

Challenges in Linkages Between Industry and Academia in Technology Transfer: Case Study at University Technology of Malaysia (UTM)

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Abstract:- Collaboration between academia and industry is important towards technology development process especially in the context of Malaysia. The first objective of this study is to investigate the challenges of technology transfer between academia and industry from UTM's academia perspectives. Secondly, to identify if culture, goals, time constrains and ownership of intellectual property are listed as the common challenges in technology transfer between UTM's academia and industry. Third, to identify possible solutions for all mentioned challenges between academia and industry linkage from UTM academia's perspective. This research employs explanatory research design and qualitative methods in data collection and analyses. Semi-structured interviews have been conducted which involved researchers that are also represented as a chief executive officer, assistant directors, manager, and chief registrar. The finding of this study showed that the most common challenges faced among UTM researchers in collaborating with industry is time constraint, while the least rated is intellectual property ownership. The result of this study can be used to improve the understanding of the challenges faced by the academic and industry linkages in technology transfer, as well as recommendation points for further improvements in the context of research university in Malaysia.

Keywords:- Component; Academia-Industry, Time Constrains, Ownership of Intellectual Property, Different Culture/Orientation, Different Goals.

I. INTRODUCTION

In knowledge economies, the growth of technology is leaning on the capacity of generating, applying and use of knowledge as the fundamental for a technology development [1]. The process of technology development is complicated where it requires various of resources [3]. Technology can be acquired by companies through the process of in-house development [2]. Another mechanism of technology acquisition and exploitation is through technology transfer [1]. Technology transfer can be participated by industry, government and universities [4,8,910]. In this study, the mechanism of technology transfer is focus on university-industry.

In developed countries, for instance in Japan, the linkage between academia such as research institutes and industries are solid and stable. "The Japanese government has approached promoting industry-university collaborations in various ways, such as by enacting a Japanese version of the Bayh-Dole Act and by establishing policies to encourage the transfer of university research results to industry applications for the sake of economic development" [11]. The companies believe that the linkage between industry and academia offers them a lot of advantage in understanding more about a product, process or through detailed and in-depth research. Different in Malaysia, according to [12], there are rooms for improvement in academia and industry linkages. Hence, this paper is to investigate the challenges as the first step before suggesting ways to encounter challenges.

II. PURPOSE OF THE STUDY

The importance of linkages between academia and industry has been acknowledged. However, there are common barriers that become the main challenges in the process of technology transfer between academia and industry. Among the challenges mentioned in the previous literatures are culture, different goals, time constraint and deciding on the ownership of the property [13, 14, 15, 16, 17]. With the mentioned challenges, academia and industry need to compute the most suitable strategy to encounter such challenges. Using these premises, this study is conducted purposely to further understand the challenges included different goals, different culture, time constraints, and intellectual property ownership in the context of UTM.

III. OBJECTIVES OF THE STUDY

Based on the above problem statement and purpose of this study, specific objectives are outlined.

1. To investigate the challenges of technology transfer between academia and industry from UTM academia's perspective.
2. To identify if culture, goals, time constraint and ownership of property become the common challenges in technology transfer between academia and industry from UTM academia's perspective.
3. To identify possible solutions for all mentioned challenges between academia and industry linkage from UTM academia's perspective.

IV. SCOPE OF THE STUDY

This study conducted interview sessions with researchers from UTM Innovation and Commercialization Centre (UTM ICC), Institute of Bioproduct Development (IBF), Centre for Environmental Sustainability and Water Security and UTM Senior Researcher. The participants have various of experience in handling technology transfer between academia and industry. The challenges focused in this study are culture, different goals, time constraint and ownership of intellectual property.

V. LITERATURE REVIEWS

In Malaysia, the government has specifically focused to encourage the collaboration between universities and industry especially in research and development (R&D) as one of their objectives in the process of achieving the title of a developed country [5,39]. According to [18], the objectives of supporting the linkage is to promote the research made by academia by empowering the quality of the research and in obtaining new, emerging technologies in strengthening the linkage between academia and industry.

