# Instructional Design for the Development of Career Professional Competencies of Industrial Technology Education in Thailand

**Weerayute Sudsomboon**[1] *(weerayute.sud@kmutt.ac.th)*
**Sittichai Kaewkuekool**[2] *(sittichai.kae@kmutt.ac.th)*
**Tanaporn Maungmungkun**[3] *(tanapornmm@hotmail.com)*
**Tanyaluck MacLean**[3]
**Tanuttha Kornpitack**[4] *(tnuttha@uru.ac.th)*

## Abstract

This paper reviews recent research on the career professional competencies to enhance undergraduate industrial technology education in Thailand, mostly in the diversity of instructional innovation within students' professional development. The discussion is addressed a conceptual model of learning outcomes, comprising learning activities, and personal professional factors. An innovative instructional design is conceived as a coherent whole of learning activities that learner usually achievement, their beliefs about career competencies and their learning motivation; therefore, a whole that is attribute of them in the excellence on social-demand. Implications are provided and identified some crucial aspects of learning are discussed. It is summarized that teachers explore into the quality of learning and professional development in the diversity of educational and social change.

**Keywords:** *Career professional competencies, Epistemology, Instructional design, Professional learning*

## 1. Introduction

In recent years, the role of career professional competencies on higher education with industrial technology education (ITE) has been more and more focused on. With the rapid changes of technological and social conditions, an important aim of ITE is facilitating the students professional competencies—flexible or adaptive—competencies that could be applied in industry demands (Association for Career and Technical Education, 2010; Office of the Education Council, 2009). The main points of a set of the professional knowledge worker in this paper is guide to play an instruction leading in ITE, which the level of industries demands will complete to competition between knowledge and technology (Chiva & Alegre, 2009; Molleman & Van den Beukel, 2007). As a result, the instruction leading in ITE to narrowly focused routine expertise could become inconsistent with the needs of industries demands, which requires flexible abilities to learn in competency conditions and adapt to technological innovations (Sudsomboon & Anmanatrakul, 2010).

In modern economy, the flexible or adaptive expert's performance as an important required well-developed cognitive skills that are based on an organized high-level knowledge base and

[1] *Lecturer, Department of Mechanical Technology Education, Faculty of Industrial Education and Technology, King Mongkut's University of Technology Thonburi, THAILAND, 126 Pracha Uthit Rd., Bang Mod, Thung Khru, Bangkok 10140.*
[2] *Associate Professor, Department of Production Technology Education,Faculty of Industrial Education and Technology, King Mongkut's University of Technology Thonburi, THAILAND*
[3] *Lecturer, Faculty of Industrial Technology, Nakhon Si Thammarat Rajaphat University, THAILAND, 1 Moo 4, Thahiew, Maung, Nakhon Si Thammarat 80280*
[4] *Lecturer, Faculty of Industrial Technology, Uttaradit Rajaphat University, THAILAND, 27 Injaimee Rd., Maung, Uttaradit 53000.*

metacognitive skills for new graduates' ability (Barrtman, Bastiens, Kirschner, & Van Der Vleuten, 2007). However, the processing in Thai settings lacks of cognitive instructional designer represent a significant factor influencing the effectiveness of learning flexible competencies. Much research has been conducted in recent years on the acquisition of partially or fully automated cognitive skills and knowledge structures allows on cognitive resources for achieving higher-levels of knowledge flexibility and competencies could be integrated (Chiva & Alegre, 2009).

As a result of knowing that it is impossible to construct this idea based on the individual and/or social demands, generated with the result of designers that "as the vocational and technological education system multiplies choices, and in a social demands system the consequences choices become ever more important than the learning achievement or outputs" (Office of the Education Council, 2009). Designers must be selected regardless gather information and transform this information through develop the career competencies model into flexible high-level cognitive skills to guide into competency in ITE context. Hence, the integrate focus on the development of an instructional design for the ITE curriculum. The outcomes pursuits integrating intelligent cognitive tutors with competency could be an effective instructional approach.

The aim of this paper is to address a conceptual model of learning outcomes, comprising learning activities, and personal professional factors. Authors intend to provide insights into the important and current concern of future undergraduate ITE career professional competencies. While there is significant perspective as to the realistic nature and extent of undergraduates' competencies, empirical evidence recommends that the industry sectors to be concerned about new graduates' ability to meet current and future workplace requirements.

