add value and to help them assemble teams to work on projects, and (3) lead to the development of better employees. The Instituto Nacional de Empleo de España (INEM) (as cited by Serpell & Ferrada 2007) explains that "professional competencies define the effective use of skills that allow work to be performed with regard to the levels required by the job." Serpell and Ferrada (2007) define 'core competencies' as (1) basic competencies as entry attributes, this is, the knowledge, abilities and attitude of a person upon joining an organization; (2) organizational competencies as those that are directly related to the value, policies, and culture of the organization; and (3) labour function competencies as a mixture of knowledge, abilities and psycho-social behaviours, both technical and generic to the function in question. The summary of core competencies as defined in all four studies is shown in Table 1.

Table 1: A summary of core competencies

Plonka, Hillman, Clarke and Taraman (1994)	**Ng, Chan and Wong (2006)**	**McGettrick, May and Ward (2000)**	**Serpell and Ferrada (2007)**
1) know self & work with others	Basic	1) attractive, challenging and rewarding to employees	1) basic competencies as entry attributes, this is, the knowledge, abilities and attitude of a person upon joining an organization

2) design, build and run high value-added manufacturing systems	Intermediate	2) guiding and assisting managers to add value and to help them assemble terms to work on projects	2) organizational competencies as those that are directly related to the value, policies and culture of the organization
3) solve unstructured problems 4) lead change	Advanced	3) leading to the development of better employees to address this area	3) labour function competencies as a mixture of knowledge, abilities and psycho-social behaviours, both technical and generic to the function in question

Besides core competencies, there are also technical competencies which we may call as soft competencies. Technical competencies (Hlaoittinun, Bonjour & Dulmet 2007) are attributes which specify the characteristics of tasks and team members. Moreover, competencies of a person will increase during their work on the assignments and will decrease with time. Therefore, it is suggested that assigning tasks is a good indicator of increasing competency development of such person.

Boucher, Bonjour, and Grabot (2007) posit that competencies can be seen in three different forms which are static, functional and evolutionary. Hlaoittinun, Bonjour and Dulmet (2007) explain that the mechanisms of competency mobilization in the context of work is to make the best use of available competencies. They also discuss how to measure a compatibility indicator. They found that the difference between positive gap and negative gap can be used to identify the level of competency. If there are more results in the positive gap, this shows a level of over competency. In contrast, more occurrences in the negative gap reveal a level of under competency.

Woodruffe (as cited by Serpell & Ferrada 2007) observed that competencies will become common language and there will be differences in the limitation of competency. That is to say, skill is mainly about 'a role or job-related concept' whereas competency is mainly about 'a person-related concept' which can describe behaviours necessary to accomplish tasks or functions of the job. In terms of proficiency, Mertens (as cited by Serpell & Ferrada 2007) found that competency-based management has been used in developed countries as well as many developing countries.

Linton and Walsh (1999) noted that learning techniques to achieve competencies is important. Technology plays an important role in shaping the relationship between related subjects in order to achieve competencies. This helps the acquisition of technical competencies.

Antonacopoulou and Fitzgerald (1996) found that competency management is like a framework to be referenced. There can be inputs for organizations and outputs in the form of performances. The performance is evaluated based on the criteria. The competency management can also be used in recruitment and selection, training and development, changing the personnel, changing the structure, giving rewards and benefits. Alles (2000) observed that a competency framework is considered as the main resource to add value to the personnel. Serpell and Ferrada (2007) observed that a competency approach can be used as a framework to develop systematic training which is beneficial to the personnel.

Andreou and Bontis (2007) and Adonis and Drira (2007) posit that human capital, structural capital, and customer capital are all factors which can be used in strategies to specify the limitation of competence of such organization so that the same objectives of the strategy are attained.

RESEARCH METHODOLOGY

Procedures

In the first phase, we sent out one questionnaire to the manager of each of 319 small, medium and large electronics companies in Bangkok and suburban areas of Thailand in April, 2006. We asked in the letter that the questionnaire be completed by those dealing with competency development in the organization. We received 89 responses. From these 89, we selected five companies with which to conduct the semi-structured interviews as well as observations. We conducted interviews with two individuals in each company. One was a senior manager and one a factory manager.

