

## RESEARCHERS' MOTIVATION, INTERACTION CHANNELS, AND STRATEGIES TOWARDS UNIVERSITY-INDUSTRY COLLABORATION: A CASE STUDY APPROACH

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**ABSTRACT** – The relationship between the university and industry is an important element to increase knowledge and technology exchange that benefits both. However, this collaboration remains unclear understanding how this relationship can be enhanced for better opportunities that impact the community and economic development. The decreased number of UIC grants is due to several influencing factors, mainly researchers' motivation, interaction channel, and innovation culture. This study will have a deeper understanding of the researchers' motivations, interaction channels, and strategies toward University-Industry Collaboration (UIC) from the context of a technical university. This research employed semi-structured interview sessions with top management of the university and academics and analyzed thematically. Through this study, it was found that the factors that influence the motivation of researchers are student talent, funding, enthusiasm to contribute, and appreciation as an expert. While the four interaction channels used to communicate with the industry are namely traditional channels, two-way channels, and commercial and service channels. Thus, strengthening channels of interaction, increasing the motivation of the researchers, and improving the culture of innovation will ultimately improve the UIC for the years to come.

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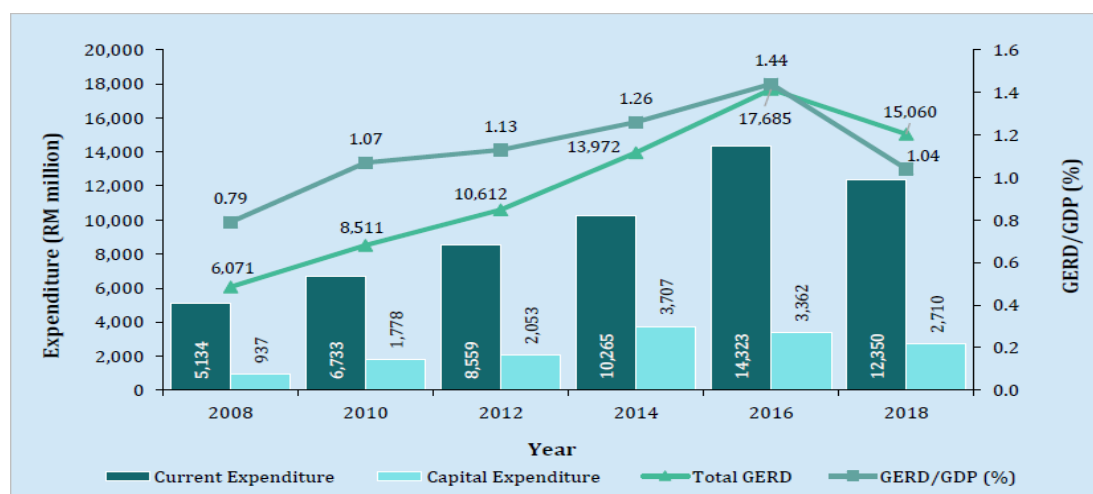
Researcher's Motivation

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## INTRODUCTION

Research and development (R&D) collaboration between universities and industry is pertinent due to the changes in economic environments and technologies. Currently, universities act as important external institutions for industries to enhance their innovations by implementing R&D collaboration. The innovation performance of academic research should be largely driven by collaborative engagement with industry by focusing on new methods that are more efficient and effective and reduce the routine operations of the organization (Ahamed Galib, Nahar Munny, & Khudaykulov, 2015). This is due to the downtrend in R&D investments as reported by Malaysia Science and Technology Report 2020, as shown in Figure 1.



Source: National Survey of R&D in Malaysia 2019

**Figure 1.** Gross Expenditure Research and Development in Malaysia 2008-2018

\*Note: Resources from Malaysian Science and Technology Report 2020

There is a downward trend in R&D investments during 2016-2018 which was reflected by the decline in the country's performance in GERD and GERD/GDP ratio. In 2018, Malaysia's GERD/GDP ratio was recorded at 1.04% compared to 1.44% in 2016. The decline was mainly due to the significant decrease in BERD. This sharp decline has disrupted the tremendous growth trend of Malaysia's GERD/GDP ratio since 2008. The expenditure for research and development increased but it was not sufficient to drive the growth of innovation (MOSTI, 2021).