Authors present our ideas in the following three sections. First, the theoretical background is to propose the idea context. Second, authors generate a detail and model including design and implementation within the context of 4-year ITE of Faculty of Industrial Education and Technology (FIET) at King Mongkut's University of Technology Thonburi (KMUTT). Third, authors discuss state findings and conclude the paper with recommendations for future research and curriculum development.

## 2. Theoretical Background

### *2.1 The Learning Outcomes of ITE Graduate Competencies*

The FIET at KMUTT develop to face growing agenda for professionalism and integrity, which affect to external factors (e.g., higher global competition, customer needs, social demands, etc) and internal factors (e.g., quality management initiatives, educational assurance efforts, Thai Qualifications Framework (TQF), etc). These pressures have effected to a think loud and search a new approach in innovation efforts on learning outcomes, such as knowledge and competencies (Moskal, Taylor, & Keon, 2008). As well as, this idea consequences the European Qualifications Framework (EQF) have focused on learning outcomes are stated "statements of what a leaner knows, understands and is able to do on completion of a learning process" (European Commission, 2006; as cited in Cedefop, 2008, p. 15).

Competency is the awesome educational system that emphasis on learning outcomes specific insight industrial technology education at FIET, KMUTT. Instructional design in competency-based education as well as career professional competency is a model that is a used as a guide for developing and evaluating effective methods of instruction (Sudsomboon, Wongrod, & Injun, 2009). However, competency focuses on learning outcomes, which reflects to support specific educational programmes fit into social and technological movement redefining the role of higher education institutions. It changes from the traditional notion of 'autonomous entities' and towards a 'social demands' model.

ITE students' uses the purposeful application of mathematical, sciences, engineering technology as a framework of engineering knowledge, technology and techniques. Industrial technology seeks to produce inventions whose effects are prepared to the great demand possible in often uncertain contexts. While bringing benefits, ITE activity has potential adverse consequences; therefore, carried out actually performance and technical training instructors, use available resources efficiently, be economic, safeguard health and safety, be environmentally sound and sustainable and generally manage risks throughout the entire workplace professional skills.

*2.2 The Development of ITE Comprising Learning Activities*

The development of ITE comprising learning activities is an ongoing process with important identified 2 stages. First, the attainment is an *accredited technological areas*, the gainful skills aspect. The fundamental purpose of *engineering education* is to build a knowledge base and attributes to enable the graduate to continue learning and to proceed to formative development that will develop the competencies required for independent practice (Kagaari & Munene, 2007). Second, following after a period of formative development, is *professional practicum*.

The fundamental purpose of cognitive skills development is to construct on the educational base to develop the competencies required for independent practice in which the graduate works with engineering/technologist practitioners and professional from an assisting role to taking more individual and team responsibility until competence can be demonstrated at the level required. Once allowed, the practitioner must maintain and expand competence.

Mason, Williams, and Cramer (2009) found that the attributes of accord programmes are defined as *professional competencies profile*, an indicated volume of learning and the attributes against which graduates must be able to perform with learning activities. The requirements are stated without reference to the design of programmes that would achieve the requirements (Yorke & Knight, 2007). Washer (2007) stated to design programmes with different detailed structure, learning pathways and modes of delivery providers therefore have freedom. Thus, evaluation of individual programmes is the concern of career professional competencies instructional design.

*2.3 Professional Competencies as Personal Professional Factors*

To generate an innovation instructional design, a know base in technical-term allows multidisciplinary sciences of information to be categorized as a single higher-level unit, which drives the both cognitive and competency processes by rapidly applying workplace situations and retrieving appropriate strategies and procedures (Bailey, Hughes, & Moore, 2004). In order to enhance acquisition of flexible high-level cognitive skills, competencies improve personal professional factors with career professional realistic and instruction needs to indeed doubts about the motivation and the level of knowledge and skills.

Koul, Clariana, Kongsuwan, & Suji-Vorakul (2009) argued that professional competencies as a thinking shape of the way professional acquire, structure, or process information, and approach learning. They managed of two procedural call *'separate way of knowing'* and '*connected ways of knowing*'. The 'separate way of knowing' stresses the merits and inherent value of knowledge validated through formal logical argumentation. The 'connected ways of knowing' stresses the value of empathy to understand the socially connected nature of knowledge. Hence, the flexible higher-levels of knowledge flexibility is structured formal logical in accredited technological areas and engineering education (Chiva & Alegre, 2009).

When put it all together, the factor are defined as an *innovation instructional design*, an indicated volume of learning outcomes and the attributes against which graduates must be able to perform. The requirements are stated with renovate to the design of curriculums that would achieve the different detailed structure, learning pathways and modes of delivery. Evaluation of individual programmes is the concern of effective instructional system.

