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Halizan Mohmood and Puteri Fadzline Muhamad Tamyez

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Researchers' Motivation, Interaction Channels and Innovation Culture Towards University-Industry Collaboration: A Case Study Of Universiti Malaysia Pahang

Halizan Mohmood[1], and Puteri Fadzline Muhamad Tamyez[2*]

[1, 2] *Faculty of Industrial Management, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Pahang, Malaysia*

[*] *Corresponding author: izan@ump.edu.my*

ABSTRACT

The relationship between the university and industry is an important element in creating the development of innovation in a university. The decrease number of UIC grant in a year 2012- 2019 is probably due to several influencing factors such as researcher motivation, interaction channel and innovation culture. The research objective of this study is to explore the researchers' motivations, interaction channels and innovation culture towards University- Industry Collaboration. It also to determine the way to improve UMP researchers' involvement in University-Industry Collaboration. This research is qualitative research and Universiti Malaysia Pahang as a case study. Data collection was done through semi-structured interview sessions with top management of the university and academics as well as analytical documentaries. It also used thematic analysis for the responses from the interview session. 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 in UMP there are four interaction channels used to communicate with the industry, namely traditional channels, two -way channels, commercial and service channels. A culture of innovation is also created at UMP through a wide selection of local grants and innovations. Through this study also identified several factors to increase the involvement of researchers in collaboration between universities and industry by strengthening channels of interaction, increasing the motivation of researchers and improving the culture of innovation in UMP. There are also several factors that lead to the loss of motivation of researchers.

Keywords: University-Industry Collaboration, Researchers Motivation, Interaction Channel, Innovation Culture.

INTRODUCTION

The global education is now heading into the era of the Industrial Revolution 4.0 where the development of innovation in information and technology are increasingly dynamic and competitive. The symbiotic relationship between universities and industry becomes a catalyst in accelerating the achievement of innovation and technology. Universities- industry collaboration (UIC) UIC is a relationship that involves institutions of higher learning and industry with the main objective to increase knowledge and technology exchange that benefits both (Bekkers & Bodas Freitas, 2008). Cooperation between universities and industry is one of the most important components to advance both organizations in terms of knowledge and new technologies. This relationship consists of four related components; namely knowledge transfer, technology transfer, support in research and cooperative research (Santoro, 2000). This collaboration is aimed at obtaining better opportunities that impact the community, economic development, additional funding, student learning opportunities in the industry and cooperation with the government for program funding grants (Elsevier, 2021). Through the impact

of this cooperation, it is seen as a critical element in the transformation of the country's innovation system towards better efficiency (Paunov et al., 2019).

Industry and university collaboration in the field of research play an important role to not only increase the number of licenses and patents, commercialize services and products and help improve the national economy (Ahamed Galib et al., 2015). This collaboration also provides opportunities for innovation through knowledge transfer. In addition, it opens up opportunities to gain industry experience and expertise through industry training, staff attachment and student final year projects. The success of this collaboration is driven by the trust, leadership, communication and commitment of both parties (Rast et al., 2015).

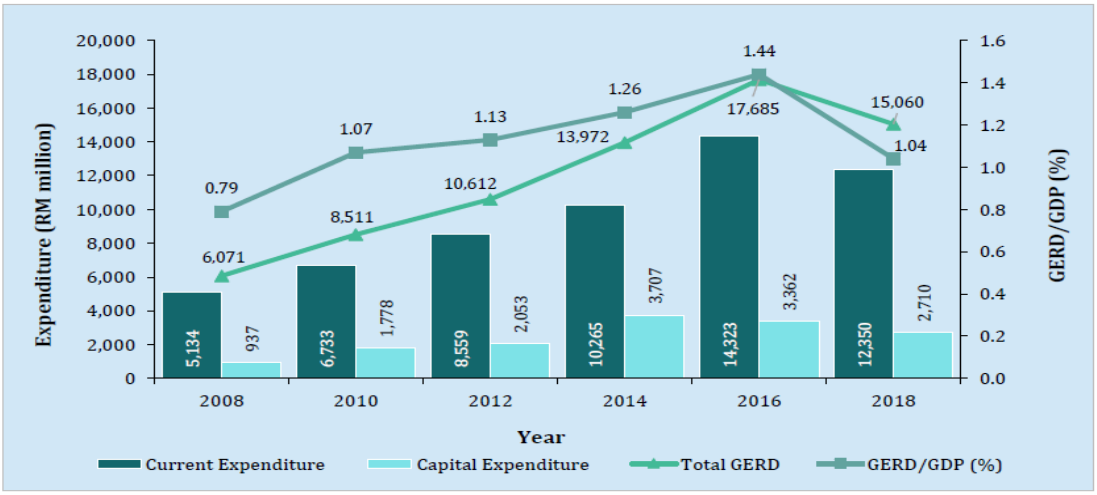
Based on the survey reported in the 12th Malaysia Plan (2020-2025) as well as the Science Survey 2020, UIC is less prioritized and developed which does not give a high impact to the industry and the community. This situation creates competitiveness on all universities in Malaysia to establish their University Industry Collaboration (UIC) particularly to improve university innovation. Through innovation, universities must also be proactive in improving their relationships with industry (Salleh & Omar, 2020).