Hence, Malaysia as a developing country needs to leverage innovation as a key source of productivity and enhanced economic growth (Ragupathy et al., 2020). This is possible with cooperation between universities and industry that needs to be implemented carefully to be balanced in terms of the needs and priorities of both parties as well as provide a win-win situation (Rybnicek & Königsgruber, 2019). However, several studies are often focused on barriers to university-industry collaboration (UIC): hierarchical communication style, bureaucracy, university and lack of results-oriented cultural focus (Azman, 2021). Recognition of the successes and strengths of UIC is also often expressed (Rybnicek & Königsgruber, 2019). The success of UIC projects depends heavily on being committed to achieving the fusion and synergy of both parties. Critical success criteria for managing effective strategic university-industry cooperation include commitment, open and transparent communication, rewards and benefits to individuals, organizations, and institutions, and support from management and the government (Seow et al., 2015). However, there is a lack of information about several elements that determine the collaboration process, such as the planning stage of U-I collaboration, which needs to be highlighted (Morandi, 2013).

Other research on cultural differences as different organizational cultures is seen as a key impediment to collaboration among partners and gave a significant impact on the outcomes of R&D (Fiaz & Naiding, 2012). The collaboration between industries and ties is hampered by a variety of impediments, ranging from university orientation and researchers' attitudes to university administration's attitudes and behavior (Bruneel et al., 2010). Existing research, on the other hand, has highlighted innovative culture and internal communication as crucial success determinants (Linke & Zeffass, 2011). Universities' performance in technology innovation is strongly influenced by three essential aspects of UIC settings, including management structure, innovation climate, and reward system (Chuan et al., 2020b). Nonetheless, there is a lack of studies focusing on how the motivations of researchers and their interaction channels can increase the UIC. There are many various forms of U-I connections, ranging from research collaborations to training, and they are not differentiated (Bodas Freitas & Verspagen, 2017). Thus, this study explores the researchers' motivations, and interaction channels towards UIC, and determines ways to improve the university researchers' involvement in UIC.

## LITERATURE REVIEW

### University-Industry Collaboration

Growing rivalry, a shorter product life cycle, and increased complexity are all putting pressure on organizations. Industry-university collaboration is regarded as a crucial kind of learning association, with universities focusing on knowledge contribution and industries dealing with the risks of innovation and gaining access to exploration (Fiaz & Naiding, 2012). UIC is an important component in driving the innovation process and requires frequent interaction and making innovation as main catalyst as well as universities and industry as the center (Giuliani et al., 2008). The innovation process occurs by establishing a policy of funding cooperation between universities and industry through patent activities, academic startups, student entrepreneurship, innovation, and entrepreneurship education programs (Kaloudis, 2019).

Collaboration allows several innovative capabilities to be combined to come up with something new and beneficial, culminating in a new degree of mastery. The overall number of university-industry collaborations is calculated by adding the number of university-industry partnerships, which are mostly in academic research and innovation. Engagement with industrial partners will be critical in the innovation process because it will give universities a larger number of resources and expertise at a reduced cost, as well as a method for partners to share risks (Lin, 2017).

Knowledge exchange and technology transfer are also seen as the innovation processes to increase innovation in various related fields (Ankrah & Al-Tabbaa, 2017). As a result, a collaboration between two or more partners is the ideal method to achieve these objectives. The impact and benefits of collaboration between the two parties depend on the activities undertaken such as cost reduction, achievement of innovation in various fields, branding and reputation, and enhancement of expertise in specific fields. Therefore, the collaboration between universities and industry is a necessary initiative in meeting the current increasingly competitive market and developing innovations in their respective products and services (Roshani, et al., 2015).

### Researchers' Motivations

Universities with significant support for research and innovation have a powerful linkage between researcher motivation and interactions with the industry to drive innovation performance compared to those universities with low support for an innovative climate (Huang & Chen, 2017). The success of the implementation of cooperation between the two parties is determined by the resources available and it will be offered and evaluated based on the quality and use of those resources by both parties (Rybnicek & Königsgruber, 2019). Because the industry expects something that is appreciated throughout the collaborative project and something tangible, strong teamwork between academics and industry, as well as the leadership qualities of the leaders, are vital in UIC initiatives and successful factors (Hanid et al., 2019). The motivation of academics to collaborate with industry is divided into two elements, namely motivating learning that leads to joint research, contract research, and consulting, and the motivation for the commercialization of research patents, spin-offs, and consultations (D'Este & Perkmann, 2011).

## Interaction Channels

Analysis of interactions between universities and industry can be done by measuring the performance of interaction channels as an indicator of UIC performance (Seppo, 2010). The traditional channels in UIC interaction are related to the recruitment of new graduates, committees and conferences, social networks, informal contacts, and publications. Service channels include staff training, seminars and industry skills training, knowledge exchange, staff attachment, facilities sharing, and consulting services (Lemos & Cario, 2017). The benefits gained are in economic terms which include the provision of resources and equipment, while in intellectual terms it includes training and learning as well as individual satisfaction (Arza, 2010).