## 3. A Career Professional Competencies Model of Industrial Technology Education

Instructional design is based, in part, on systematic approach (Katz & Kahn, 1978). A systematic approach receives *inputs* from the environment, *processes* them through operations within the system, submits *outputs* to the environment, and receives *feedback* indicating how well these functions are carried out. To consider, any system must gain advantages from its transactions with the environment. Inputs include raw materials, people, capital, and information. Processes are activities occurring within the organization that add value to raw materials. Outputs are services or finished goods released into the environment by the organization.

Figure 1 illustrates these basic components of an systematic approach. First, they are dependent on the external environment for essential inputs and reception of their outputs. Second, there is a pattern to the flow of inputs and outputs. Third, all but the simplest open systems are composed of subsystems and interact with environmental.

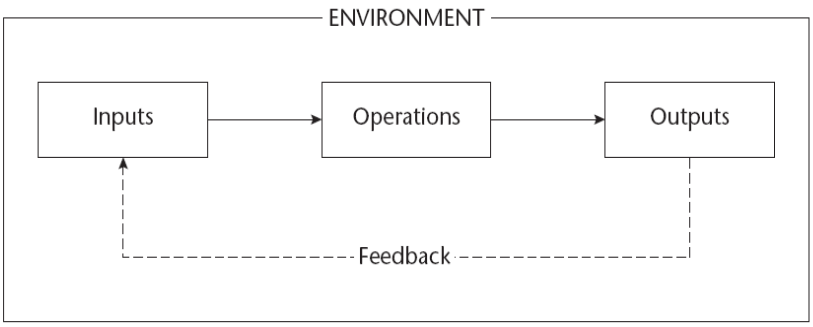


**Figure 1**. A systematic approach model (Katz & Kahn, 1978)

In Figure 2, authors have identified three transformation categories of design that can be used a suitable model. Those categories are input, process, and output. It proposed that the central is a process that provides a measure "of students" competencies and competitiveness in knowledge, skills, and attitudes during and after students in curriculums.