The main purpose of UIC cooperation is to enhance research and development as well as human capital development. Malaysia as a developing country needs to leverage on innovation as a key source to increase productivity and enhance economic growth (Ragupathy et al., 2020). The Malaysian government has adopted several administrative policies and initiatives stressing collaboration between universities and the commercial sector in order to increase research productivity and facilitate the transfer of university research discoveries. Among the initiatives established in the context of the University-Industry Collaboration are the Industrial PhD and 2u2i (two years at university and two years in industry) (Azman, 2021). These exchanges will provide enormous potential and benefits for both sides, including promoting graduate talents to industrial employers.

This study needs to be conducted in UMP is because of the need of UMP to know what are the factors that influence the motivation of researchers to get involved in UIC. It also important to know the types of interaction channels that are often used in UIC as well as to measure the extent of the existence of innovation culture in UMP and the factors that influence it. It is important for the university to plan strategies to encourage more researchers to get involved in UIC and create new initiatives and improve old initiatives to attract their interest and further increase the number of UIC -related grants in the future.

The 12th Malaysia Plan has highlighted its research and innovation outcomes and its low impact on the industry and community. This include the pre-commercialization stage, development of prototypes, proofs of concept and pilot projects, which was also low and affecting the rate of commercialization. This was mainly due to the lack of collaboration between universities and industry, poor coordination among agencies, lack of investment in high end R&D and insufficient talent in Science Technology Innovation (STI) (UPE, 2021).

Apart from that, the Malaysia Science and Technology Report 2020 which is shown in Figure 1.0, has depicted 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. Even the expenditure for research & development increased but not sufficient enough to drive growth of production innovation (MOSTI, 2021).



Source: National Survey of R&D in Malaysia 2019

*Note: Resources from Malaysian Science and Technology Report 2020

Figure 1.0: Gross Expenditure Research and Development in Malaysia 2008-2018

From the context of Universiti Malaysia Pahang as one of Malaysian Technical University Network (MTUN) specializing in engineering and technology, research and innovation is one of the major focus particularly industrial grants through university and industry collaboration. This will benefit universities as a whole (Fischer et al., 2018). However, the number of UMP industrial grant for the year 2012 until 2020 is shown in Figure 1.1.

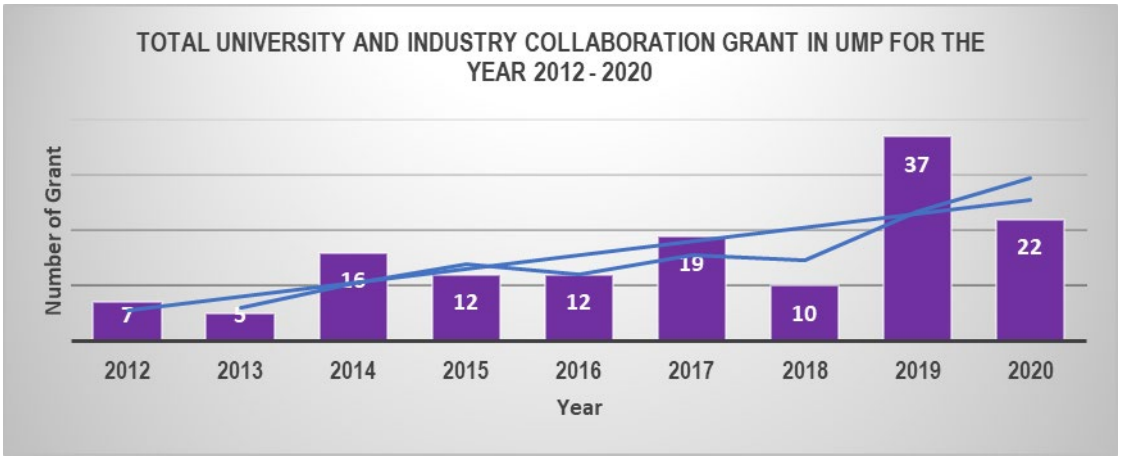


Figure 1.2: The Total University and Industry Collaboration Grant in UMP for the year 2012 - 2020

Note. *Summarized from "Universiti Malaysia Pahang Annual Report 2012 -2020"

Figure 1.1 shows a fluctuating trend of University Industry Collaboration (UIC) Grant in Universiti Malaysia Pahang) since 2012. In the eight years of UMP UIC grant performance, the minimum total UIC grant is on year 2013 which totaled to five grants and the maximum total UIC grant is 37 grants in year 2019. Year 2020 also shows a significant decline trend in the number of grants. Overall, the achievement of industrial university cooperation grants in 2012 -2019 showed a significant decline and this has led to an alarming impact on UIC. Although there was an increase in the number of

grants in 2019 but the number of industrial grants received in 2020 decreased from 37 to 22 grants. This decrease is probably due to several influencing factors such as researcher motivation, interaction channel and innovation culture but this statement must be studied and proven to overcome this issue.

The innovation performance of academic research is 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 et al., 2015). Several studies have revealed that management should play a role towards the UIC success (Carolin Plewa, 2013). The mutual benefits of UIC are dependent on a variety of elements, including a monetary incentive programme, managerial support and an innovative organizational culture (Chuan et al., 2020). Thus, cooperation between universities and industry 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).

