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University-Industry Collaboration in Project-Based Learning: Perspective and Motivation of Industry Partners

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Abstract

Extant research has examined the essence of university-industry partnership from the university's perspective. However, little is known about managing such partnership from an industry partner's perspective. Understanding industry partner's perspective is important as it may help the university to better manage the collaboration process, while keeping the focus on providing students with a positive project-based learning (PBL) experience. This study surveyed 33 industry partners to examine university-industry partnerships in a PBL setting from an industry partner's perspective. The results show that project output needs to cater to the actual need, requirement, and expectation of the industry partner. Also, there must be efficient communication between industry partners, academics, and students for the collaboration to be successful. By understanding how to manage such university-industry partnership from the perspectives of industry partners, it would help universities to improve the PBL pedagogy in their curriculum. Also, companies may learn to better work with students and academics to generate new ideas that address their existing problems and issues.

Keywords: project-based learning, university-Industry partnership, industry partner's perspective

1. Introduction

The speed of business today is moving at a faster pace than ever before. This has led to companies striving to find new strategies and ways to dominate their markets. With the rapidly changing technological realm, companies are faced with many options of how to conduct their business. This may mean that enterprises that have been around for a long time, need to change to accommodate these new advances and improve their own workflows. To better prepare university students for the complexity and uncertainty at workplace, universities are adopting project-based learning (PBL) pedagogy to bridge the gap between academia and practice (Pan et al., 2019).

PBL offers students a setting that closely simulates post-graduation work environment. In PBL, students are presented with problems and projects that are as open-ended and realistic as possible, hence creating situations and scenarios that closely resemble those encountered in the real-world settings (Stoicoiu and Cain, 2014): project requirements that are not properly structured, modifications to project scope and timelines, and the need to respond to customers' changing expectations. Furthermore, it is believed the adoption of industry-oriented projects in a PBL curriculum may improve students' skills in communication, problem-solving and teamwork that employers desire (Pan et al., 2021a). Therefore, while managing industry-oriented projects is complicated, such learning experience proves valuable as it generates tangible benefits for students, faculty and industry partners (Arthur et al., 2001). In such partnership, the faculty and the industry partner usually play an important role in guiding students' work during project development (Pan et al., 2021b). Therefore, it may be necessary for faculty and industry partners to learn how to work together, so as to provide students with an enriching learning experience.

Extant research has examined the essence of university-industry partnership in PBL from the university's perspective (see Pan et al., 2021b). However, little is known about an industry partner's perspective towards such partnership. As a result, it might be helpful to examine the motivation and perception of industry partner in a PBL setting. Afterall, having a good understanding of how industry partners perceive such partnership may help universities to better manage the collaboration process, while still keeping the focus on providing students with a positive PBL experience.

In this study, we collected the partners' feedback on their perceptions of the university-industry partnership through a survey. The survey was conducted immediately after their participation in a semester long PBL course in the undergraduate curriculum at UNIS. From their comments, we identified several key reasons why an industry partner would collaborate with a university in a PBL setting. Our analysis of both close-and open-ended feedback also revealed major takeaways from the collaboration between UNIS and its industry partners.

Our paper is organized as follows. We begin with a review of the essence of industry partnership in the PBL literature. We then present our survey findings and discussion. We conclude the paper with implications, future research and limitation of this study.

2. Literature Review

With the fast-changing work environment, universities today are embracing teaching pedagogy that inculcates learning of twenty-first century competencies so as to prepare their students to be future-ready (Garrido-Lopez et al., 2018). A major theme in developing twenty-first century competencies centres on the learning philosophy of taking what was learned in one situation and applying it to new situations (Durkin, 2016). To embrace this learning philosophy, teaching pedagogy may have to evolve from content teaching, to engaging students in active learning, hence focusing on applying and reflecting knowledge.

An approach that embodies such active learning philosophy is the pedagogy of 'learning through doing' or PBL (Daun et al., 2016), which allows students to learn theory in the classroom, then apply what they have learned in the field, solving a wide array of business challenges facing organizations, while at the same time solidifying their own knowledge (Helle et al., 2006). In a PBL setting, students are usually challenged to manage projects in unfamiliar environments and develop implementable solutions (Membrillo-Hernández et al., 2019). In this way, students are able to understand the theories and frameworks taught in class and supplement them with hands-on learning through real-world application and solution development (Hogue et al., 2011).