Academia is known as a center of knowledge [6,7] where the researchers conduct various research based on expertise on specific fields. Academia also has been encouraged to actively involved in R&D for emerging technologies [19,20, 21]. However, due to various challenges, the idea or concept from the researchers stayed as it is [22, 23 24]. There are also barriers, which do not allow the aforementioned benefits to realize in practice or hinder the collaboration altogether [14].

According to [18], there are three approaches suggested to strengthen the linkage between academia and industry. First, the academia should be involved actively in activities with industry to seize an opportunity to apportion and expand their knowledge and improve their research quality. Second, the universities need to strengthen the management of intellectual property policies. Lastly, the academia needs to actively involve with industries in R&D collaboration to support the commercialization of innovations and new technology. These steps are absolutely can be practice by the academia as a kick start to initiate linkage with industry for the technology transfer purpose.

Therefore, university should not ignore the fact that technology transfer does offer benefits as it's generating the economy and performance at organization and national level

[34]. It is important for as it has the influence in the perspective of economy, generating competitive advantage that has spark the linkage between academia and industry [1, 3, 6,7]. The process of technology transfer never has is a complex process and requires varies of expertise and sources [35,36, 37]. As a consequence, the implication in lacking the expertise and sufficient resources are the common factors that risking the collaboration of the technology transfer process [38, 40, 41].

A. Definition of Technology Transfer

Technology transfer is not a new topic of discussion anymore. Therefore, the definition of technology transfer is distinguished by numerous of previous researchers. The definitions are varies depending on the individual interpretation [29,44].

According to [1, 42], technology transfer is defined as “the process of movement of technology from on entity to another. Another definition of technology transfer has been contributed by [1] “The technology transfer may be said to be successful if the receiving entity, the transferee, can effectively utilize the technology transferred and eventually assimilate it”. Besides that, technology transfer can also be defined as “Technology transfer has also been used to refer movement of technology from laboratory to industry, developed to developing countries, or from one application to another domain” [43].

Referring to [29], the technology transfer is “technology transfer is said to be successful if the receiving entity, also known as the ‘transferee’, can effectively utilize the technology transferred and eventually assimilate it. The movement may involve physical assets, know-how (expertise), and technical knowledge”. Moreover, [45] pressed that, relocating and exchange of personnel is also considered as technology transfer.

Conclusively, the similarities in technology transfer contributed by previous researchers are the terms of ‘movement of technology’ and ‘from one to another’. Thus, in short, technology transfer is a process of moving a product, service, system, know-how from one individual or entity to another.

B. Previous Researches on Challenges in Technology Transfer Between Academia and Industry

Table 1 below is the lists of common challenges of technology transfer between academia and industry from the previous researchers’ point of views.

Authors	Challenges	Point of Views
Santoro (2000)	Different goals	Companies’ interest is to use the research results for solving present problems and thereby increase return and profit.
Seppo and Roolah (2013)		Universities main principle is creating and disseminate new knowledge.
Elmuti et al. (2005)	Culture Differences	Different organizational cultures, languages and value can bring along many communication problems.
Iqbal et al. (2011)		Because of the cultural differences, it is important that partners define common goals and mutual perception before agreement.
Jones-Evans (1998)		One of the barriers to the linkage between university and industry is the knowledge gap about each other’s organizational cultures.
Iqbal et al. (2011)	Time Constraint	As companies are not always ready to wait, they use a possibility to import the solution instead of collaborating with universities.
Bruneel et al. (2010)	Intellectual Property Ownership	The problem with the ownership of intellectual property is one of the most mentioned conflicts between universities and industries.
Ammon et al. (2009)		Potential conflicts with university regarding royalty payments from patents or other intellectual property right and concerns about confidentiality.

Table 1:- List of Common Challenges in Academia and Industry Collaboration

C. Success Factor of Technology Transfer between Academia and Industry

Technology transfer that involves academia and industry is complex [29], however, it is important to recognize that technology transfer offers benefits to technology development, economy, and to the industry and

university itself [25, 26, 27, 28] upon its success process. The definition of success is depending on the individual’s interpretation [1, 30, 31,32, 33] (Table 2). The idea of success may be in a form of wealth creation or also can be on the ability of transferee to utilized the technology transferred.