Several studies are often focused from an academic perspective only such as by stating the barriers to the success of UIC collaboration which are hierarchical communication style, bureaucracy, university inflexibility and lack of results -oriented cultural focus (Azman, 2021). Recognition of the successes and strengths of UIC is often expressed and at the same time there are also obstacles and challenges that need to be overcome that contribute to the failure of this collaboration (Rybnicek & Königsgruber, 2019). The success of UIC projects depends heavily on everyone participating being committed to achieving the research's goal by fusing the two organizations and comprehending the two surroundings (M. Hanid et al., 2019). 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 a number of elements that determine the collaboration process, such as the planning stage of U-I collaboration, which needs to be highlighted (Morandi, 2013).

Others researched on cultural differences also stated that the different organization cultural are seen as a key impediment to collaboration among partners and have a significant impact on the outcomes of R&D collaborations. Cultural differences play a significant effect in the formation of joint ventures of this nature (Fiaz & Naiding, 2012). The collaboration between industries and universities is clearly 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 & Zerfass, 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). Continued studies on innovation culture and its bases may concentrate on the need of taking innovation effectively and having a written plan in place, as well as an aggressive research approach based on a clear commitment (Olmos-Peñuela et al., 2017).

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. The lack of understanding of motivational alignment and organizational structure in UIC collaboration as well as absence of organizations supporting this alignment (Bodas Freitas & Verspagen, 2017). Motivation is essential in collaboration and it is targeted towards a certain action or aim. The differences in both motives will derived to choose the wrong collaboration due to the lack of understanding each other (Proulx et al., 2014). Because industry expects something that is appreciated throughout the collaborative project and definitely something that is tangible, strong teamwork between academics and industry, as well as the leadership qualities of the leaders, are vital in UIC initiatives and successful factors (M. Hanid et al., 2019).

LITERATURE REVIEW

University-Industry Collaboration

The definition of university and industry cooperation is very broad. 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). Growing rivalry, a shorter product life cycle, and increased complexity are all putting pressure on industrial companies. External sources of innovation are becoming increasingly popular as a means of acquiring new ideas, developing new competencies, and gaining access to the most recent academic research (Schofield, 2013). As a result, innovation tends to alter organizational perceptions and connections. Furthermore, innovation in its broader socio-technical, socioeconomic, and political aspects has the ability to greatly impact, shape, and evolve how people live their lives, businesses create, cooperate, success, and failure, and countries prosper or collapse (Taratori et al., 2021).

UIC it is an important component in driving the innovation process which requires frequent interaction and making innovation as the 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 start -ups, student entrepreneurship and innovation and entrepreneurship education programs (Aris Kaloudis, 2019). University-industry partnership has been a prominent research priority as a tool for institutions to access new areas of knowledge and technology. Collaboration allows several innovative capabilities to be combined to come up with something new and beneficial, culminating in a new degree of mastery (Wang, 2016). 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. For scholars to broaden their knowledge sources, they must interact. Engagement with industrial partners will be critical in the innovation process because it will give universities with a larger number of resources and expertise at a reduced cost, as well as a method for partners to share risks (Lin, 2017).

Collaboration between universities and industry also occurs when the two parties interact with the aim of encouraging and enhancing the exchange and transfer of knowledge and technology (Bekkers & Bodas Freitas, 2008). Knowledge exchange and technology transfer are also seen as one of the innovation processes to increase innovation in various related fields (Ankrah & Al-tabbaa, 2017). As a result, 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 (Ivascu et al., 2016). The creating and implementing capital resource cooperation is an important element. Therefore, the relationship and communication between the two parties in obtaining various resources through long -term trust, understanding and loyalty must be established and maintained (Thune, 2007). The planning and monitoring of collaborative projects should involve both parties together in doing so (Pertuzé et al., 2010). Therefore, the collaboration between university and industry is a necessary initiative in meeting the current increasingly competitive market and developing innovations in their respective products and services (Roshani, Roshani, et al., 2015).

Researchers' Motivations

Universities with significant support for a research and innovation have a powerful linkage between researcher motivation and university culture to drive the innovation performance compared to those universities with low support for an innovative climate (Huang & Chen, 2017).

The main motivation of researchers involved in university and industry cooperation is to cover the lack of public funding by making the relationship with the industry as one of the financial resources to fund academic staff, equipment and laboratory materials and students (Haase, 2015). The success of

the implementation of cooperation between the two parties is determined by the resources available and that will be offered and evaluated based on the quality and use of those resources to both parties (Rybnicek & Königsgruber, 2019).

Motivation of academics to collaborate with industry is divided into two elements, namely motivated learning that leads to joint research, contract research and consulting. While the motivation for the commercialization of research is patents, spin offs and consulting (D'Este & Perkmann, 2011). While another motivation that leads to UIC is to get job opportunities and placement of university graduates which will help improve the reputation and branding of the university and attract new students to choose the university to continue their studies (Rohrbeck & Arnold, 2011).

The industry is of the view that among the factors that drive this collaboration is to increase competitiveness as the first organization to discover scientific technology knowledge, risk sharing through joint research project, the utilization research facilities, greater productivity and lower labor expenses for research purposes (Costa et al., 2021). The motivation of each researcher is not easily measured directly, there are also other factors that influence the motivation of researchers in UIC such as career development and advancement to a better level and the appreciation given by the university for their contribution (Hsing-Fen Lee, Marcela Miozzo, 2010).