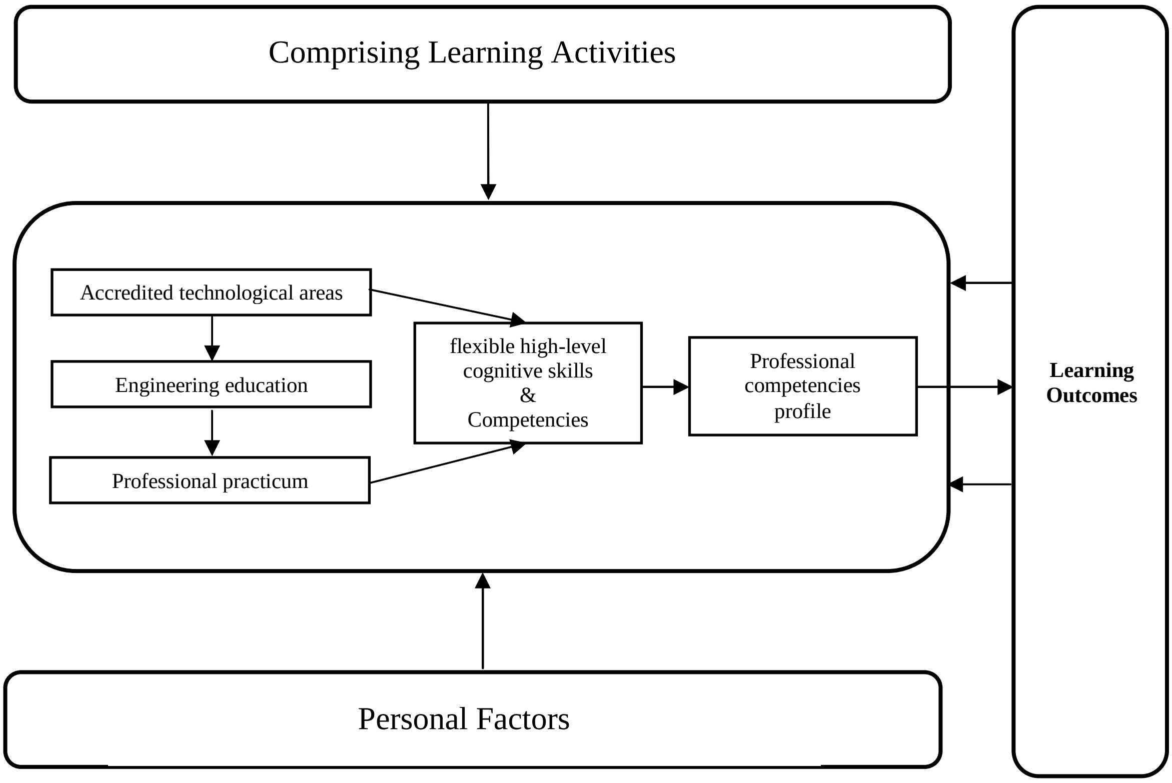


**Figure 2**. A career professional competencies model of industrial technology education

The central of a model is formed by the professional competencies profile employ about CPC in the ITE context. These professional competencies profile are initiates by flexible high-level cognitive skills and competencies, which are in turn influenced by students' accredited technological areas, engineering education, and professional practicum about their own learning. These five categories, especially their interrelationships, together constitute an innovations instructional design. The professional competencies profile employ influence the learning outcomes that they attain, and these learning outcomes form input for new learning processes (Yorke & Knight, 2007; Washer, 2007). A model is influenced by comprising learning activities and personal factors.

## 4. Discussion

In the career professional competencies model showed in this paper, the majority of the ideas were drawn from professional knowledge workers scenarios that the students could engage to in their learning practice. However, authors mentioned that the critics of the application of a model to apply only would argue that the concepts emerges rapidly in an integrated flexible high-level cognitive skills and competencies. Therefore, how to promote hybrid programmes should attempted. The designers would apply to perform successfully. Instructional designers sometimes assume, mistakenly, that their role is to “offer job-oriented instruction” (Kagaari & Munene, 2007; Molleman & Van den Beukel, 2007).

In fact, students performance problems cannot always be solved by instruction. Instruction should only be used when the performance problems from a lack of knowledge or skills or the wrong attitudes and when instruction is the most cost-effective solution. Since authors will adapt the terms *knowledge, skills,* and *attitudes* throughout a new approach, provides some definitions are in order at this point. *Knowledge* is simply "what the student knows. It is important in terms of education because students usually perform better if they understand what they are doing and why. *Skills* involve the abilities to do something—such as operate a machine. "Skills imply actions; others can observe them". The term *attitudes* denotes how students feel about what they do and how they express on their learning environment. Instructional designers "generally accept that how students gain beneficial about what they are learning and the institutions for which they are working has similarity as well as workplace situations on their competencies" (Sudsomboon, 2010).

As work becomes more focused on making decisions, processing information, and attitudes—traditionally neglected by instructional designers in favor of knowledge and skills—are becoming more important in the mix of what leads to effective performance (Rothwell & Lindholm, 1999). The career professional competencies can be described using a set of attributes corresponding largely to the graduate attributes, but with different emphases. For instance, the learning outcomes, the ability to learn as a process is essential. Unlike the graduate attributes, career professional competencies is more than a set of professional knowledge worker that can be demonstrated individually. Rather, competencies must be assessed holistically.

Moreover, the professional competencies profiles are written for each of the three categories: engineer, engineering technologist and engineering technician (U.S. Department of Education, 2001) at the point of accomplishment. Sudsomboon (2007) found that the professional competencies profile is vital like their counterparts in the graduate attributes, the range statements use the notions of complex engineering problems, broadly-defined engineering problems and well-defined engineering problems defined. At the professional knowledge worker, a classification of technologist activities is used to define ranges and to distinguish between categories (Rothwell & Lindholm, 1999).

Pros of a career professional competencies model of ITE may be utilized by the following:

1. Identify and analyze design/ planning requirement and draw up detailed requirements specification in ITE curriculum.
2. Synthesize a range of students potential to guide a approach for constructing the project execution.
3. Evaluate the potential approaches against requirements and impacts outside requirements.
4. Fully develop design of selected learning environment.
5. Produce design learning materials for implementation.

## 5. Conclusion

This paper argued that an innovation instructional design to facilitate students in the industrial technology education for Thai setting. Authors have analyzed current of examples from the social-demands to reflect strategies that have potentially to develop career professional competencies. However, the literature reviewed established that while the model is not covered into instructional system development. This paper is a prototype of developing the professionalism of undergraduate industrial technology education. The finding required stakeholders to engage with the progress. Students were encouraged to learn different learning environment in these considerations in order to make these ideas.

In particular, the review revealed a limitation of evidence implementing the career professional competencies model as a strategy in order to support with the design curriculum process. This paper took an initial and small step in exploring how this may be generated and implemented, but our findings are preliminary, and further research is needed to provide better insight in this research area.

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