Author	Definition of success in technology transfer
Ramanathan (1994)	The transfer may be said to be successful if the receiving entity, the transferee, can effectively utilize the technology transferred and eventually assimilate it.
Bennett (2002), Cited by Kumar and Khorakian (2010)	Process of technology transfer is successful if it: <ul style="list-style-type: none"> • Congruent with goals and strategies of companies. • Market oriented • Provides increase in profit • Creates and protects employment • Has acceptable environmental impact
Widiawan (2008)	The higher technological capabilities of university, the more successful are the partnership with industry.
Kumar and Khorakian (2010)	The success of a technology transfer often depends on the method that is applied to bring together university professors and interested companies.
Mamat and Roslan (2012)	Level of trust among partners and the best of human resources between companies are ingredients for success in technology transfer.

Table 2:- Definition of Success Technology Transfer between Academia and Industry.

D. Proposed Research Model

The list of challenges and conceptual definitions above in Table 1 and Table 2 could be summarized and simplified into a proposed research model as below.

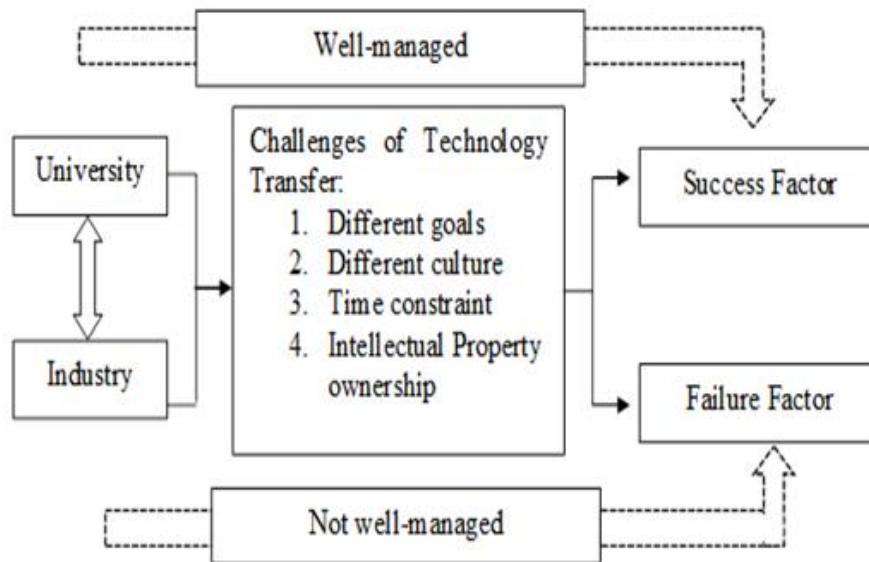


Fig 1:- Proposed Model on Challenges between Academia and Industry in Technology Transfer

Based on this model, the challenges of technology transfer play an important role in determining the success of a technology transfer process between academia and industry. If the academia and industry are able to manage and encounter the challenges well, they have wider potential to have a successful technology transfer. Otherwise, they will tend to face more issues that can be the obstacle to guarantee the success of the technology transfer. The challenges involved in this model has been taken from the most common challenges that have been mentioned and discussed by previous researchers. Furthermore, Good Practice Model [18] is one of the main references in developing this model. The most common challenges have been discovered by previous researchers are different culture, different goals, time constraint, and intellectual property which are related to the model proposed [18] that also showed concern in these key challenges for the collaboration between academia and industry.

VI. METHODOLOGY

This explanatory study adopts qualitative approach and focuses on gathering secondary data from previous literatures to formulate the theoretical framework. Primary data were collected from interviews to conduct an empirical study. Through semi-structured interview, various information gathered to develop a case study on the context of UTM's academia perspectives regarding the challenges in technology transfer between academia and industry. This has allowed the study to achieve the objectives. Three data analysis methods were used which are data transcription, data translation, content analysis and thematic analysis are used to analyze the data collected from interviews.

VII. FINDING OF THE STUDY

Referring Appendix 1, shows the summary of data collected from participants. The data has been analyzed and categorized into few themes under each challenge between academia and industry in technology transfer in the context

of UTM. Data collected are based on the objective of this study which is first, to investigate the challenges of technology transfer between academia and industry from UTM's academia perspective. Secondly, to identify if culture, goals, time constraint and ownership of property become the common challenges in technology transfer between academia and industry from UTM academia's perspective. Lastly, to identify possible solutions for all mentioned challenges between academia and industry linkage from UTM academia's perspective.

