

Industrial training approach using GPM P5 Standard for Sustainability in Project Management: a framework for sustainability competencies in the 21st century

Kartina Johan¹ and Faiz Mohd Turan¹

¹Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600
Pekan, Pahang, Malaysia

E-mail: kartina@ump.edu.my

Abstract. Malaysian Engineering Accreditation (Engineering Programme Accreditation Manual, 2007) requires all bachelor degree in engineering programmes to incorporate a minimum of two months industrial training in order for the programme to be accredited by the council. The industrial training has the objective to provide students on the insights of being an engineer at the workplace hence increasing their knowledge in employability skills prior to graduation. However the current structure of industrial training is not able to inculcate good leadership ability and prepare students with sustainability competencies needed in the era of Sustainable Development (SD). This paper aims to study project management methodology as a framework to create a training pathway in industrial training for students in engineering programs using Green Project Management (GPM) P5 standard for sustainability in project management. The framework involves students as interns, supervisors from both university and industry and also participation from Non-Profit Organisation (NPO). The framework focus on the development of the student's competency in employability skills, lean leadership and sustainability competencies using experiential learning approach. Deliverables of the framework include internship report, professional sustainability report using GPM P5 standard and competency assessment. The post-industrial phase of the framework is constructed for students to be assessed collaboratively by the university, industry and the sustainability practitioner in the country. The ability for the interns to act as a change agent in sustainability practices is measured by the competency assessment and the quality of the sustainability report. The framework support the call for developing holistic students based on Malaysian Education Blueprint (Higher Education) 2015-2025 and address the gap between the statuses of engineering qualification to the sustainability competencies in the 21st century in particular by achieving the Sustainability Graduates (SG) attributes outlined in the framework.

1. Introduction

Industrial Training refers to work experience done during the program of study that is relevant to professional development prior to graduation. All engineering programs accredited by Board of Engineers Malaysia (BEM) require a completion of at least 60 working days of approved industrial training prior to graduation [1]. The fundamental objective of industrial training is to prepare students for future employment in their chosen engineering discipline. Industrial training



enhances the academic material studied at University by allowing students to practice what they have learned and to develop key professional attributes. Soft skills such as team working and ability to make decisions based on critical thinking are most sought after skills for learning during the internship [2]. Based on literature employers and students both have positive perceptions on the programmes in terms of getting students in 'work ready' mode for employment [3]. However, study shows employers are still not satisfied with student's leadership ability [4]

One of the objectives in industrial training programme is for students to experience the discipline of working in a professional engineering organisation. In this era of sustainability, organization functions within large and complex interdependent networks and no more operating within a fairly predictable, stable system like before [5]. Businesses around the world is retooling their talent management systems to reflect the new competency imperatives to position their firms for future success. Fueled by globalization, technological change, population growth and shifting demographics, sustainability mega-forces will affect the ability of business to succeed and thrive over the next 30 years [6]. This need for knowledge and competency in sustainability practices is stated by United Nations (UN) General Assembly in its 57th meeting in December 2002, where it proclaimed the UN Decade of Education for Sustainable Development 2005- 2014 (DESD) and emphasize that education is an indispensable element for achieving sustainable development. It also designated UNESCO as the lead agency to promote and implement the DESD proclamation [7]

In industrial training programs, students will gain new competencies because they will experience the life as an employee i.e. engineer in real situation if they receive good supervision from both the industry and faculty supervisors [8]. Since competencies can be defined as a cluster of related knowledge, skills and abilities that affects a major part of one's job that correlates with performance of the job, the framework includes assessment plans and deliverables based on sustainability education from both parties i.e. University and industry [9]. Action or experiential learning is the recommended approach since this method requires student to apply knowledge and competencies, such as research, problem solving and critical thinking to solve real-life problems [10]. Therefore, industrial training is the platform for students to experience sustainability practices in real world as it is a practical course of which the important stakeholders of education are involved i.e. university and industry [11]

Higher education institution (HEI) plays a role in two kinds of growth i.e endogeneous growth and catching-up growth. Endogeneous growth is economic growth based on new technological breakthroughs and catching-up growth is adaptation of technologies from abroad. HEI also play a critical role in basic activity , helping society to identify and solve local problems of sustainable development [12]. Inevitably, in 21st century where sustainability is the new norm for looking into our world in the perspective of Triple Bottom Line (TBL) principles universities are vital to prepare workforce for the country and its students are the most highly suitable candidates to act as change agents with regard to Sustainable Development (SD) [13]. It is crucial for students to see the impact of sustainable development in industries of which they are attached to during the internship so that they can understand the reality or the consequences of not having sustainability-oriented thinking in the engineers mind upon graduation. This change of paradigm is extremely important because in order to be sustainable, the world and its citizen cannot afford to operate in process-based approach anymore [14]. Therefore, the paradigm shift must be introduced already in industrial training to realize the teaching under the experiential learning methodology.