Questionnaire

We began with the choice of a questionnaire. The questionnaire was taken from the European Centre for Development of Vocational Training (Cedefop 2006). We translated the questionnaire into the Thai language. There were 105 items. We validated the content of the questionnaire using five Thai experts with English as a second language. The first part of the questionnaire included demographic information (i.e. position in the company, gender, etc.). Part II asked respondents to provide information about the company itself (i.e. its products and size, etc.). Part III included five sections as follows: (1) competence management, (2) the use of competence (level), (3) personnel categories involved, (4) policy levels of competence, and (5) competence development needs.

Interview protocol

We adapted a semi-structured interview protocol from the European Centre for the Development of Vocational Training (Cedefop 2006), which includes four main items as follows: (1) Companies' policy for competence development in organizations, (2) Companies' qualification requirements, (3) Training description and model, and (4) Assessment system. The interviews typically lasted two to three hours per person. The purpose of the interviews was to gather more in-depth information.

Observation

In addition to the questionnaires and interviews, we conducted observations lasting three to four hours in five of the companies. These companies had over 200 employees. The observations were also semi-structured and used the same protocol as the interviews. The purpose of the observations was to gain a more holistic insight into competency management in the company.

Analysis of Data

The questionnaire data were analysed using frequency, percentage, mean and standard deviation. The interviews and observation data were analysed using content analysis. We aggregated the data from these sources and grouped them into the four categories. We reduced the data in cases where there were similarities. We used keyword analysis (Miles & Huberman 1994). We then constructed a matrix table to compare across companies.

RESULTS OF THE STUDY

Based on the analysis of our data, we first identified eight dimensions of competency development in electronics companies as follows: Policy; training models; learning activities; target group of trainees; scope of the training course contents; training steps; evaluation and follow-up; application of the

evaluation. Next, we developed our adaptive model of competency development from our data and according to the concept of workplace learning model by Smith, Robertson and Wakefield (2002) and by Sadler-Smith, Down and Lean (2000) who argue that "the enhancement of working in organization …begins at the stage of needs assessment in developing the organization and the needs of each person." Choosing the training method and media affect this model and also depends on the attributes, styles and preferences of trainees. The limitations of the organization might be resources, time and facilities. Our model is comprised of five electronics competency levels as follows:

- Level 1: operation/semi-skilled
- Level 2: semi-skilled/specialized skilled craftsman
- Level 3: craftsman/supervisor
- Level 4: technical management/management/professional
- Level 5: careers appraised by professional society/administrator level/specialist/senior.

These five levels were benchmarked and compared against the National Vocational Qualification or Thailand Vocational Qualification (NVQ/TVQ) framework (Bureau of Vocational Education Standard and Qualification 2005). The NVQ/TVQ lists seven standards for vocational education. Our levels corresponded for level 5 to TVQ standards 1-5. Levels 6 and 7 correspond to Ph.D and graduate levels. The NVQ/TVQ includes three types of competencies. The first of these, the core competencies, include knowledge, skills and working habits or behaviours. The second, professional competencies, relates to the management and administration competencies. The functionality concerns the roles and duties.

The new model includes a training system suitable for electronic engineers or technicians. The training system includes three parts: a training model, a training module, and 4H assessment. The training system should be dynamic, so the Evaluate Monitor Follow-up approach was employed to evaluate, monitor, and follow-up the training process. The training models might include flexible delivery, blended, team and collaborative learning. Assessment includes a ranking to determine if the individual is in level 1,2,3,4 or 5. Next, it must be determined if the individual meets the standards. If they do or do not meet the standards, they can be demoted or upgraded a level or remain at the same level. The 4H means that the assessment must relate to the heart (motivations and personal traits), head (knowledge and cognitive skills), hand (practical skills) and health (hygiene and safety).