A. Different Goals

From UTM perspectives, different goals as a challenge in technology transfer is not a new challenge. Four out of five participants have agreed in different experiences when it comes to different goals in dealing with industry to transfer a technology. From the interview conducted, different goals in UTM context can be categorized into two different themes. The first one is the technology developed has no demand by the industry. Resulting from the interview conducted, four out of five researchers mentioned about this as a challenge. Most of the participant mentioned that the industry conventionally wants a technology that is established enough for them to be used for internal or market purpose. Participants also pointed out that academia historically conducted and offered a technology that unsuccessful to satisfy the industry's need and demand. Resulting to this, participants believe that it become the core cause of industry to shows less interest to invest in the technology offered. Moreover, at least three participants computed that the technology offered by researchers are too advance to be applied by the current market and it too radical as the industry always wanted a technology that have a place in market and proven to have its own market segmentation.

Least of all, the other themes found for different goals is technology seems cannot solve the industry's problems. This was mentioned by four out of five participants that have experienced with this as a challenge. According to the participants, this happened due to the failure of UTM's

researchers' technology to solve industry problems. Second and fourth participants explained that, the technology has been tested to be working effectively at lab scale, where industry showed their interest in the technology. But when it is being applied to the real industry scale, the technology failed to be operated as it is supposed to, which this is ordinarily disappoint the industry.

B. Different Cultures

From the interviews conducted, different culture can be classified into two themes. Firstly, the working style between academia and industry are too different. Three out of five researchers have mentioned this challenge in technology transfer linkage with industry. For this theme it indicates that academia and industry have differences in the way they are performing tasks. Additionally, the way academia and industry foreseeing potential problems are also differently. The industry is always working in the fast pace to catch up with the market movement, while, the academia is focusing on producing high-quality research that requires number of years to be conducted. Which, this is an absolute contradicts with the industrial culture.

The challenge in different culture often caused due to lack of understanding between academia and industry. Through the interviews conducted, four out of five participants showed their agreement towards the discussed challenge. According to the second and third participant, mutual understanding is important. This is because if both of parties neglect to build mutual culture, both will be accountably to face the possibility of not be able to understand each other roles in the collaboration. The fourth participant supported by stated the result of this challenge, the research produced by academia tend to be way too advance for the industry. Moreover, through observation of the first participant feedback, industry and academia have a different way of foreseeing a potential problem and different focus areas. Industry sees profit as their main focus, while the researcher focuses on technology development and education. It's a challenge to align two different entity with different understanding and goals in a collaboration.

Moreover, convincing the industry about researchers' technology future potential is onerous due to unpredictable technological changes and market demand. Consequently, researchers tend to develop a technology that is reserved to be the potential technology that does not applicable to the current needs. Thus, the industry expectation could not be meet by the academia.

C. Time Constrains

In the time constrains wise, academia always claimed that the industry always gives them pressure to work at the same pace as them. Through the interview sessions, the theme for time constraints can be classified to pressure on time by the industry to academia. This challenge has been ranked as the most common challenge faced by UTM researchers as five out of five participants mentioned about the challenge.

The participants agreed that time constrain is a critical challenge in technology transfer between academia and industry especially when it involves contract research and contract manufacturing because researchers are locked onto their agreement. Most of the participants pointed that, it is crucial for researchers to follow the timeframe and schedule to ensure that the technology transfer can be done within the time stated in the agreement between researcher and industry. The first and second participants mentioned that, industries are unwilling to wait for a long duration of time as they foreseeing the potential for them to be less competitive in the market in doing so, thus it pressuring the academia need to work in the same tempo as them. Thus, it is concluded that researcher should be more alert with the current demand and put utmost effort to predict the future needs to ensure the technology is fully developed and ready to enter market on the right time.

Likewise, the pressure in time constraints felt by UTM's researchers are not only at the early stage till the process of the technology development is completed, but also after the process. The fourth and fifth participants stated the possibility for an industry to requests for modification towards the technology and obviously the modification requested will take time. However, industry wants it instant solution to it. Therefore, the participants always perceive this as a crucial challenge for them to keep catching up in meeting the industry expectation. The participant also mentioned that, the industry should understand the academia commitment, as they are not only entitled as a researcher but also running a different portfolio such as a lecturer.