Commercial channels consist of patents, licensing, spin-offs, prototypes, academic-related entrepreneurship, project collaboration, and cooperatives (Lemos & Cario, 2017). The impact of this academic research can be seen in the improvement and growth of the economy and the productivity of research and development in the private sector. Industry and universities will gain a positive outcome from substantial knowledge and technology transfer and in the meantime produce strategic partnerships that could be crucial for future initiatives and product innovation (Roshani, Lehoux, et al., 2015).

The bi-directional channel involves collaborative research and development between the two parties such as contract research, joint research, development of science and technology parks, and construction of knowledge networks (Lemos & Cario, 2017). Collaboration through this channel will facilitate access to funding resources, equipment, and research materials, increase the energy and expertise of the university and further increase the university's revenue generation through spinouts and licensing (Nasiibah & Zinatul Ashiqin, 2013). It is also found that various collaboration channels are more effective in promoting UIC because it reflects the advantages of the university and can attract more industry and university cooperation (Costa et al., 2021).

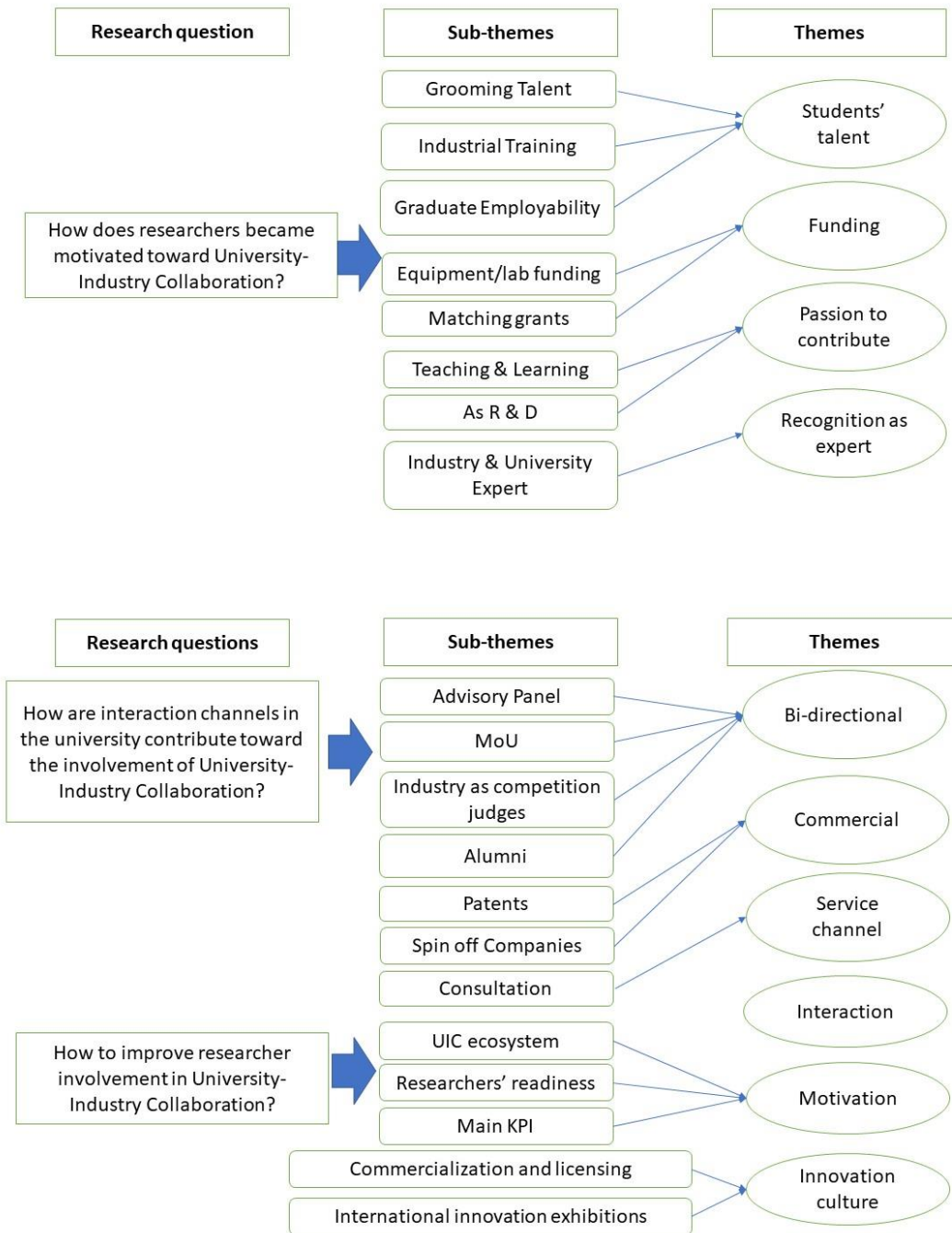
## METHODOLOGY

This study adopted a qualitative methodological approach using a case study as it is most suitable to reveal the experience and the opinion of the academician who is currently and was involved with UIC. This case study selects a technical university to investigate a contemporary phenomenon based on a real-world context from a deeper perspective. It is to seek clarification and understanding when the boundary between a phenomenon and a context is in a vague or ambiguous situation (Yin, 2018). Data collection was done through semi-structured interview sessions with top management of the university and academics. The steps required for data collection are setting the boundaries of the study (sampling and retrieval), and establishing a protocol for recording information (Creswell, 2018). Interviews were done with the experts such as; the Deputy Vice-Chancellor and Dean of Research and Innovation, Assistant Vice Chancellor Graduate Development Department, and academicians actively involved in UIC. All interviewees are the university's top management; however, they also have a certain workload as academic lecturers.

The sample size was determined by saturation, as this is considered the primary means of verification for thematic analysis (Suddaby, 2006). Saturation occurred when the interviewing of additional participants did not generate any new themes (Corbin and Strauss, 2015). Overall saturation was achieved for 5 participants. Braun and Clarke (2006, p. 35) offer six phases of thematic analysis that were employed: "familiarizing yourself with your data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report." This research iteratively applied the six phases to enhance the richness and depth of findings (Clarke, Braun & Hayfield, 2015). The interview transcripts were loaded into the software ATLAS.ti to conduct the thematic analysis because it offered transparency, flexibility, the ability to code data, and the ability to retrieve data quickly (Corbin and Strauss, 2015). To ensure the validity of the findings and reduce researcher bias, the three researchers in the research team each had a distinct role, as suggested by Saldana (2014). Researcher I conducted a thematic analysis of all the interviews, Researcher II conducted a thematic analysis of 10% of the interviews and Researcher III compared the themes, sub-themes, and codes from Researchers I and II.

## RESULTS AND DISCUSSION

The purpose of this paper is to understand the university-industry collaboration, using a technical university as a case study. The paper addressed the RQ1, RQ2, and RQ3 drawings in Figure 1. Figure 1 shows the progression from sub-themes to themes, whereby the arrows indicate transitions across the stages.



