Model of university-industry collaboration to support internship program in Engineering Faculty of Universitas Negeri Yogyakarta

S Sudiyatno¹, A Nuryanto¹, S Sutopo¹ and I M Nashir²

¹Department of Mechanical Engineering Education, Universitas Negeri Yogyakarta, Indonesia
²Universitas Pendidikan Sultan Idris, Malaysia

E-mail: sudiyatno@uny.ac.id

Abstract. Collaboration between industry and universities is well recognized by scholars and policy makers as a necessity for industrial innovation products and university graduate skills development. This study presents a proposed university-industry collaboration model which expresses the university and industry benefits obtained through the collaboration experiences. Method used to explore the model of collaboration that will be proposed is observation to industries where students doing internship and FGD. The result shows that activities of collaboration are very potential to bring benefits to both parties. The proposed UIC model is suited for use at two different courses, those are internship program and final project course. The model is also implemented to assist in realizing the third role of universities in community service in the area of the contribution to innovation and R & D, production commercialization and technology transfer.

1. Introduction

In an era of disruption where educational institutions are facing the challenges of rapid change. Therefore, universities must have high adaptability in order to survive to meet the various challenges and new demands of its graduate users [1]. Likewise, the Faculty of Engineering, Universitas Negeri Yogyakarta, in the last three years received an average of 1085 students and graduated an average of 850 graduates. FT UNY graduates must be equipped with adequate knowledge and skills in accordance with the competency needs in the job market. FT UNY as an organization that continues to improve its performance, according to the theory of learning organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together [2]. Therefore, FT UNY needs to work together for various reasons and provide an enabling mechanism to build capacity to survive and develop. One of the strategic institutions that is really needed by the Faculty of Engineering as its cooperation partner is relevant industries.

On the other hand, industry also faces the same challenges in this era of industrial revolution 4.0. They must immediately adapt to the rapidly changing environment, especially the development of information technology. This further encourages the industry to increase the intensity of its cooperation with universities. Industry cannot only rely on internally generated knowledge, but also needs to exploit sources of information and innovation from external institutions, especially universities as centres of science and technology development through research and development (R&D) activities.
Industry categories that require collaboration with universities, especially the micro, small and medium enterprises (UMKM) or small medium enterprises (SMEs) category industries. This collaboration is needed to help the SMEs in improving the quality of processes and products, and the competence/expertise of its workers through knowledge transfer. Cooperation between universities and industry in several developed countries, such as Germany, America and China has been carried out for a long time. In Germany which adopts a dual education system, cooperation between universities and industry has been very strong. China founded the Collaborative Innovation Centre (CIC) established at Huzhou University has missions: (a) to reinforce the collaboration between university and local companies, (b) to synergize the resources and strengths of both parties through education reform, and (c) to achieve the goal of improving the quality of personnel training and delivering highly qualified graduates to industry [3].

The model of collaboration between universities and industry in an effort to improve the quality of HR is also being carried out by Malaysia. In Malaysia UIC is established to broaden the industry experience of university faculty members and to facilitate collaboration between industry and relevant universities, the Knowledge Transfer Partnership (KTP) program was introduced in 2011. The KTP aims to facilitate the transfer of expertise and research findings via innovative projects undertaken jointly by faculty members and their partners from the industry. The KTP has also provided industrial-based trainings programs to enhance the practical knowledge, business skills, and employability of graduates [4]. Cooperation between universities and industry at Universiti Kebangsaan Malaysia (UKM) is grouped into four fields: Innovation and R&D, technology transfer, consultancy and product commercialization) between university and industry (Figure 1). Even though many studies have been done, it is still challenging for enterprises and universities to identify the effective implementations to follow in order to establish and sustain collaboration. This has led to the increasing need for establishing some practices and principles to guide the innovation, implementation and success of a collaboration.

The purpose of this article is to propose a framework to enhance the effectiveness of university–industry collaboration (UIC). The proposed framework is based on the inputs obtained from experts working in industries, observation and FGD to review of the literature regarding the best practices for collaboration. This framework is proposed to facilitate the partnerships and improve the effectiveness of UIC, hopefully offers steps to be taken for effective collaboration between universities and industries.

![Figure 1. Model of university-industry collaboration implemented in UKM.](image-url)

2. Method
This study was conducted in Yogyakarta and Central Java Province. Purposive sampling was employed to select respondent of student doing internship program, lecturers of Mechanical Engineering Education Department and experts from industries. Three different fields were chosen as consideration in doing observation to industries: casting technology, machining process and sheet metal-based product manufacturing. We organized one focus group discussions to explore possibilities in the collaboration. In this way, seven participants (three from the industry background and four university lecturers) in total, observations and two discussion in July-October 2020.
3. Results and Discussion

3.1. Observation of Industries

Observations of interns were carried out in three industries which have different production fields. First at PT Yogya Presisi Tehnikatama Industri (YPTI), located in Sleman Yogyakarta. This industry produces a lot of components that are produced by machining, such as lathes and milling machines. Examples of work objects produced by interns while working at YPTI can be seen in Figures 2 and 3. Second, observations were made in the metal casting industry, namely CV Putra Sari Logam located in Klaten, Central Java. The industry produces cast products which are mainly made of aluminium and iron. An example of the resulting workpiece can be seen in Figure 4. The three observations were made at PT Hari Mukti Teknik, located in Bantul, Yogyakarta. This industry produces machines that use a lot of metal plate-based materials, such as automatic sinks, washing machines and dryers (Figure 5).

![Figure 2. Product of machining process.](image1)

![Figure 3. Product of machining process.](image2)

![Figure 4. Product of casting process.](image3)

![Figure 5. Sheet metal-based products.](image4)

3.2. Model of University Industry Collaboration

Based on the results of the FGD which was held by presenting three industry practitioners and four lecturers at the Faculty of Engineering, YSU, a UIC model can be formulated as depicted in Figure 6. The first stage, the lecturer introduced a number of machine prototypes that had been produced. Furthermore, together with the industry agree on a feasible prototype machine to be developed until produced and marketed. After that the industry conducts a market survey in order to obtain product specifications and prepare a financing plan. The lecturer prepares students who will be involved in this collaboration. In this case there are two groups of students, namely a group of students who are preparing a final project lecture and a group of students who will do an internship program in industry.
The main task for students who are preparing a final project is to design a working drawing for each component and its production process. This group of students is obliged to prepare a final report on their project in writing and must take an oral exam. While the main task for students who take part in the apprenticeship program is to produce machine components in the relevant industry. Therefore, apprenticeship students are grouped into three fields of work, namely casting, machining and metal forming. Interns carry out these assignments for six months and are required to prepare a final report and take an oral exam. During the production of this machine, the two student groups received intensive guidance from both supervisors and industry advisors. The complete stages of this collaboration model are depicted in figure 6.

![Proposed Model of University-Industry Collaboration in UNY](image)

**Figure 6. Proposed Model of University-Industry Collaboration in UNY**

4. Conclusion

It can be concluded that the proposed model of collaboration are very potential to bring benefits to both university and industry. The proposed UIC model is suited in Engineering Faculty of UNY for use at two different courses, those are internship program and final project course. The model is also implemented to assist in realizing the third role of universities in community service in the area of the contribution to innovation and R & D, production commercialization and technology transfer.
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