Interaction Channels

The interaction channel is very important to the universities. It is about how the landscape of how university need to be in their operation (Rayna, 2014). Interaction channels consist of various categories namely bi-directional, traditional, commercial and service channels. Among the following channels are commercial channels that are not important and less popular among industry and academia (Nsanzumuhire & Groot, 2020). Analysis of interactions between universities and industry can be done by measuring the performance of interaction channels as an indicator of UIC performance (Marge 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 (Lemos & Cario, 2017). The benefits of traditional channels are to provide universities with infrastructure and equipment facilities, funding and opportunities to increase knowledge as well as professional integration of students (Perkmann et al., 2013).

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 includes 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 on the improvement and growth of the economy and productivity of research and development in the private sector as a whole. Through licensing activities has launched new technology transfer and product commercialization activities by the private sector (Lach & Schankerman, 2008). Industry and universities will gain positive outcome from substantial knowledge and technology transfer and in the meantime producing strategic partnership that could be crucial for future initiative 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 spin-outs and

licensing. Another impact will be to improve university research facilities and research fundraising for the future (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 is able to attract more industry and university cooperation (Costa et al., 2021). Greater opportunities for collaboration between the university and industry can be created if university researchers interact more often with industry staff, the more frequent visits are made will give a better impact to the project (Pertuzé et al., 2010). Each channel of interaction has different roles and benefits whether short -term or long -term effects. The best channel is the channel that gives a high impact in a long period of time that is related to the preparation and joint development and contracts, human resources and property rights to the industry (De Fuentes & Dutrénit, 2012).

Innovation Culture

Innovativeness at a university or industries can be described in a variety of ways, from the desire to be innovative to the ability to provide new products, services, or ideas to the implementation of processes and systems that can improve business performance (Dobni, 2008). The strategy, structure, support mechanisms, behaviors that stimulate innovation, and communication are all determinants of innovation culture (Padilha & Gomes, 2016). Because of the "cultural distance" between partners in terms of "goals, viewpoints, reasons, and routines," U-I collaboration has been described as "very multidimensional (Bäck & Kohtamäki, 2015).

Innovation framework and factors that encourage innovation have a significant influence on productivity than culture as a whole. The formalisation of the decision-making process, flexibility of the organizational structure, teamwork, appreciation of ideas, and updated information have a significant impact on performance in product innovation (Padilha & Gomes, 2016). Internal communication should seek to guide staff members through several stages of identification in order to foster an innovation culture on a micro level (Linke & Zerfass, 2011). As a result, a company with more direct connections has access to a wider variety of information sources, which fosters the recombination that leads to improved innovation (Tian et al., 2021). Students can develop an innovative idea into a marketable product with the help of industry. An effective team will produce graduates with excellent employability rates as well as creative business owners (Wijesinghe et al., 2018).

In order to develop creativity, a company's ideology must have a networking culture. Even if the organization operates on a worldwide scale and does not employ an open innovation model, networking skills can be quite beneficial (Roshani, Lehoux, et al., 2015). The university resource such as laboratories services, research equipment, expertise and technology are the resource can be offered to the industry. Besides that, the organizational structure and police or procedure also play the role to develop and encouraging the university industry collaboration (Elsevier, 2021).

The adoption of a culture of the importance of university and industry collaboration in the university environment will increase research funding and in turn help universities meet future financial needs (Kurtulus Kaymaz, 2011). The development and also the implementation of various policies and programs in the university with the aim of creating and supporting an improved research environment of collaboration between universities and industry. This is important because the industry will be easily attracted to the research environment that benefits them (Chuan et al., 2020a).

METHODOLOGY

This research study is qualitative research as it is most suitable to reveal the experience and the opinion of the academician who are currently and was involved with UIC to obtain their motivations, interacting channel and innovation culture towards UIC in UMP. This case study selects Universiti Malaysia Pahang as one of the public universities of higher learning located in the state of Pahang. Case study is a method used to investigate in depth a contemporary phenomenon based on the real-world

context. 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 as well as analytical documentaries. 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). Semi-structured interviews are a common strategy for conducting qualitative research. This method begins by asking some key questions that lead to the definition of the field of study. Through the main question the interviewer develops a branch of the question to get a more detailed explanation or idea from the person being interviewed (Gill et al., 2008). Five extensive interviews have been done on March – April 2022 with the following experts (1) Deputy Vice Chancellor Research and Innovation, (2) Dean Innovation Industry, (3) Assistant Vice Chancellor Graduate Development Department and (4) An academician actively involved in UIC. All interviewees are the university's top management; however, they also have a certain workload as academic lecturers in the Universiti Malaysia Pahang. This study used thematic analysis for the responses from the interview session. By using this technique, the researcher can determine and understand the driver factors influencing towards university and industry collaboration.

RESULTS AND DISCUSSION

Based on the thematic analysis of the interviews with all participants, the findings show that there are 4 themes for RO1, 4 themes for RO2, 2 themes for RO3 and 3 themes for RO4. Table 2 depicts the distribution of themes.