**Figure 2.** The progression from sub-themes to themes, whereby the arrows indicate transitions across the stages.

**RQ1. How do researchers become motivated toward University-Industry Collaboration?**

Based on the feedback from all participants, it was found that two main factors influence researcher motivation, namely student talent and academics. Researchers who focus more on joint consultation services will be more likely to benefit from UIC for students in terms of grooming student talent. One of the participant 1 stated: “At one point it was easy to engage with MNCs, most of the western, US and European saw academia as a place to groom talent, Motorola, Intel, and Keysight brought university program initiatives”. In addition, UIC also provides industry training placement for students. Industry training placement will provide an opportunity for students to experience real work in the industry and further open opportunities to be offered job placement if the student shows good performance during the industrial training period. This makes researchers very motivated to get involved in UIC since students' exposure to professional environments was valued highly. Continuous learning with outside parties and two-way knowledge flows were made possible by the contextual learning and knowledge exchange procedures that were developed through new interactions (Osorno-Hinojosa et al., 2022).

Participant 3 stated: *“Collaboration with industry gives students an advantage, Terra Drone joint projects, involve many fields such as computers and mechanics, and students have the opportunity to undergo industry training and job placement to the appropriate industry”*. Through the existing facilities, the researcher can offer their expertise to the industry in terms of research, innovation, and material testing. This in turn creates opportunities for research collaboration in the future. Access to a greater variety of research networks in various sectors, which can foster exponential growth and enhance the company’s reputation as a collaboration partner with the prestigious university is another incentive for the industry to engage (Aliu & Aigbavboa, 2020). Participant 2 stated: *“Universities need to meet with the industry regularly because the industry always does routine jobs, that is, in Malaysia, many industries do apply projects, not develop that technology but to improve the process, a great opportunity for venture universities is through SMEs because SMEs do not have R&D units, so that's where universities can play a role”*

Some participants explained that they were motivated to get involved in UIC due to their previous work experience in the industry. They feel that working experience in the industry is most useful during teaching and learning so that the knowledge and skills shared are in line with the current needs of the industry. Ultimately, the university can become a knowledge-sharing center for industrial cases (Huang & Chen, 2017). Participant 4 stated: *“The university acts as a service center to create and share knowledge with stakeholders such as students. Most basic for undergraduates, if at the top universities in the US and, Germany, the majority of lecturers who enter have industry experience, what is taught is not only a textbook but there is also a package with experience then students can visualize a first-hand experience that is made by the industry”*

The appreciation given by the industry to researchers due to their expertise and success has motivated researchers to collaborate with the industry. This appointment will give merit to them, especially in the application for job promotion and the appointment to university management positions. Participant 5: *“The recognition and the reputation given by the industry to us is also considered as one of the ways that can be motivated now through my own experience. Because of the past, I published a paper, and it attracted one of the companies who want to know more about how the companies can improve further from a governance perspective you know so they have now actually appointed me as one of their independent directors whom to give them some advice”*.