Generally there is an assumption that a country has available professionals who are capable to lead changes that support the transition to sustainability [15]. Studies have shown that the number of sustainability practitioners and scientists is still insufficient and may be due to limitations in current higher education framework [16]. Sustainability competencies may be developed by adapting cross-cultural and real world experience as it can be accounted for local nuances of sustainability problems and solutions [17]. In the context of multi-cultural business landscape in

Malaysia and the significance of industrial training in developing employability skills in the education system, the framework aim to address these following questions:

- How can the industrial training act as a learning platform in higher education landscape to provide a real world experience to prepare graduates to learn about the workplace skills needed by engineers of the 21st century
- Does the industrial training provide the basic knowledge and competencies on sustainability practices for engineering students to grow as competitive professionals with sustainability practice mind-set in the era of sustainable development (SD)?
- How can the stakeholders of HEI i.e. students, industries, universities and communities work collaboratively in educating the graduates as future change agent in sustainability practices in Malaysia?

2. Methodology

The development framework of proposed approach is as depicted in Figure 1.

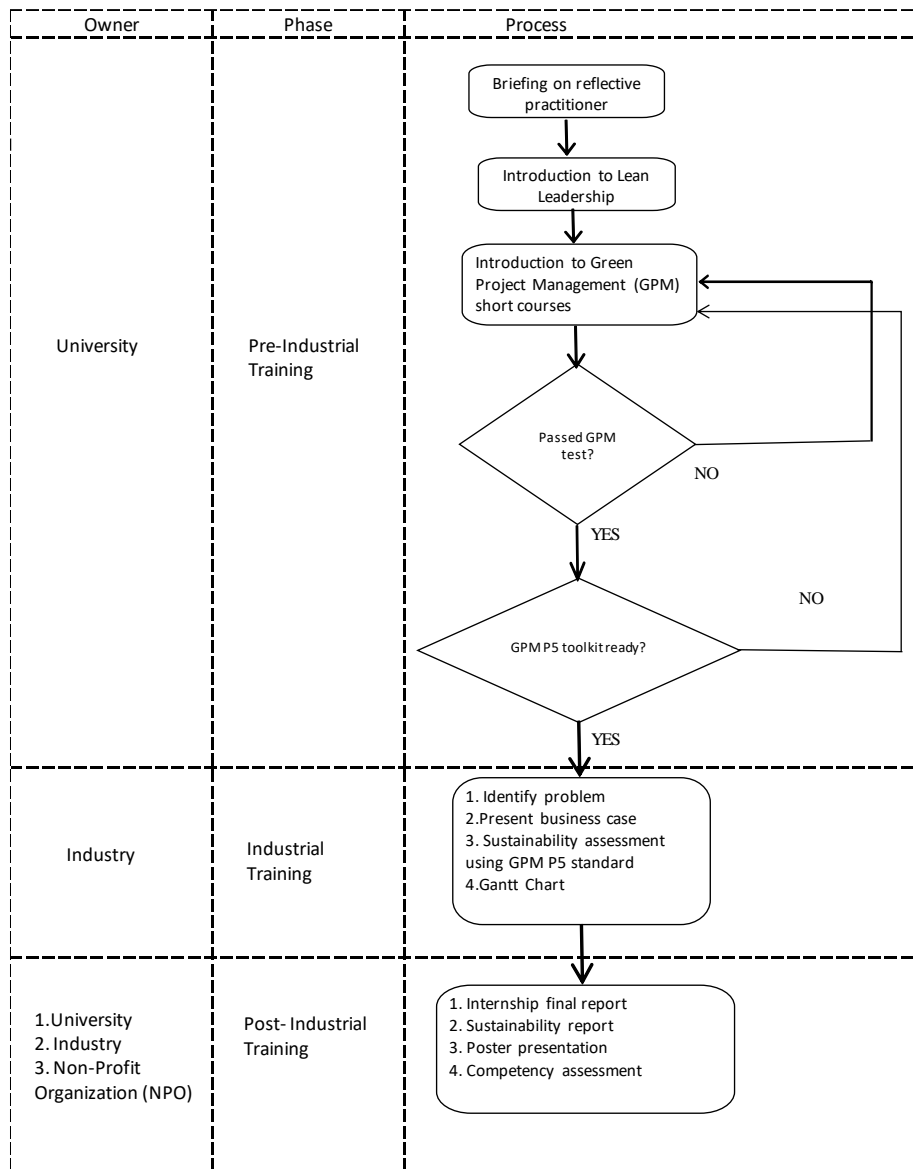


Figure 1. General framework of proposed approach

2.1. Pre-Industrial Training Phase

This is the initial phase to educate students with the awareness of being a reflective practitioner [18]. Students are also introduced to Lean Leadership as the fundamental of leadership training [19]. In this phase students will have learning experiences in sustainability competencies during Green Project Management (GPM) sustainability in Project Management course [20].