A significant challenge in the university education is the difficulty in maintaining students' interest and motivation, whilst addressing the core knowledge and skills that will enable students to work in the industry upon graduation. It is believed by offering real-life examples rather than "dry" academic assignments, students are likely to improve their interest and motivation in learning (Choy and Delahaye, 2009). PBL has long been touted as an effective approach of active learning, which facilitates application and retention of theory (Cain and Cocco, 2013). Its use for improving 'soft skills' such as communication, problem-solving, teamwork, critical thinking, ethics and resilience, is also evident (Ruskin and Bilous, 2017). In order to be job-ready, university students will need to gain project experience in solving problems and issues that diverge from the theoretical realm, by entering a practical context similar to what they would eventually encounter in the industry (Foss and Liu, 2020).

A collaborative relationship between the university and the industry partner is a significant learning process for linking theory and practice. University-industry partnership is an efficient and cost-effective approach to improving university education. Increasingly, traditional classroom teaching is said to be a cause of students' low level of motivation in learning as well as a lack of real-world practices that reflect the nature of the work students will carry out in the future (Ferreira et al., 2019). Improving students' knowledge as well as their transition into the workplace, requires effective partnership between the university and its industry partners (Chandrasekaran et al., 2013). Besides providing an opportunity to apply knowledge, such project experience may also improve students' employability by making the project industry oriented (Spichkova, 2019). Compared to traditional classroom teaching, the PBL pedagogy provides students with more autonomy and flexibility (Xu and Liu, 2010). Prior PBL studies have also suggested that students crave meaningful and interesting project activities that allow them to associate with their career fields of interest (Pan et al., 2021a).

Through PBL, industry partners could support the students to develop necessary skills to cope with complexity and uncertainty, while handling real-world issues and problems (Abrami et al., 2015).

According to Portz (2014), an industry partner may be motivated to collaborate in a PBL setting because it might help to fill the talent pipeline with students who are future-proof and real-world ready, as they enter the workforce. Besides this reason, how an industry partner may be motivated and how it perceives the partnership with a university in a PBL setting remains rather vague. It is therefore the aim of our study to plug this knowledge gap in the PBL literature, by offering a set of key takeaways for universities when collaborating with their industry partners.

3. Methodology

A survey questionnaire was administered to the industry partners who have participated in PBL courses at UNIS. The survey consists of six quantitative rating questions and two qualitative open-ended questions. A total of 33 industry partners voluntarily participated in our survey. The survey was conducted by the administrative office in charge of the PBL initiative at UNIS.

The online survey was conducted using the Qualtrics tool. The survey was administered by emailing the survey link to participants. The email assured anonymity and confidentiality of respondents and encouraged the industry partners to complete the survey.

4. Results and Discussion

Majority of the industry partners indicated that they found out about the PBL initiative at UNIS through university staff members (37.5%), followed by faculty members/instructors (25%) (Table 1). This shows that it is important for the university to share its PBL initiative across the entire university so that staff can help to promote the PBL initiative to their wider network.

Table 1. How Did You Learn about the PBL Initiative at UNIS? Please Select all that Applies

	Count	%
From a UNIS intern/alumni	1	2.5
From a UNIS faculty member/instructor	10	25
From a UNIS staff member	15	37.5
From UNIS website/social media	3	7.5
From a colleague/acquaintance/friend/relative	7	17.5
From other organisations who have previously participated in the PBL course at UNIS	2	5
From news/media	0	0
Others	2	5
Total	40	100

Table 2 indicates the reasons that attracted the industry partners to embark on the PBL courses at UNIS. Participants were allowed to select multiple responses that are applicable. The most popular reason (27 responses, 16.2%) is "to obtain fresh perspectives to my organisation's challenges". The second most popular reason (24 responses, 14.4%) is "to identify untapped opportunities that my organisation might work on in the future". Two reasons were jointly rated as the third most popular reason (21 responses, 12.6%). The two reasons were "to forge new partnerships with a university" and "to get extra help to complete a project/solve a problem which my organisation does not have the bandwidth to do so". It appears that companies are keen to work with the university. This indicates that it is important for companies to collaborate with external parties such as the university's faculty and students to obtain fresh perspectives on their existing issues. They also appreciated the additional resources through the collaboration with the faculty and students. As companies may not have the financial resources to engage external consultants, working with the university would be a cost-effective solution.

Table 2. What Was/Were Your Reason(s) for Embarking on the PBL Project?