D. Intellectual Property

The challenge of technology transfer between academia and industry in intellectual property ownership can be classified into two themes which the first one is confidentiality. The issue that related to confidentiality among academia and industry is not new. It is hard to build trust between academia and industry especially in sharing confidential information. By referring to the second participant, in a successful technology transfer between academia and industry, sharing information is crucial. Ones need to have the integrity in their information to ensure the smoothness of the process. Second participant mentioned that the industries show an unwillingness to share their information to academia which makes it hard for academia to fulfill their requirement and understand the real problem that is faced by the industry itself. The issue in confidentiality does not only applied to the industry, but also the academia. According to the first participant, there are numbers of researchers that are not always willing to share their information with the industry as they want it to be closed only to them. However, this challenge has been ranked as the least challenge mentioned by the participants. Only two out of five participants pointed out this challenge.

Challenges related to intellectual property ownership is royalty payment. This challenge has been mentioned by three out of five participants involved. According to the second participant, academia gets involved in technology transfer as it is one of the sources of income. The modern

university is not only focusing on education, but also focusing on generating income from different sources. But in some cases, the third participant mentioned that it is a challenge to keep the royalty payment on track from industry. However, the first and second participants showed a positive reaction when an issue about royalty payment is raised during the interview sessions. All the participants stated that, this challenge can be encountered through memorandum of agreement in the technology transfer linkage between academia and industry. The fourth participant mentioned that if such case still happened, the academia is entitled to take legal action against unfair cases.

E. Additional Suggested Challenges

1. Commercialization

Commercialization is a process to bring the technology transferred to the user of the technology, such as industries or consumers of the technology. Two out of five participants have mentioned about this challenge. According to the participants, the commercialization of the researcher's technology is slightly hard new to the technology developed by them. At times, the technology is too advance that makes it too hard to be commercialized.

2. Communication

Communication is a key to success in everything including technology transfer between academia and industry. This challenge has been mentioned by three participants out of five through their experiences. According to the second participant, through communication, ones will be able to understand the other parties, share initial information and able to create mutual understanding between academia and industry. Academia and industry regularly faced communication as a challenge in collaboration to transfer a technology. The participants mentioned that this is because the language used by the industry and academia is not at the same level. The academia habitually tends to use academic terms where it is hard for the industry to exactly understand the information provided by the academia.

VIII. COPING WITH THE CHALLENGES

In technology transfer between academia and industry, the ways to cope with the challenges are depending on the researchers and industry themselves. Since the discussion is diligently focus on academic perspectives, a lot of changes can be made by the researchers that may help in improving the linkage between academia and industry in technology transfer. These suggestions were offered by the participants during the interview sessions.

A. Different Goals

According to the fourth participant, every researcher has their own method in facing the challenges. The first participant suggested that an academia needs to be able to adapt to the changes. In order to cope with the different goals, most of the participants agreed that researchers need to focus on applied research where it can use to fulfil the demand from industries. Academia will be able to

understand better about the current market and the cycle of technology for a specific industry. It is not only will enable to a researcher to widening the knowledge but also can be an opportunity for a researcher to get more involved in technology transfer between academia and industry by offering the solution to the industry's problems.

B. Different Culture

In solving the different culture as a challenge, researchers need to realize that the modern academia orientation has changed to not only focus on generating new knowledge for academic purpose but also research to provide the solution to problems. The first participant pointed out, an academia must need to have value added in themselves by enhancing their entrepreneurship knowledge. With that, the academia can at least be at the same par as the way of the industries thinking. Further to this, most of the participants suggested that academia should understand the problem of the industries in order to offer solutions for them. Moreover, the second participant realized the important for academia to work at the same pace as industry to match with their culture. This will help to enhance the collaboration between academia and industry in technology transfer.