2.1.1. Reflective practitioner

Reflective practice may be regarded as a process of professional development [21]. A briefing on reflective practice to the internship candidates can be viewed as a baseline in setting the right learning attitude during the industrial training. Students will learn that they must come to an understanding of their own behavior; they must develop a conscious awareness of their own actions and effects and the ideas or theories-in-use that shape their action strategies. Within the context of experiential learning, this briefing session will benefit the millennial generation who learn effectively under experiential learning and collaborative mode [22]

2.1.2. Lean Leadership

This introductory course has the objective to educate students on the difference of Management by Objective (MBO) and Lean Management (LM). In order to be a change agent, the student must be able to understand that effective leaders must spend their time at the 'gemba' or working place [23]. In Lean Leadership course the students will have exposure to leadership skills in LM which is highly practiced in industries around the world.

2.1.3. Green Project Management (GPM) P5 Standard

The knowledge in GPM will enable the students to produce a professional sustainability report in accordance to United Nations Sustainable Development Goals (UN SDGs) which is a measureable tool in assessing sustainability performance [24]. The P5 concept integration matrix is described in the following paragraph:

- a) Product impacts – objectives and efforts, lifespan and servicing
- b) Process impacts – maturity and efficiency
- c) Society (People) – labor practices and decent work, society and customers, human rights, ethical behavior
- d) Environment (Planet) – transport, energy, water, waste
- e) Financial (Profit) – return on investment, business agility, economic simulation

2.2. Industrial Training Phase

This phase is the real world experience where students apply the knowledge on sustainability in GPM course. The framework suggest that both the faculty and industry supervisors vet the industrial attachment evaluation form with elements of sustainability practices thus promoting the students to contribute to the industry as change agents during their attachment. Students are required to identify a problem and solve it with solutions based on sustainability-oriented critical thinking and knowledge. Students must present a business case with milestones in order to understand the industry process and organisational behaviour and use the GPM P5 assessment checklist to analyse the sustainability performance observed at the internship sites.

2.3. Post-Industrial Training Phase

In this phase, students are to deliver final internship report, sustainability report, poster presentation and competency assessment as the measurable for Sustainability Graduates (SG) attribute. In this study SG is defined as an engineering graduate who has good employability skills and sustainability competencies. The sustainability report produced in this framework is using the GPM approach which is in accordance to Global Reporting Initiative (GRI)

sustainability reporting standards [25]. The knowledge of producing such report will benefit the graduates in becoming the change agent in SD as it supports the directive of Bursa Malaysia to industry players in Malaysia [26].

Non-Profit Organisation (NPO) is required to participate in this phase to act as the subject matter expert or 'endorser' i.e. sustainability practitioners. This collaborative assessment between the stakeholders (university-industry-NPO) is thought to be conducive in providing students a social-environmental-technical problems in real life situation which is highly required for sustainability education.

Conclusion

This new framework has the objective in providing learning experiences in employability skills with high focus in lean leadership skills and sustainability competencies. Both the deliverables can be measured and collaboratively assessed by the university, industry and the practitioners in sustainability development. It provides a formal and constructed measureables in the current industrial training teaching and learning plan in the context of engineering programs in Malaysia. It further supports the development of Sustainability Graduate (SG) attributes in this framework as the evaluation can be made based on students' achievement in the competency assessment and the quality of the sustainability report. In view of the current awareness level in sustainability professional practices in Malaysia it is foreseen that the implementation of such framework is yet to be made effective and may face challenges. Validation of the outcome from the framework shall answer the call of the nation to produce 'holistic graduates' as documented in the Shift 1 of Malaysian Education Development Plan (Higher Education) 2015-2025.

Acknowledgements

The authors would like to give special thanks to Research & Innovation Department, Universiti Malaysia Pahang for funding this research project.