Table 1.2: Distribution Sub -Themes and Themes

Research Question	Sub Themes	Themes
RO1. How does researcher's became motivated toward University-Industry Collaboration?	• Grooming Talent • Industrial Training • Graduate Employability	Student Talent
	• Equipment/lab funding • CSR funding • Research funding	Funding
	• as R & D • New Technology for Teaching & Learning	Passion to Contribute
	• Industry & University Expert	Recognition as Expert
RO2 How are interaction channels in UMP contribute toward the involvement of University-Industry Collaboration?	• Conference	Traditional
	• Advisory Panel • MoU	Bi-directional

	• Industry as competition judges • Alumni	
	• Patents • Spin off Company	Commercial
	• Consultation	Service channel
RO3. What is the UMP innovation culture that contribute towards UIC?	• Increased of internal grants	Variety of grants
		Local innovation
4. How to improve researcher involvement in University- Industry Collaboration?	• UIC ecosystem • Researchers readiness	Interaction
	• Main KPI • Training for commercialization and licensing	Motivation
	• International innovation exhibitions	Innovation culture

Table 1.3: Distribution of Themes

Themes	List of Participants				
	P1	P2	P3	P4	P5
RQ 1					
Student Talent	✓	✓	✓	✓	✓
Funding	✓	✓			✓
Passion to Contribute		✓	✓	✓	✓
Recognition as Expert	✓	✓	✓	✓	✓
RQ 2					
Traditional	✓	✓		✓	✓
Bi-directional		✓	✓		✓
Commercial		✓	✓		✓
Service Channel		✓			✓
RQ 3					
Local Innovation	✓	✓	✓	✓	✓
Variety of Grants		✓		✓	
RQ 4					
Interaction	✓	✓		✓	✓
Motivation	✓	✓	✓	✓	✓
Innovation Culture		✓	✓	✓	✓

Based on the interview results with five participants shown on the Table 1.3, there are four themes for RQ 1, four themes for RQ 2, two themes for RQ 3 and three themes for RQ 4. All participants are agreed that student talent and recognition as expert are the main factor that influence researcher motivation, only three participants stated the funding factor and only four participants stated their opinion about the passion to contribute in UIC. Only four participants also respond about traditional interaction channel that used in UMP in collaborating with industry. Three participants also stated the others interaction channel that used in UMP such as bi-directional and commercial. The two participants also stated service channel also used but not in wider range. All participants also agreed that local innovation is the types of innovation culture in UMP contribute towards UIC but only two participants stated that the variety of grants also the initiative that done by UMP to build innovation culture. Lastly, all participants agreed that to improve researcher involvement in UIC, UMP must increase researcher's motivation. Only four participants stated that interaction and innovation culture also need to be improve by UMP to increase the researcher involvement in UIC.

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 academic. Researchers who focus more on joint consultation services will be more likely to benefit from UIC for students (grooming talent, industrial training and graduate employability). While for researchers who are inclined to research collaboration grants will benefit more from collaboration with industry through funding (research, teaching equipment and CSR), experience with industry and recognition as an expert. But there are also a handful of researchers who are motivated to get involved in UIC due to their passion to contribute, interest and also the advantages they have such as having served the industry before becoming an academician and have networking and a reputation that has been known by the industry. They are also very comfortable with the working environment with the industry and the income earned from consulting services. The intellectual (learning and teaching) and economic (commercialization and access to in-kind resources) components of UIC motives can both have an effect on UIC performance (Huang et al., 2019).

Looking at this situation can be categorized researcher motivation in UIC in UMP is still at a moderate level, where there are many who are interested in getting involved in this UIC but the university environment factors are not very supportive of them. Most of them are motivated to do so on their own initiative and interest. Senior researchers may be interested in increasing the relationship between publishing and the resource access motives of the faculty, while junior scholars may aim to increase the relationship between learning motivation and patent outputs (Huang et al., 2019).

Theme 1: Student Talent

Sub Theme 1(a): Grooming Talent

Close cooperation between the university and the industry is able to attract parties to hold talent development cooperation programs organized by the industry. The talents of these potential students will be given focused training through special programs with the industry. The experience of industry practitioners at UIC can be divided into two categories: research-focused (joint research projects, joint patenting or licensing), or exclusively center on academic talent recruitment (student internships and student projects) (Giones, 2019).

Sub Theme 1(b): Industrial Training

In addition, through UIC also has the opportunity to get student placement for industry training. Industry training placement will provide an opportunity for students to experience real work in the industry and further open up opportunities to be offered job placement if the student shows good performance during the industry training period. This makes researchers very motivated to get involved in UIC. Its improvement of soft skills as a result of 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).

Sub Theme 1©: Graduate Employability

Once the good relationship between the university and the industry has, it is very easy for academicians/researchers to gain the trust of the industry, this will launch cooperation between both parties and open job placement opportunities for students. Numerous employability programmes have been formed at the ministerial, academic, and industrial levels, where students can earn top-tier certificates that are respected by business in addition to their degree (Ragupathy et al., 2020).

Theme 2: Funding

Sub Theme 2 (a) Equipment /Lab Funding

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 also familiarize students with the technology. The purpose of funding is different depending on the objective of cooperation, namely for the purpose of CSR, product innovation, research and student learning. Industry increasingly engage in R&D operations within the infrastructure of universities and transfer a share of their R&D costs to universities as support for academic programmes (Hsu et al., 2015).