Good relations with the industry will also attract the interest of the industry to contribute technology and equipment to the university for the use of researchers and students. This is intended to introduce their technology and familiarize students with the technology. Participant 1 stated: *“Company A has sponsored equipment at the lab. Learning electrical subjects based on their technology. The benefit is that when their grade students are familiar with the technology, the chances for them to work with them are high”*

In addition to research grants, some researchers work with the industry to run CSR programs. These projects are often for short periods and more to CSR branding to industry and universities. Participant 1 stated: *“When industry and university collaborate, there are several aspects such as CSR program, industry gives university money and runs the program, most one-off and KPI is not high, for example, Company N gives university money to clean the beach, contribution towards improving the environment and make it complete. Some companies give a certain amount to repair the house”*. Research funding also motivates researchers to get involved in UIC. This is because it is required to meet the Key Performance Indicator (KPI) of the researcher as an academician. Research funding can be in the form of matching grants with the industry. Participant 5 stated: *“Probably one of the ways they can motivate us is the public funding. Yeah, once you have sufficient funding, the interaction with the industry will be able to motivate the researcher, so we can fully commit to the project that has been given to us without any worries. OK, there is one of the ways they can motivate us”*

In addition, passion to contribute is also a factor of researcher motivation towards UIC. Researchers want to improve their skills and knowledge of the industry. Some are more inclined to consulting work than research. Therefore, they are more comfortable working with the industry through product development projects and industry product innovation. Researchers must remember that their intense interest in the subject matter, not financial gain, is what drives them to conduct their research and collaboration with the industry (Zain et al., 2011).

## **RQ2. How do interaction channels in UMP contribute toward the involvement of University-Industry Collaboration?**

The interaction channel used in the university by researchers for UIC is more towards the traditional interaction channel. They use the medium of conferences and colloquiums to present the results of their research work to obtain research funding from the industry. This channel involves research initiatives that typically follow academics' agendas and do necessarily necessitate personal interactions with industry (Arza, 2010). Participant 4 stated: *“If there is more research in the form of a conference or an intellectual colloquium, they usually call for funds and presentations. The same academia also in the form of a conference, not only among the university but among competitors, when it comes to academia, they will be collaborators if the CSR project uses social media a lot, to announce and showcase what they have done”*.

The appointment as an advisory panel in the faculty to help evaluate the effectiveness of the faculty program has given a good effect on the relationship between the university and industry. This is because those appointed are at the top management level of the industry and this facilitates the university to expand other cooperation networks such as research, staff development training, and also knowledge-sharing programs with students. Universities can invite industry guest speakers to present on related issues, which can help students get ready for the coming wave of technology (John et al., 2021). Participant 5 mentioned: *“Talk and the sharing section and the benefits that can be brought after those have successful UIC records. OK, so maybe may invite them for sharing session so that the university researcher will have better knowledge of this part”*.

Participants also stated that the university often uses the medium of MoU to initiate and strengthen cooperation with the industry. The content of the MoU will also often include several items related to collaboration opportunities in the areas of research, academia, human development, and community service programs. Often at the MoU ceremony, the top management of the industry and the university will have a friendly discussion, and this will open up opportunities and make it easier to expand the network of cooperation between the two parties. Collaboration was challenging due to the bureaucracy inside the university framework, as well as their own strict rules, laws, reward and incentive structures, and administrative hierarchies with a variety of goals (Azman et al., 2019). It was mentioned by the participant 2: *“Always at the university is mostly formal through MoU/A, working visits, and appointment of CEO@faculty. That to me makes it somehow easier for some projects to go through go to the top, the top person then enters the bottom, if from the bottom there are many layers”*.

In addition, the university also uses informal interaction channels to cooperate with the industry. Relationships through friends and alumni who work in the industry provide an advantage to obtain opportunities for cooperation from both parties. This is because trust builds friendship, and it is easy for them to recommend the industry management. Collaboration in research is facilitated by trusting relationships between alumni and the university. Therefore, it will continue to draw top researchers as long as the membrane center holds its position as the epicenter of excellence (Whah, 2021). Participant 2 elaborated: *“Informally through the alumni and friend channel. As a friend my age, they have usually been in the industry for 15 years and the level of business owner and manager can make decisions. This is one of the channels to get a job. The projects I got mostly from one matriculation friends and alumni, networking among alumni”*.