C. Time Constrains

Coping with time constraints can be settled with time management. However, referring to the second participant, the industry also needs to understand the role of researchers and put their trust to the researcher in conducting the research. All participants suggested for academia to have their own timeframe in doing research. Mostly, in collaboration between academia and industry, the academia will set the duration of research, or technology development. But in some situation, if the duration is being suggested by the industry, and it is too short or not relevant to complete the research, the academia should be open and request for the time extension, but it must be relevant with the weight of the research. This has strongly been suggested by three participants involved during interviews.

Furthermore, the participants also mentioned that, challenge related to time constraints can be avoided by including the duration of research in a clause in the collaboration agreement. In the clause, it should state the duration of the research, person in responsibility for the delay, consequences and more. Despite that, the first participant stated that, it is also important for the industry and academia to have contingency plan especially when it comes to time. Both parties need to agree to have more than one plan of timeframe work. This is because, if an unpredicted event occurred, they can switch to the other plan that is suitable for both of parties.

D. Intellectual Property

Intellectual property ownership challenge is a serious matter especially when it comes to confidentiality issues and payment. The confidentiality challenge can be from either academia and or industry in sharing data or information that precise that related to technology transfer. According to participants, the ownership of intellectual property itself has to clearly explained. The participants also mentioned that

this has contribute to the importance of an agreement in technology transfer between academia and industry. It's included clauses such related to ownership of technology, confidentiality and payment method. The agreement will reduce the risk of existence for this challenge.

The second and fourth participants mentioned that industry and academia should draft an official agreement at the earliest stage. They both have to discuss especially related to intellectual property ownership. Therefore, in coping with intellectual property ownership challenge, it is important to set an agreement between academia and industry. Further to this, researchers should have awareness about the importance to get intellectual property protected by law to ensure there are no issues about the technology being copied by industry and more.

E. Commercialization

Technology commercialization from researcher to an industry is important as it is the main element in technology transfer between academia and industry. Since researchers are always produced and develop a new technology, it may be hard to commercialize it to the industry and consumers. Therefore, it is important for a researcher to know the current demand from the industry and market. To achieve this, the fourth participant suggested the importance of academia and industry to work together at the earliest stage. So, that academia can provide technical skills, while industry can provide business and market-related information.

F. Communication

Communication between academia and industry can be improved if one shows effort for the sake of the linkage in technology transfer. The second participant stated that researchers need to help themselves to get improved and understand ways to communicate with the industry better in ensuring the collaboration between industry and academia can be strengthened in the future. In adding to that, the participant also believe that academia needs to be able to adapt to changes and the new environment when they are working with the industry. A lot of changes are needed especially in communication to ensure the information can be delivered accurately and good communication will able to create mutual understanding between academia and industry to achieving both ultimate goals.

IX. DISCUSSION

Based on the findings, it could be discussed the achievement of the research objectives.

A. Objective 1: To Investigate the Challenges of Technology Transfer Between Academia and Industry From UTM Academia's Perspective.

There are a lot of challenges faced by academia and industry in collaborating to transfer technology. By referring to table 4, most of the participants from UTM has given close answers as what being suggested in previous research. The challenges in linkages between academia and industry in technology transfer in UTM context included different

goals, different culture or orientation, time constraints, and Intellectual property ownership. UTM's academia also suggested a few others challenges such as communication and commercialization.

For communication, UTM's academia agreed that the way of academia and industry communicate are not at the same rhythm. Also, the other challenges that have been suggested by participants from UTM's academia are commercialization. This is because to introduce a technology that is novel to the industry and market is the real challenge. Industries are less likely to take the risk of investing in a technology that has no proven as a successful technology for them or the market.

B. Objective 2: to identify if culture, goals, time constraint and ownership of property become the common challenges in technology transfer between academia and industry from utm academia's perspective.

In the earlier discussion, the four challenges have been mentioned as the most conventional challenges in technology transfer between academia and industry in UTM. For the first challenge suggested by works of literature reading and participants, different goals, the answers are mostly led to two themes which are the technology created by academia has no demands and it cannot help the industry to solve their problem. The second challenge is a different culture or orientation. This challenge developed can be categorized into two different aspects which are different working style and lack of understanding between industry and UTM's academia.