Sub Theme 2 (b) CSR Funding

In addition to research grants, there are also researchers who work with the industry with the aim of running CSR programs. These projects are often for short periods and more to CSR branding to industry and universities.

Sub Theme 2 (c) Research Funding

Based on the participants feedback, research funding is the main objective that motivates researchers to get involved in UIC. This is because it is required to meet the KPI of the researcher as an academician. Research funding is in the form of applied research grant or fundamental research grant. In general, commercial businesses anticipate that supporting academic researchers at universities will give them a technological or competitive advantage. In response, academic scholars who receive financial aid from businesses might be eager to participate in those businesses' R&D efforts (Cheng et al., 2020).

Theme 3: Passion to Contribute

Sub Theme 3 (a) As Research and Development

Participants also stated that the complete laboratory equipment facilities at the university also encouraged them to collaborate with the 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 company reputation as collaboration partner with prestigious university is another incentive for industry to engage (Aliu & Aigbavboa, 2020).

Sub Theme 3 (b) New Technology for Teaching and Learning

There were also participants who informed that they were motivated to get involved in UIC due to their previous work experience in the industry. This is important for the purpose of increasing the effectiveness of teaching and learning new technology with students, so that the knowledge and skills shared are in line with the current needs of the industry. This is also to make the university a knowledge

sharing center in a form of industrial cases. Universities should facilitate more connection between universities and industry by recruiting additional industry specialists to look for new partners for UIC. This would increase the number of UIC partnerships and boost academic innovation by encouraging more UIC activities in universities (M. Huang & Chen, 2017).

Theme 4: Recognition as Expert

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 also the appointment of university management positions.

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

Interaction channels that are often used in UMP for collaboration with industry are traditional channels, bi-directional and service channels. Traditional channel through conference sessions that often involve industry, universities and individuals. This is a common channel used by all universities to obtain grant investors from the industry. While the interaction channel most often used in UMP 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 into 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 time and involves a lot of rules.

Based on this, it is found that UMP has used all interaction channels to work with the industry and it has been adapted based on the needs and current situation. There is also the question of the extent to which the effectiveness of the interaction channel has been used to maintain and further expand existing collaborative relationships. For example, the MoU that has been signed, what is the impact of the MOU to UIC if the information is not shared. This is because there are also participants who questioned that the information related to this MoU was not disseminated to all relevant parties. The UIC agreement appeared to be overly focused on legalities to the detriment of actual execution due to the partnership document's complexity, the laborious nature of the process of finalizing the legal papers, and claims of excessive worry over the documentation (Azman et al., 2019).

There are also several factors that cause researchers to be demotivated to engage in UIC at UMP. Factors such as nature of industry, lack of teamwork, extra workload, lack value of job promotion, lack of trust and lack of monitoring by UIC Center. Individual researchers believe that collaborative research has little impact on their careers because it is barely accounted during performance evaluations (Muscio & Vallanti, 2014). Building trust takes time and typically necessitates multiple interactions. The lack of confidence between partners has emerged as a significant impediment to UIC's development in the country (Azman et al., 2019).

Among all these factors, it can be seen that most participants agree with the nature of industry, that is, the needs and wants of the industry are not in line with what the university has to offer. This is because UMP is more interested in fundamental research while the industry is more interested in applied research. This is because the industry prioritizes ROI in every money invested and wants quick results. Compared to universities fundamental research takes a long period of time and the results are not yet certain can be commercialized. The constraints are related to the distance between academic research and industry, as well as the demands affecting those departments conducting research that is of limited

interest to the commercial sector due to its low applicability (Muscio & Vallanti, 2014). The industry's culture of conveying research findings was radically different from that of academic researchers, leading to an unfavorable opinion of their academic colleagues' communication approach (Azman et al., 2019)

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Based on this study, it can be concluded that interaction channel is an important medium to connect universities and industry. It will also determine whether the relationship between the two parties is successful or unsuccessful. The smoothness or disruption of this medium needs to be identified immediately so that the efforts carried out by the university are not in vain. The improvement steps that need to be taken to ensure that the interaction channel used has an impact on the university is to improve the role of the UIC Center and R&D and Commercialization Center, so this center can be an information center and coordinate all activities related to UIC and research in a more organized and effective manner. Companies already engaged in UIC activities and those planning to do so may want to alter their levels of creativity and absorptive ability to ensure the success of these collaborations (Kobarg et al., 2018).

Theme 1: Traditional Interaction Channel

Sub Theme 1 (a) Conference

Participants also stated that conference platforms or colloquiums are also often used at UMP to obtain research grants from the industry. During the conference session, it will often involve researchers from various universities and industries who want to find opportunities for research collaboration.

Theme 2: Bi-Directional Channel

Sub Theme 2 (a) Advisory Panel

According to a respondent, the appointment as an advisory panel in the faculty to help evaluate the effectiveness of the faculty program has given a good effect in the relationship between UMP and industry. This is because those appointed are the top management level of the industry and this facilitates the UMP 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).

Sub Theme 2 (b) Memorandum of Understanding

Participants also gave they opinion, UMP often uses the medium of MoU to initiate and strengthen cooperation with the industry. The content of the MoU will also often include a number of 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 chat 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).