Generally, the interaction channels that are often used in the university with the industry are traditional channels, bi-directional and service channels. The traditional channels through conference sessions often involve industry, universities, and individuals. This is a common channel used by all universities to obtain grant investors from the industry. The interaction channel most often used in the university is bi-directional. It involves the appointment of the CEO / industry manager as an advisory panel, meeting committee, and award evaluation panel. This has opened a space for closer cooperation by both parties because the university has already given recognition to the industry. In addition, the MoU medium is also often used to formally enter cooperation with the industry. The terms in the content of the MoU also cover cooperation in various fields. Another medium that is often used is the service channel which involves consulting services. It is very easy to attract industry participation because it suits the needs of the industry. The medium of interaction channel that is somewhat less used is the commercial channel. This is because the process of creating a spin-off company and registering patents is consuming quite a time and involves a lot of rules.

### RQ3. How to improve the university researchers' involvement in University-Industry Collaboration?

Researchers' involvement in UIC can be increased by improving the interaction between researchers and industry, researcher motivation, and encouraging innovation culture. This is because the ecosystem environment at the university at this time is not very stimulating for researchers to get involved in UIC. The intended ecosystem is to further streamline the role of the UIC focal center and provide academicians with training and skills to deal with the industry. University KPI also needs to be relooked at as UIC is not much emphasized as one of the promotion criteria. Participant 4 stated: *“Because the innovation culture is not a compulsory thing you know, so people tend to choose which one is compulsory to then so to be very honest if we want to embark on this innovation culture we need, we may need to put this in the university KPI. This is one of the, yeah, sometimes people would only do when they are asked to do”*

Currently, the university is weighty heavily on Times Higher Education (THE) and Malaysia Research Assessment (MyRA) rankings. The field of commercialization also needs to be enhanced by further strengthening the existing Commercialization Center so that it can play a role in commercializing the university's research products more effectively. Based on the finding in this study, the UIC ecosystem in the university already exists where there is a UIC Center, R&D Centre, and Commercialization Centre established to assist this UIC initiative. The issue is the effectiveness of this Centre in assisting researchers/ academicians involved in UIC. Reorganization needs to be done so that there is no duplication of duties between the faculty and the center while duties related to the main KPIs of researchers and training systems for commercialization need to be reviewed and improved. This is so that researchers get clear information on this. Participants also informed that the university needs to create a UIC ecosystem as a platform to provide facilities and an environment that supports the development of UIC in the university. One of the participants 4 mentioned: *Ecosystem in place, meaning how about the communication channel, let somebody from industry want to get our expertise, resource and sources where he wants to get, and our staff want to meet the industry where he wants to go refer, must refer to one place to get info about the company and value proposition, at least there must be one focal point, one center, otherwise it will not be impactful”*

A focal center needs to be established where it serves to provide industry information resources and university expertise as a reference for all parties. This is important so that communication between the two parties runs smoothly accurate information can be conveyed. An innovative ecosystem would also need tight cooperation between academia, government, industry, and the community because all of these are reliable indicators. The development of Malaysia's economy and technology is nourished by this partnership on concept incubation, development, and marketing (Ragupathy et al., 2020). Participants also stated that a focus on the staff's mindset and readiness is needed. Participants 4 stated: *“One of the challenges is our staff mindset staff their readiness, how ready they are to move to the industry, who have no experience whatsoever how confident he is, also their skillset (communication, attitude), then they can overcome and move forward. Like his faculty, we train our staff until he can autopilot when dealing with industry”*.

This is because not all staff have the experience and ability to deal with the industry. Working in teams that have multidisciplinary research knowledge and skills should be embedded in every researcher. Most of the researcher's training has focused on research and financial results. The researcher's perspective needs to be considered in the vision and mission of UIC. Researcher engagement programs are effective but have not been successful in developing researcher skill sets or achieving the vision and mission of collaboration (Kulkarni et al., 2020).

Some participants also suggested that UIC be included under the university's KPI as a motivation for every researcher to be involved in UIC. Currently, UIC is not a main key KPI in the researcher's workload. If it becomes a part of the KPI, all parties will implement it. High-performing organizations will discover ways to include employees, empower them to make decisions, encourage activities that are consistent with their fundamental values, adapt to their environment, and provide employees with a clear sense of direction and purpose that is represented in their mission (Samad et al., 2018). Participants gave the view that researchers should use more international exhibition to showcase and promote their research products to attract local and foreign industry interest. Competitions and exhibitions also need to be organized openly outside the university to facilitate industry access and encourage an innovation culture. Participant 2 mentioned that: *"This culture is still new in Malaysia, but more to the point of how many medals are the reason to get marks in MyRA and so on. But in Germany, the industry is willing to pay to enter the exhibition, because they want to see new inventions. But here, people don't come for paid exhibitions, people don't come for free ones unless it's made in KLCC, it's the industry that comes to see"*.