References

- [1] Engineering Programme Accreditation Manual, 2012. Available <http://www.eac.org.my/web/document/EACManual2012.pdf>
- [2] Khalid, N. et al., "Importance of Soft Skills for Industrial Training Program: Employers' Perspective", Asian Journal of Social Sciences & Humanities Vol. 3(4), 2014
- [3] Nordin, M.R., et al., "Enhancing the effectiveness of the industrial training of undergraduate students: input input from industries and organisation", Academic Service Centre, KUTKM, 2005
- [4] M., Jamil et al , "Competencies Achieved Through Industrial Training Programme", Proceedings of the 7th WSEAS international conference on engineering education, 2010
- [5] Jeffrey D. Sachs; "The age of sustainable development", Columbia University Press, 2015
- [6] Strandberg, C., "Sustainability Talent Management: The New Business Imperative", 2015. Available: <http://corostrandberg.com2015>
- [7] UN Decade for Education for sustainable development 2005-2014. Available <http://unesdoc.unesco.org/images/0014/001416/141629e.pdf>
- [8] M., Jones, H., Warnock, L., "Towards a competency framework for student work-basedearning", The Higher Education Academy, 2014
- [9] Jane Ellen Dmochowski Dan Garofalo Sarah Fisher Ann Greene Danielle Gambogi, "Integrating sustainability across the university curriculum", International Journal of Sustainability in Higher Education, Vol. 17 Iss 5 pp. 652 – 670, 2016
- [10] Rodzalan, S. A., M. Saat, M., "The Effects of Industrial Training on Students' Generic Skills Development", Procedia – Social and Behavioral Sciences 56:357-368, 2012
- [11] McPherson, S., et al., "Pathways to Cleaner Production in the Americas II: Application of a competency model to experiential learning for sustainability education", Journal of Cleaner

- Production 135, pp 907-918, 2016
- [12] The GlobalCompetitiveness Report 2014-2015. Available <https://www.weforum.org/reports/global-competitiveness-report-2014-2015>
 - [13] Elkington, J.; "Cannibals with Forks: Triple Bottom line of 21st Century Business". UK: Capstone Publishing Ltd; 1998
 - [14] Transforming our world : The 2030 agenda for sustainable development. Available <https://sustainabledevelopment.un.org/post2015/transformingourworld>
 - [15] Lakshmi Charli-Joseph Ana E. Escalante Hallie Eakin Ma. José Solares Marisa Mazari-Hiriart Marcia Nation Paola Gómez-Priego César A. Domínguez Pérez-Tejada Luis A. Bojórquez-Tapia , (2016),"Collaborative framework for designing a sustainability science programme", International Journal of Sustainability in Higher Education, Vol. 17 Iss 3 pp. 378 – 403, 2015
 - [16] Arnim Wiek, Michael J. Bernstein, Manfred Laubichler, Guido Caniglia, Ben Minter, Daniel J. Lang, "A Global Classroom for International Sustainability Education", Vol.4, No.4A, 19-28, 2013
 - [17] van der Leeuw, S., Wiek, A., Harlow, "How much time do we have? Urgency and rhetoric in sustainability science", J. et al. Sustain Sci 7: 115, 2012
 - [18] F, Cullen., "Internship framework report : Developing a Pedagogic Approach to Enhance Student Learning Before, During and After International Work Placement", Dublin Institute Of Technology, 2010
 - [19] Ahmed, M.H., "Lean Transformation Guidance: Why organisations fail to achieve and sustain excellence through lean improvement", International Journal of Lean Thinking Volume 4, Issue 1, 2013
 - [20] The GPM Global Standard P5 of sustainability in Project Management, first edition, GPM Global, 2014. Available www.greenprojectmanagement.org
 - [21] Karen F. Osterman Robert B. Kottkamp, Reflective Practice for Educators Improving Schooling Through Professional Development, Corwin Press, Inc. A Sage Publications Company Newbury Park, California, 1993
 - [22] Nicholas, A., "Preferred Learning Methods of the Millennial Generation" Faculty and Staff - Articles & Papers.Paper 18. 2008
 - [23] Jeffrey K. Liker, Gary L. Convis, "Toyota Way to Lean Leadership: Achieving and Sustaining Excellence through Leadership Development", McGraw Hills, 2012
 - [24] Osborn D., Cutter, A., and Ullah, F; Report of a study by stakeholder forum, Universal Sustainable Development Goals. Understanding the transformational challenge in developed countries. The Stakeholder Forum; 2015
 - [25] GRI standard . Available <https://www.globalreporting.org/standards>
 - [26] Bursa Malaysia. Sustainability Reporting Guide, (2015). Available <http://www.bursamalaysia.com>
 - [27] Malaysia Education Blueprint 2015-2025 (Higher Education). Available <https://www.mohe.gov.my/ms/muat-turun/awam/penerbitan-dan-jurnal/pppm-2015-2025-pt/6-executive-summary-pppm-2015-2025/file>