Sub Theme 2 (c) Industry as Competition Judges

UMP also often invites the industry to be involved in UMP's internal competitions such as CITREX and also the *Anugerah Kecemerlangan Industri dan Masyarakat (AKIM*) award as a judging panel. This is to ensure quality in the evaluation and selection of winners as well as to obtain the views of the industry in related matters.

Sub Theme 2 (d) Alumni

In addition, UMP 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 build as a friendship and it is easy for them to give a recommendation to the industry management. Collaboration in research is facilitated by trusting relationships between alumni and 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).

Theme 3: Commercial Interactional Channel

Sub Theme 3 (a) Patents

Participants also stated that the government has improved the grant application policy by placing patents as application criteria, this has caused UMP to start improving research products by registering patents for products that have the potential to be commercialized. The most important metric for assessing innovation output and information diffusion now revolves upon patents. As a result, the quantity of publications and patents is typically used to assess how well colleges do in terms of knowledge innovation (Cheng et al., 2020).

Sub Theme 3 (b) Spin off Company

Spin off company is a company that is exploiting a university or research institution intellectual property. The university or research institution may or may not own equity in the company. The medium spin of company is also used by UMP in the interaction channel although not so much. Numerous academic spin-offs exist that may be commercialized with few improvements, but after industry assessments, they are not taken into consideration elsewhere. Through industry mentoring, these spin-offs can be created to help improve innovation (Wijesinghe et al., 2018).

Theme 4: Service Interactional Channel

Sub Theme 4 (a) Consultation

According to participants, most academicians who are less interested in research grants (fundamental) will focus on consultation with industry (applied research). This is because they use the

advantage of their experience working in the industry before becoming academicians at the university to collaborate with industry in areas that benefit students and staff in particular as well as profit base.

What innovation culture that contributes towards University-Industry Collaboration?

Based on this study, the initiative that has been implemented to create an innovation culture at UMP is to add and diversify the types and number of grants to give researchers options to attract their interest in engaging in UIC. UMP also holds exhibitions and competitions at the internal level to encourage competition between researchers to compete for their research results. This initiative also provides an opportunity for the industry and outsiders to obtain information on research projects that have the potential to be developed and even promote the expertise of UMP researchers. However, there are also participants who stated that local innovation does not give a big impact because the culture in Malaysia related to university and industry cooperation is not very encouraging, especially when it involves local research results.

The findings from this study, the university has created several initiatives to promote innovation culture in UMP but it is not enough to boost innovation culture in UMP. Initiatives such as adding and diversifying internal grants for product development and holding CITREX competitions are seen more towards creating competition among internal researchers. The competition needs to be rebranded by including elements of commercialization and profit as the main agenda. This is because the industry is more interested in investing in research results that can be commercialized and provide profits quickly. The number of internal grants offered also needs to be reviewed, which should prioritize applied research over fundamental research. This change will indirectly create an innovation culture more effectively.

Theme 1: Variety of Grants

According to the participants, the UMP has also created a special grant for product development /applied research. This is because previously UMP only focused on fundamental research grants. Most of these fundamental grants take a long time to complete and the industry is less interested in collaborating. This is because the industry is very concerned about the time period and return on investment at an immediate period.

Theme 2: Local Innovation Exhibitions

Participants also agreed by stating that research competitions organized by UMP such as CITREX have helped create an innovation culture in UMP. During this competition, it provides an opportunity for outsiders, especially the industry to evaluate and explore opportunities for cooperation through the research results displayed.

How to improve UMP researchers' involvement in University-Industry Collaboration?

There is moderate level of involvement based on the 3 factors that are focused on this study. There are some contradictory views on their motivation towards UIC, less focus on the commercial interaction channel and lack of innovation culture. Thus, based on these 3 factors, the participants gave their view on how to improve the researcher involvement in UIC.

Thus, researcher involvement in UIC can be increased by improving interaction in UMP, researcher motivation and encouraging innovation culture. This is because the ecosystem environment at UMP 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. UMP also needs to relook on the university KPI. This is because UIC is not much emphasized as one of the promotion criteria. Currently, the university is weighty heavily on Times Higher Education (THE) and Malaysia Research Assessment (MyRA) ranking. The field of commercialization also needs to be enhanced by further strengthening the existing

Commercialization Center so that they can play a role in commercializing UMP's research products more effectively.

Before this UMP has implemented My UMP, training program which gave each staff the opportunity to contribute ideas together and they got to know each other better. This has had an impact in terms of the reputation of good relations between staff and launching the next business it creates a culture of cooperation between staff.

The finding in this study, the UIC ecosystem in UMP 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 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.

Theme 1: Interaction Channel

Sub Theme 1(a) UIC Ecosystem

Participants also informed that UMP needs to create UIC ecosystem as a platform to provide facilities and environment that supports the development of UIC in UMP. 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 and 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).

Sub Theme 1(b) Researchers Readiness

Participants also stated in terms of focusing the staff's mindset and staff's readiness. 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 embedded in every UMP researcher. Most of researcher training have focused on research and financial results, researcher perspective needs to be taken into account in the vision and mission of UIC. Researcher engagement programmes are effective, but have not been successful in developing researcher skill sets or achieving vision and mission of collaboration (Kulkarni et al., 2020).