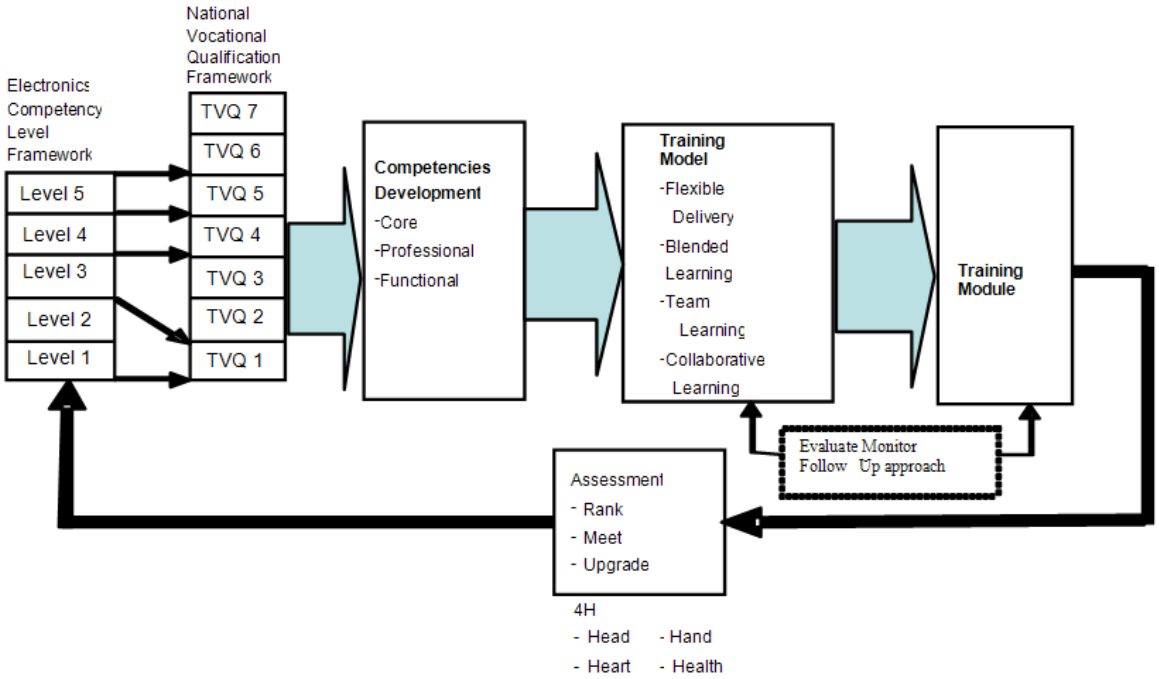

Figure 3: *Adaptive model of competency development for the electronics industry in Thailand*

DISCUSSION AND CONCLUSIONS

The purpose of this research was to develop an adaptive model of competency development for the electronics industry in Thailand. The study involved a questionnaire, interviews and observations. Eighty-nine individuals completed the questionnaire. Interviews were conducted with 10 managers with high experience in competency development from five renowned companies which practiced competency development. Observation was conducted in the five companies. Our adaptive model consists of the following elements: (1) five electronics' competency levels which can be compared to Thailand Vocational Qualification, (2) competencies development, and (3) a training model. The training model consisted of training program, training module, 4H (head, hands, habits, and health) assessment, as well as monitoring and follow-up.

Presently, in Thailand, an individual at level 2 cannot upgrade to a higher level. The use of this model would provide an approach for allowing individuals to move across levels. For example, a craftsman could move to a position of craftsman supervisor. This model is particularly well-suited to the electronics industry in Thailand, however; we suggest that it may be useful in other contexts as well. In countries such as Thailand where there are shortages of specialized labour, models such as ours will play an important role in filling gaps and providing the expertise needed for industry.