## CONCLUSIONS

This research provides an insightful bridge between the university and the industry to understand how both parties can work individually and collaboratively to best prepare students for the graduate labour market, resulting in enhanced outcomes for all stakeholders. More in-depth research needs to be done on researcher demotivation in the university which sees some key aspects such as extra workload, lack of value promotion, and lack of trust and teamwork have a great impact on researcher motivation to get involved in UIC. This will also affect the mindset of the researcher in working to achieve the KPIs set by the university. It is very detrimental if the university has a potential researcher but is not motivated with the right values. This will also have an impact on the achievement of collaboration between industry and universities. Secondly, the role of the UIC Center to attract industry participation could be another avenue for research where it is seen as not very effective in providing the UIC ecosystem in the university.

## REFERENCES

- Ahamed Galib, M., Nahar Munny, K., & Khudaykulov, A. (2015). Enhancing university-industry collaboration: What are the drivers of academic researchers' involvement in the industry? *International Journal of Innovation And Economic Development*, 1(1), 36–46.
- Aliu, J., & Aigbavboa, C. O. (2020). Structural determinants of graduate employability: impact of university and industry collaborations. *Journal of Engineering, Design, and Technology*, 19(5), 1080–1100. <https://doi.org/10.1108/JEDT-05-2020-0189>
- Ankrah, S., & Al-tabbaa, O. (2017). Universities — industry collaboration: A systematic review. *Scandinavian Journal of Management*, 31(3), 387–
- Arza, V. (2010). Channels, benefits, and risks of public-private interactions for knowledge transfer: Conceptual framework inspired by Latin America. *Science and Public Policy*, 37(7), 473–484. <https://doi.org/10.3152/030234210X511990>
- Azman, M., & Sirat. (2021). University-industry collaboration : clash of two cultures.
- Azman, N., Sirat, M., Pang, V., Lai, Y. M., Govindasamy, A. R., & Din, W. A. (2019). Promoting university-industry collaboration in Malaysia: stakeholders' perspectives on expectations and impediments. *Journal of Higher Education Policy and Management*, 41(1), 86–103. <https://doi.org/10.1080/1360080X.2018.1538546>
- Bodas Freitas, I. M., & Verspagen, B. (2017). The motivations, institutions, and organization of university-industry collaborations in the Netherlands. *Journal of Evolutionary Economics*, 27(3), 379–412. <https://doi.org/10.1007/s00191-017-0495-7>
- Bruneel, J., Este, P. D., & Salter, A. (2010). Investigating the factors that diminish the barriers to university-industry collaboration. 39, 858–868. <https://doi.org/10.1016/j.respol.2010.03.006>
- Chuan, F., Mu, T., Huang, H., & Zen, D. (2020b). University Innovation Performance. *The Journal of Technology Transfer*, 45(2), 560–577. <https://doi.org/10.1007/s10961-018-9656-6>
- Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic analysis. *Qualitative psychology: A practical guide to research methods*, 222–248.
- Corbin J & Strauss A (2015) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Fourth edition. Sage, Thousand Oaks, Ca. 170–435.