	Count	%
1. To forge new partnerships with a university	21	12.6
2. To get extra help to complete a project/ solve a problem which my organization does not have the bandwidth to do so	21	12.6
3. To identify new talents who are a good fit for my organization	14	8.4
4. To identify untapped opportunities that my organization might work on in the future	24	14.4
5. To keep abreast of new knowledge and skills	20	12
6. To leverage on the skill, knowledge and expertise of academics	18	10.8
7. To manage my organization's reputation	6	3.6
8. To obtain fresh perspectives to my organization's challenges	27	16.2
9. To understand my customers better	13	7.8
10. Others	3	1.6
Total	167	100

Based on the nine reasons indicated in Table 2, we asked the industry partners to rate the extent to which they have benefitted from the PBL project, ranging from "to a little extent" to "to a very great extent (see Table 3). For the nine reasons, only one industry partner rated "to a little extent". Majority of the partners (43.71%) rated "to a great extent" in terms of benefitting from the PBL project. A significant number (26.95%) rated "to a very great extent". The earlier Table 2 indicates that the most popular reason for participating in the PBL project is "to obtain fresh perspectives to my organisation's challenges". For this main reason, 12 partners (44.44%) indicated they have benefitted "to a very great extent", 9 partners (33.33%) indicated they have benefitted "to a great extent" and 3 partners (11.11%) indicated they have benefitted "to a fairly great extent" and "to a moderate extent"

respectively. Our data suggest that most industry partners have benefitted much from the PBL project, hence indicating a successful university-industry collaboration.

Table 3. You Mentioned that you Participated in the PBL Project for the Following Reasons. To What Extent do you Think Your Organization Has Benefitted from this Collaboration?

	To a little extent	To a moderate extent	To a fairly great extent	To a great extent	To a very great extent	Total Count
1. To forge new partnerships with a university	0	4 (19.05%)	1 (4.76%)	11 (52.38%)	5 (23.81%)	21
2. To get extra help to complete a project/ solve a problem which my organization does not have the bandwidth to do so	1 (4.76%)	1 (4.76%)	0	15 (71.43%)	4 (19.05%)	21
3. To identify new talents who are a good fit for my organization	0	3 (21.43%)	4 (28.57%)	5 (35.71%)	2 (14.29%)	14
4. To identify untapped opportunities that my organization might work on in the future	0	2 (8.33%)	5 (20.83%)	13 (54.17%)	4 (16.67%)	24
5. To keep abreast of new knowledge and skills	0	2 (10%)	6 (30%)	9 (45%)	3 (15%)	20
6. To leverage on the skill, knowledge and expertise of academics	0	0	4 (22.22%)	6 (33.33%)	8 (44.44%)	18
7. To manage my organization's reputation	0	0	4 (66.67%)	0	2 (33.33%)	6
8. To obtain fresh perspectives to my organization's challenges	0	3 (11.11%)	3 (11.11%)	9 (33.33%)	12 (44.44%)	27
9. To understand my customers better	0	0	4 (30.77%)	5 (38.46%)	4 (30.77%)	13
10. Others	0	1 (33.33%)	1 (33.33%)	0	1 (33.33%)	3
Total	1 (0.60%)	16 (9.58%)	32 (19.16%)	73 (43.71%)	45 (26.95%)	167

We asked industry partners to rate their satisfaction level with various aspects of their involvement in the PBL project on a five-point Likert scale ranging from extremely dissatisfied (=1) to extremely satisfied (=5). For all eight questions, the mean rating was above 4, indicating that the industry partners were satisfied with their PBL experience (see Table 4). The industry partners were very satisfied with the knowledge and expertise of the instructors (M=4.61, SD=0.56). They were also very satisfied with the commitment of the students (M=4.61, SD=0.61). Partners were also very satisfied with the final deliverables/solutions (M=4.55, SD=0.56). The lowest rating relates to students' knowledge and understanding of the issues within the organisation (M=4.21, SD=0.7). The project was completed over the semester of 12 weeks. Due to the relatively short duration, it is expected that students may not have strong contextual understanding of the industry partners.

Table 4. To What Extent Are You Satisfied with the Following Pertaining to the PBL Project?

	Questions [a]	Mean (n=33)	Standard Deviation
1.	Scoping of the project	4.48	0.57
2.	Instructor's commitment/ involvement in the project	4.58	0.56
3.	Instructor's expertise/ knowledge	4.61	0.56
4.	Experience working with the instructor	4.55	0.62
5.	Mentoring the students	4.33	0.65
6.	Students' commitment/ involvement in the project	4.61	0.61
7.	Students' knowledge/ understanding of my organization's issue	4.21	0.70
8.	Students' final deliverables/ solutions	4.55	0.56

a. Survey scale: 1 = extremely dissatisfied; 2 = dissatisfied; 3 = neutral; 4 = satisfied; 5 = extremely satisfied

Besides satisfaction level, overwhelming 32 out of 33 industry partners (97%) indicated that they would like to continue the collaboration and participate in future runs of the PBL course (see Table 5). The results suggest that the industry partners believe there is value in participating in the PBL project. The buy-in from industry partners highlights the success of the PBL initiative at UNIS.