In order for the training to be successful, it must allow flexible delivery. Flexible delivery is well-suited to improving personnel competence in organizations. Smith (2003) outlines the advantages of resource-based flexible training as follows. It "(1) provides opportunities for learning on an individual basis, (2) enables learning that is sustainable within shift and production schedules, and (3) minimizes the need for expensive one-to-one instruction and demonstration from a more expert trainer." Flexible delivery means an advantage in preparing and assessment in the way that learners need not appear at a fixed location or time. Materials used for learning could be varied and are supposed to accommodate the issues of when, where, how, and what learners learn. Payne, Ball and Snow (2000) explain that flexible delivery is different from interaction between instructors and learners in that flexible delivery have options in terms of time and place. However, learners in flexible delivery systems need to be more responsible for their own learning.

This study was limited to participation by a small group of managers. Results may have been different if we had worked with a larger group. Also our response rate was low in comparison to the number of questionnaires sent out. Those who responded may have different or specialized views about competency development. Our study was limited to the electronics industry and only focused on the Thai context. Others may wish to apply the model in their context to test its relevance.

Issues for further in-depth study might include a comparison of the impact from various strategies such as flexible delivery strategy, training outcome strategy and/or the learning content strategy in the electronics industry in order to create future effective competency models. Trainers can apply the results of this study to the development of learning innovation appropriate for organizations concerned with competence development. They can apply the model for quality competence development of learning innovation in their organizations; for example, in systems for competence development and promotion. Organizations and/or relevant institutes can apply the results of this study to the establishment of policy in order to develop, train, and/or evaluate staff's competence.

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ACS Accreditation: What's in the name?

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ABSTRACT

In Australia, all higher education Information and Communications Technology (ICT) programs seek accreditation at the professional level with the Australian Computer Society (ACS). It acts as the basis for national and international benchmarking of ICT professional education. Additionally, meeting the requirements of an independent professional body is vital for onshore and offshore course marketing purposes, hence contributing towards the University's performance portfolio.

The overriding task of the ACS accreditation is to examine all aspects in the provision of a quality ICT education program designed to produce competent graduates. To this end, the ACS seeks evidence that comprehensively covers the three main aspects of accreditation assessment: the structure and content of curricula; the resources of the teaching and learning environments; and the quality assurance processes in place at the applying University.

This paper describes the recent ACS accreditation of Victoria University computing courses: the accreditation process, the preparation for the accreditation, the visit of the accreditation panel and their feedback. The paper reports on the local response and the process of addressing the panel recommendations which posed a number of local challenges. An insight into issues of importance in the execution of the recommendations is discussed as the ACS accreditation informs the framework for future course reviews.

INTRODUCTION

Acquiring a recognized professional body accreditation is pivotal for all quality, technically-based, academic programs. In particular, such endorsement is vital as a quality assurance measure for courses which have a major component of Information and Communications Technology (ICT) content. It acts as the basis of national and international benchmarking of ICT professional education and it shapes the curricula (Harman & Meek, 2000, p. 3; Collings et al., 2005). Internationally, these professional organizations include the Association for Computing Machinery (ACM), the Accreditation Board for Engineering and Technology (ABET), the Institute for Certification of Computing Professionals (ICCP) and the Institute of Electrical and Electronics Engineers (IEEE) (ACM, 2007; ABET, 2007; ICCP, 2007; IEEE, 2007).

In Australia, higher education is an important export industry, with large cohorts of offshore and onshore international students (Harman & Meek, 2000, p. 33). The endorsement of a professional accreditation ensures international credibility and it enhances the marketability of academic programs (ACS, 2003; Jones & Price, 2002; Tan & Venables, 2007; Ramakrishnan, 2007). The Australian Computer Society (ACS) is the professional body responsible for the assessment of all higher education ICT courses accreditation ensuring that their programs are of an 'industrial strength'.

Founded in 1966, the ACS provides the public voice of Australian ICT businesses and professionals. The association attracts membership from all sectors of business, industry, government and academia. Its objectives are 'to further the study, science and application of Information Technology; promote, develop and monitor competence in the practice of ICT by people and organisations; maintain and