Theme 2: Motivations

Sub Theme 2(a) Main Key Performance Index (KPI)

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 key KPI in the researcher workload. If it becomes a part of the KPI, all parties will definitely 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 a clear sense of direction and purpose that is represented in their mission (Samad et al., 2018).

Sub Theme 2 (b) Training for Commercialization and Licensing

UMP has also strengthened the field of commercialization by appointing the Dean of Commercialization to coordinate and manage the commercialization of potential UMP research products. Their job is more to grooming researchers, finding investors and organizing workshops related to commercialization. To have a larger understanding of the influence of their job, researchers should be trained and educated. The researcher should consider the real-world applicability of their research rather than the narrow limitations of their research outcome as a publication. It is necessary to raise awareness among researchers about the importance of putting their findings in a larger framework

(Awasthy, 2021). The knowledge makes it possible for the university technology transfer office to maintain partnerships and start new ones more successfully while successfully commercializing academic research (Plewa et al., 2013). Three forms of payments were made in connection with the transfer of technology license to the university: an exclusive licensing fee that was to be paid in instalments; business stocks with non-dilution of company values; and revenue-based profits (Whah, 2021).

Theme 3: Innovation Culture

Sub Theme 3 (a) International Innovation Exhibitions

Participants gave the view that UMP researchers should use more international exhibition platforms to showcase and promote UMP research products to attract local and foreign industry interest. Competitions and exhibitions also need to be organized openly outside UMP to facilitate industry access and encourage innovation culture.

CONCLUSION AND IMPLICATIONS

Conclusions and Implication of the Study

This research study on researcher motivation, channel interaction and innovation culture towards university-industry collaboration in Universiti Malaysia Pahang has provided an overview of the relationship between the factors that influence researcher involvement in UIC. It also explains the interaction channel that is often used by UMP in UIC as well as the initiatives taken to create an innovation culture in UMP. Researcher motivation to get involved in UIC is because to benefit the students and also the academic achievements of cooperation with industry provides placement opportunities for industry training students and also employment opportunities for students as well as help improve university graduate employability. Meanwhile, for academic achievement, the grant offered by the industry helps researchers make achievements in the field of research, publication and product development. UMP also uses all existing interaction channels to develop collaboration with the industry even though it seems bi-directional and service channels are more dominant. Innovation culture also seems to have been tried to be created in UMP although it does not give a big impact but some success of researchers abroad has been achieved. Through this study, several steps have been identified that need to be taken by UMP in further improving UIC, namely by improving interaction through the UIC ecosystem and further refining the main KPIs of UMP related to UIC. Finally, the factors that cause researcher demotivation have been identified such as extra workload, lack of teamwork, nature of industry and lack of monitoring of UIC Center. Several approaches to improve UIC have been proposed and it is to improve the existing approach so that the effectiveness of cooperation between universities and industry can be achieved and provide benefits to all parties.

Based on the findings from this research, the theoretical implication of the study has discovered four factors that influence researcher motivation towards UIC such as student talent, funding, passion to contribute and recognition as expert. It also discovered there are four types interaction channel in UMP contribute towards the involvement of UIC such as traditional, bi-directional, commercial and service channel. The findings also stated there are two types of innovation culture in UMP that contribute towards UIC such as variety of grants and local innovation. There also discovered three factors to improve researcher involvement in UIC by improving the interaction, motivation and innovation culture. This study also found that there is four factor that caused researcher demotivated towards UIC such as nature of industry, lack of teamwork, extra workload and lack of monitoring by UIC Centre. All of this finding is the adding of knowledge for the purpose of study. It's also given additional information on innovation culture in the study by combining the innovation culture factors with the UIC research study.

Limitations of the Study

This study is to find out the factors that influence researcher motivation, demotivation, channel interaction and innovation culture towards University- Industry Collaboration in Universiti Malaysia Pahang. While conducting this study to obtain information there are some limitations of the study that is the lack of written information sources related to the achievements of UIC in UMP, it is only included in the university's annual report and information about it is very limited. This makes it difficult to analyze UIC achievements. There are also other limitations such as the time to interview participants is very limited which is around 30-45 minutes only allocated because most participants are very busy with current tasks and there are also interruptions during the interview session. This has resulted in a delayed session of 10-15 minutes. This disruption to some extent affects the quality of participants' feedback and often the question needs to be repeated. There are also difficulties in getting participants' free time, this is because the participants are holders of top management positions in the organization. Recordings of participants' interview sessions were made in the form of video and sometimes the audio was less clear and there were technical glitches.

Recommendations for Future Research

With the insights and experiences gained from the findings of this study and the discussion of their implications and limitations, some suggestions for further research are discussed. This study offers several recommendations for future research. In -depth research needs to be done on researcher demotivation in UMP which sees some key aspects such as extra workload, lack of value promotion, 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 UMP. It is very detrimental if UMP 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. The second is about a more study on the role of the UIC Center where it is seen as not very effective in providing the UIC ecosystem in UMP. A study on the factors that influence the effectiveness of the UIC Center needs to be done so that it can play the role as a focal center by all parties, including the industry. Finally, the study is about the factors that attract industry participation in UMP. This is to get feedback from the industry that has deal with UMP in various fields. This study will help UMP to improve services as well as existing and future cooperation networks.

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