Table 5. Would you Like to Continue This PBL Partnership with UNIS?

	Count	%
1. Yes, I would like to continue this collaboration	32	97
2. No, I do not see any collaboration in the future	1	3
Total	33	100

We asked the industry partners to indicate whether they would implement the students' suggested solutions after the PBL course (see Table 6). It is encouraging to see that 7 partners (21.2%) have already implemented the students' suggestions. Another 14 partners (42.4%) indicated that they are very likely to implement the students' suggestions. Another 11 partners (33.3%) indicated that they are likely to implement the students' suggestions after further tweaking internally. Only 1 industry partner indicated that it is unlikely for the students' suggestion to be implemented. The high rate of implementation reinforces the value of participating in PBL projects.

Table 6. How likely will Your Organization Implement the Students' Suggestions?

	Count	%
1. Have already implemented the students' suggestions	7	21.2
2. Very likely will implement what the students suggested	14	42.4
3. Likely will implement but need a bit of tweaking internally first	11	33.3
4. Unlikely to implement	1	3.1
Total	33	100

Besides quantitative ratings, these industry partners also provided comments related to their experience with the PBL project. Below are excerpts of their comments:

> *It was a great learning experience with many takeaways! We really benefited from this partnership and from the students' insights. The only enhancement I can think of, is perhaps, during the initial meeting with the prof, a description can be given of the course itself, so we understand what the course is about, and can tailor our brief accordingly.*
>
> *Generally, our experience has been exceptional. Our initial expectations have been largely exceeded, and therefore, finding an area of improvement is quite challenging! One small suggestion could be to consider the opportunity to allow partner companies to develop case studies/white papers. It would be a nice touch.*
>
> *It was already a really good experience for me! Communications and support from the student and staff were really good, and the timeline was clearly communicated.*
>
> *Currently, everything is beyond expectations as a client. The nature of this collaboration has benefits on both parties which makes the model a success. Perhaps to make the project more worthwhile, is to have the opportunity for clients to hire or somehow pick out students that are interested to work in the company.*
>
> *It has been an interesting and insightful project for us. Seeing how bright young students dissect our company's case from their perspective really gives us insight into what do we need to do to build and grow our brand. As I mentioned in the presentation session, the kind of research that the students conduct for us is the kind of research that we as a company really need but don't have time to do, and we thanked the students for doing it for us. Those results really showed what our brand lacked compared to other competitors and what we need to aim for first to improve that.*

In terms of areas of improvement, some partners suggest that the PBL course could be conducted over two semesters (24 weeks), instead of one semester (12 weeks). This would allow industry partners and students to have more time to work on the project. A longer duration allows industry partners to divide the project into two phases so that students could

follow through with their recommendations from the first phase.

Industry partners also shared several positive comments relating to the students. Below are excerpts of their comments:

> *I was impressed by the student's final deliverables and the way they presented their findings and solutions. I could see that the students have put in a lot of thought process and in-dept research to the project and it is very meaningful to see the journey that the students have went through as well as their recommended end result that helped to benefit our organisation as well.*
>
> *We are glad to see the effort from students. All teams did a great job. We are able to see their passion and potential. Hope they could keep it up and be more ambitious for your future career.*
>
> *I was quite impressed with the way the students were able to process the problem statements through a structured design thinking methodology and come up with real-world solutions in a relatively short timeframe.*
>
> *I was impressed with the students' ability to grasp the business challenges and put in place practical yet usable solutions for our business operation. This has also proven that the knowledge acquired from the school is relevant and equipped them with future-ready skills that can be apply in the workforce.*
>
> *It has been a pleasure working with the students - they are a bright bunch who are creative, bold and daring. They are not afraid to challenge the norms and their solutions are refreshing.*
>
> *In such a short timeframe, students managed to design, conceptualize, and test several innovative strategies. The depth of their analysis and the solidity of the framework they put in place under the guidance of a well-experienced and dedicated faculty advisor is outstanding. The study went beyond strategy, and most of the projects are ready for execution. The outcomes of this engagement have by far exceeded our initial expectations and provided us with solid fresh perspectives and decisive actionable insights. What a great learning journey!*
>
> *The students displayed a high aptitude for understanding the complex process in working out product profitability. They were able to present alternative solution with the use of software to address the issue. They have also showed us a quicker way to work out the financial dashboard with the use of an appropriate software as opposed to our current way of using just excel and it saves us much time in completing the task. They have demonstrated excellence in all that they put their mind to this project, and I believe there will be no limit to their growth and achievements.*