- Costa, J.; Neves, A.R.; Reis, J. Two Sides of the Same Coin. University-Industry Collaboration and Open Innovation as Enhancers of Firm Performance. *Sustainability* 2021, 13, 3866. <https://doi.org/10.3390/su13073866>
- Creswell (2018). *Research Design Qualitative, Qualitative and Mixed Methods Approaches* (6th edition, Issue July). SAGE Publications, Inc.
- D'Este, P., & Perkmann, M. (2011). Why do academics engage with industry? The entrepreneurial university and individual motivations. *Journal of Technology Transfer*, 36(3), 316–339. <https://doi.org/10.1007/s10961-010-9153-z>
- Fiaz, M., & Naiding, Y. (2012). Exploring the Barriers to R&D Collaborations: A Challenge for Industry and Faculty for Sustainable U-I Collaboration Growth. *International Journal of U- & E-Service, Science & Technology*, 5(2), 1–15. <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=80176353&site=ehost-live>
- Giuliani, E., Morrison, A., Pietrobelli, C., & Rabellotti, R. (2008). Why Do Researchers Collaborate with Industry? An Analysis of the Wine Sector in Chile, South Africa, and Italy. April, 3–18. <https://doi.org/10.47556/b.outlook2008.6.1>
- Hanid et al. (2019). Critical Success Factors in University-Industry Collaboration Project in Research Universities. 15(2), 1–23.
- Huang, M. H., & Chen, D. Z. (2017). How can academic innovation performance in university-industry collaboration be improved? *Technological Forecasting and Social Change*, 123, 210–215.
- Huang, M., & Chen, D. (2017). Technological Forecasting & Social Change How can academic innovation performance in university-industry collaboration be improved? *Technological Forecasting & Social Change*, 123, 210–215. <https://doi.org/10.1016/j.techfore.2016.03.024>
- Kaloudis, A., Aspelund, A., Koch, P. M., Lauvås, T. A., Mathisen, M. T., Strand, Ø., ... & Aadland, T. (2019). How universities contribute to innovation: A literature review-based analysis. Norwegian Higher learning institution of Science and Technology. Oslo, Norway.
- Kulkarni, P., Mutkekar, R., & Ingalagi, S. (2020). Role of strategic management for employee engagement and skill development for start-ups. *Vilakshan - XIMB Journal of Management*, 17(1/2), 79–95. <https://doi.org/10.1108/xjm-07-2020-0036>
- Lemos, D. da C., & Cario, S. A. F. (2017). University-industry interaction in Santa Catarina: evolutionary phases, forms of interaction, benefits, and barriers. *RAI Revista de Administração e Inovação*, 14(1), 16–29. <https://doi.org/10.1016/j.rai.2016.12.001>
- Lemos, D., & Cario, S. A. F. (2017). The national and regional innovation systems and their influence on university-business interaction in Santa Catarina. *REGE-Revista de Gestão*, 24(1), 45–57.
- Linke, A., & Zerfass, A. (2011). Internal communication and innovation culture: developing a change framework. *Journal of Communication Management*, 15(4), 332–348. <https://doi.org/10.1108/13632541111183361>
- Morandi, V. (2013). The management of industry-university joint research projects: How do partners coordinate and control R&D activities? *Journal of Technology Transfer*, 38(2), 69–92. <https://doi.org/10.1007/s10961-011-9228-5>
- MOSTI. (2021). *Malaysian Science Technology and Innovation Indicators Report 2020*. 13, 99–109.
- Nasiibah, R., & Zinatul Ashiqin, Z. (2013). University-Industry Collaboration: Entrepreneurial University Catalyst towards. *Prosiding PERKEM VIII*, 3, 1227–1233.
- Osorno-Hinojosa, R., Koría, M., & Ramírez-Vázquez, D. D. C. (2022). Open Innovation with Value Co-Creation from University-Industry Collaboration. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(1). <https://doi.org/10.3390/joitmc8010032>
- Ragupathy, D. K., Baharin, S., & Turan, F. M. (2020). University-industry collaboration: the role of public universities within the Malaysian manufacturing landscape. *Journal of Modern Manufacturing Systems and Technology*, 4(1), 36–44.
- Roshani, M., Lehoux, N., & Frayret, J.-M. (2015). *University-Industry Collaborations and Open Innovations: An Integrated Methodology for Mutually Beneficial Relationships*. 1988.
- Rybnicek, R., & Königsgruber, R. (2019). What makes industry-university collaboration succeed? A systematic review of the literature. *Journal of Business Economics*, 89(2), 221–250. <https://doi.org/10.1007/s11573-018-0916-6>
- Saldana, J. (2014). Coding and analysis strategies. *The Oxford handbook of qualitative research*, 581–605.
- Seow, A., Yee, V., Chong, A. L., & Kendall, G. (2015). Managing University-Industry Collaborations in Malaysia by Examining its Critical Success Factors: A Dyadic Approach. *World Review of Business Research Issue*. Pp,5(3), 213–230.
- Suddaby, Roy. 2006. “From the Editors: What Grounded Theory Is Not.” *Academy of Management Journal* 49 (4):633–42. Doi: 10.5465/amj.2006.22083020.



- Yin, R. K. (2009). Case Study h Research Design and Methods. In Applied Social Research Methods Series (Vol. 5). SAGE Publications, Inc. [http://cemusstudent.se/wp-content/uploads/2012/02/YIN\\_K\\_ROBERT-1.pdf%5CnISBN 978-1-412296099-1](http://cemusstudent.se/wp-content/uploads/2012/02/YIN_K_ROBERT-1.pdf%5CnISBN%20978-1-412296099-1)
- Zain, M. F., Hipni, A., Ramli, N. L., & Wan Ghopa, W. A. (2011). Motivation for research and publication: Experience as a researcher and an academic. *Procedia - Social and Behavioral Sciences*, 18, 213– 219. <https://doi.org/10.1016/j.sbspro.2011.05.030>

## CONFLICT OF INTEREST

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