論　文　要　旨
Thesis Abstract

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主論文題名　（Title）

Surveys and analyses of professional engineering competencies for education fit for the future

内容の要旨　（Abstract）

The rapid advances in a range of technology, globalization, the fourth industrial revolution, employability, and sustainability, are the major challenges for engineering education. These challenges will require new types of engineering programs, to help students develop skills in cross-disciplinarily, complexity, and contextual understanding. Future engineering students should be able to understand the needs for technological solutions in context, with sustainable solutions, be able to act in complex situations with the appropriate skills and competencies.

Professional competencies are growing critical, particularly in engineering education, due to constant progress in multidisciplinary and globalization. The need to include professional competencies in the engineering curriculum is currently a challenge for curriculum designers. The universities should adjust the educational goals of undergraduate programs to address some of the professional competencies, including using PBL and co-curricular and extracurricular activities or utilizing dedicated courses with the belief that specific courses on professional competencies may help students improve their required competencies for their future career.

Universities have faced challenges in preparing students who are competitive both in the domestic and global labor markets. This places new demands on the context, structure, and content of curriculums and educational materials and the need to explore various aspects of the social dimension and sustainability. Second, as the labor market needs ever more specific technical skills, but it is also increasingly becoming in need of professional skills. The development of professional skills in higher education students can be considered a key factor to ensure an effective transition from higher education into the labor market.

However, engineering education around the world is confronted with the question that how they can improve the engineering education system more effectively and how to prepare engineering students for the jobs of the future?

Therefore, this dissertation provides the contributions to engineering education with the following strategies for preparing engineering students and education systems fit for the future;

1) Surveys on the needs competencies/skills for an engineering graduate to excel both in the domestic and global labor markets and diversity challenges for preparing engineering students and education systems fit for the future. The study investigated the importance of global competencies and skills, provided by Warnick, from the perspective of well-known Thai and multinational companies based in Thailand. The findings indicated that global competency is an important requirement for global engineer employment. Following that, the set of global competencies was verified to be the most critical competencies for engineers to develop based on higher education institutions' perspectives. After that, the study determined the future competencies for three demanding careers, and the findings indicated a broad mix of needed competencies in the present Industry 4.0 environment.

2) Survey on the competency of engineers working at global companies in Thailand to illustrate the gap between the competency expected for engineers by companies and the competency of working engineers measured by PROG test. The findings highlight the essential generic competencies for preparing engineering students for professional engineering employment and career success.

3) Identify an integrated learning strategy for building professional competency in engineering education to bridge the gap between engineering education and professional practice. The study found that using STEAM-PBL in engineering has a beneficial impact on students, making learning more engaging. Students have also been able to acquire a variety of skills and competencies.