Overall, our results suggest that students were receptive and adaptive to the challenges in the project, which are based on the exigencies of work to precisely reflect real-world circumstances that overtly add to business outcomes. This is consistent with prior studies

which suggest that a closer alignment of university curriculum to real work tasks showed a higher engagement, and students tend to be more motivated in learning the subject, as compared to students having classes in the traditional way (Dieck-Assad et al., 2021). Similarly, Ruskin and Bilous (2017) suggest that co-creation of the university curriculum with industry engagement is critical to satisfying the expectations of student, industry partner and faculty (Hurn, 2016). Such partnership allow active participation by students, academics, and employers through industry-oriented projects that are mutually motivating, hence developing a mechanism for a partnership arrangement over time, and establishing personnel connections (Lester and Costley, 2010; Dinis-Carvalho et al., 2017).

According to our survey participants, the successful implementation of industry-oriented projects within a PBL setting has contributed toward nurturing job-ready graduates (Pan et al., 2021a). To build a successful university-industry partnership, partners would need to have a shared vision on ideas or concepts which ought to address the specific needs of all partners in the partnership (Pan et al., 2021b; Zainuddin and Alwi, 2021). Some of the participants also highlighted the importance of project output catering to the actual need, requirement and expectation of the industry partner. It is also noted that for university-industry collaboration to be successful, there ought to be effective communication channels between industry partners, faculty and students (Collis and Seeto, 2008).

Our results also suggest that a major motivation for industry partners to engage in cooperation agreements with universities, owes largely to knowledge seeking and transfer (Figueiredo and Ferreira, 2022). This finding supports Marinho et al.'s (2020) suggestion that university-industry knowledge transfer contributes significantly to an increase of quality, productivity and economic value of businesses. It is believed innovation and creativity capability could be fostered through partnership between the university and the industry (Rampersad, 2014). In addition, industries may look forward to partnering with academics as companies are pushed to innovate by the ever-increasing competitive market forces (Thomas and Paul, 2019). Lastly, our survey participants have highlighted several benefits for collaborating with the university. These benefits include generation of new ideas, access to skill resource within universities, and new avenue of graduate recruitment (Afuwoqi and Wu, 2011).

5. Conclusion

Extant research has examined the essence of university-industry partnership from the university's perspective. However, little is known about managing such partnership from an industry partner's perspective. Understanding industry partner's perspective is important as it may help the university to better manage the collaboration process, while keeping the focus on providing students with a positive project-based learning (PBL) experience.

Our results suggest that students were receptive and adaptive to the PBL challenges, which are based on the exigencies of work to precisely reflect real world circumstances that overtly add to business outcomes. A closer alignment of university curriculum to real work

tasks showed students tend to be more motivated in learning the subject, compared to classes conducted in the traditional way. Co-creation of university curriculum with industry engagement is critical to satisfying student, partner, and staff expectations.

To build university-industry partnership successfully, partners need to have a shared vision on ideas or concepts which should address the specific needs of all partners in the partnership. Essentially, project output ought to cater to the actual need, requirement, and expectation of the industry partner. Also, there ought to be efficient communication between industry partners, academics, and students in order for the collaboration to be successful.

It is clear knowledge transfer occurred during the PBL process may lead to an increase of quality, productivity, and economic value of businesses. Innovation and creativity capability could also be fostered through such partnership between university and industry. Lastly, our results suggest that the industry partner may benefit from such collaboration in several ways: generation of new ideas, gained access to skill resource within universities, and an avenue of graduate recruitment.

This study contributes to PBL literature by identifying the reasons why a collaboration with the university in a PBL setting is beneficial to an industry partner. By understanding the perception of such partnership from the perspectives of an industry partner, it may help universities to better manage the collaboration process and improve the delivery of PBL pedagogy in the university curriculum. In addition, from our findings, industry partners may learn to work with students and academics to generate new ideas that help to address their existing problems and issues in their organizations. A critical success factor of university-industry collaboration is having effective communication channels between faculty, students and industry partners.

Future research may consider exploring the communication challenges during the partnership and developing a set of mitigating strategies to overcome such challenges. A limitation of this study relates to the university setting and its relationship with industry partners. The findings from this study may not always generalise to other universities if the relationship between the university and its industry partners is considered weak and they do not share a common vision and mutual benefit. Another limitation is the sample size of our current study is small. This may raise a question of whether there will be a difference in motivation between the types of company - public, non-profit organization and private organisations as they come with different agenda.

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