Moreover, time constraint is a crucial key and it is considered as a common challenge faced by researchers that involve in technology transfer linkage with industry. In adding to that, it is proven that this challenge is ranked as the most common challenge mentioned by participants. Last but not least, intellectual property ownership. In UTM context, different centers practice different mechanism of technology transfer between academia and industry. If the mechanism involved royalty payment. It is a well-known challenge specifically in monitor the royalty payment record and track. Confidentiality is also another challenge where academia and industry insisted to share crucial information to each other which can contribute in leading to failure of technology transfer. However, the challenge related to intellectual property is ranked as the least challenge mentioned by the participants. This is because, this challenge has been encountered by the existence of agreement in technology transfer linkage between academia and industry in the context of UTM.

C. Objective 3: to identify possible solutions for all mentioned challenges between academia and industry linkage from utm academia's perspective.

Every problem will have a solution. Therefore, it implies the challenges faced in linkages between academia and industry in the context of UTM. These suggestions were pointed out by participants during the interview. The first and second participant suggested that researchers and need to take their own initiative to improve themselves by employs with bits of knowledge that are not only related to

their fields but in general. The fourth participant stated that, academia and industry also need to achieve into one goal if they entered into a collaboration, therefore, it will be fair for the academia and industry as it can put both of them in a win-win situation. The third and fifth participant suggested for the need of academia to do research that can be related to the current problem and should not just focus on too advanced technology as it can be a waste for the technology that has no demand in the market.

For the challenge of time constraints, participants suggested for academia and industry to identify the most suitable research method. Other than that, timeframe should be included in a memorandum of agreement (MOA) between academia and industry. In addition, for intellectual property ownership in UTM context, all of the participants agreed that everything should state in Memorandum of Agreement (MOA) where both parties need to show their consents in signing the MOA. Both parties need to agree with all the clauses in the MOA. Usually, the clauses will include about payment, duration of research, termination, the person in responsibilities, implication of breach of contract and more. For communication, the second participant believes that academia should up-skill their communication skills and avoid to use scientific terms when communicating with industry. Last but not least, participant suggested in settling with the challenge in commercialization, academia should do and focus on research get industry involvement at the early stage of technology development through business meeting sessions.

X. SUGGESTIONS FOR FUTURE STUDY

Suggestions can be taken into consideration for improvement. First, to increase the number of participants. This is because, the bigger the number, the better the data. The researcher also might want to investigate the challenges from the industry's perspectives that have experiences working with UTM's researchers. The finding can be made for check and balance the ways academia and industry see the challenges in technology transfer for a context of UTM. The findings can be made and summarize up to be a better guide for academia especially in improving the collaboration between academia and industry in technology transfer. Further, when the findings are from the industry's perspective, it will enable the academia to understand better about how industry see those elements as challenges. It will able to help the academia to come out with strategies and plan on how to overcome with such challenges in the future collaboration.

XI. CONCLUSION

This paper identifies challenges in linkages between academia and industry in technology transfer in the context of UTM. By referring to the previous research papers, it has suggested few usual challenges faced by the parties involved in technology transfer between academia and industry. The empirical study has been conducted to identify if UTM researchers faced the common challenges as suggested by previous researchers. The findings which the challenges

being faced by the academia such communication, commercialization, different goals, different culture, time constraints, and intellectual property ownership. Furthermore, it identifies culture, goals, time constraint and ownership of property become the regular challenges in technology transfer between academia and industry. Most of the participants which are UTM's researchers do encounter with such challenges and agreed to labelled it as "common challenges" faced among researchers that involved in technology transfer with industry. Lastly, suggestions of action to be taken in facing the challenges by UTM's academia have been pinpointed. The suggestions offered can be used to improve the linkage between academia and industry in technology transfer by UTM's researchers.

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APPENDIX

Challenges	Themes	Participants					Total
		1	2	3	4	5	
Different goal	Technology has no demand	√		√	√	√	4
	Failed to provide solution to industry	√	√		√	√	4
Different Culture/ Orientation	Different working style	√	√	√			3
	Lack of understanding	√	√	√	√		4
Time Constrains	Time pressure by industry	√	√	√	√	√	5
Intellectual Property Ownership	Confidentiality	√	√				2
	Royalty payment			√	√	√	3
Other challenges	Commercialization			√		√	2
	Communication		√		√	√	3

Table 1:- Challenges and themes in technology transfer between academia and industry in UTM Context