IMPORTANCE OF KNOWLEDGE-ATTITUDE-PRACTICE TO ENHANCE UNIVERSITY TECHNOLOGY TRANSFER

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ABSTRACT: Malaysia Innovative Year 2010 was launched by the 6th Prime Minister. Since then, numbers of innovation activities were in raise, but not the technology transfer. Thus, every public university in Malaysia were urged to establish Technology Transfer Office (TTO) to address this issue. Unfortunately, the numbers are still low despite having the capacity, capability, resources, and funding in place and strongly supported by the university management. Therefore, the non-technical attributes such as Knowledge, Attitude, and Practice (KAP) were considered for investigation to study if they could potentially be the reasons affecting technology transfer in the universities. Thus, researchers from selected public universities in Malaysia namely lecturers and postgraduates were chosen as the respondents. A specially designed questionnaire for this study has been designed to expose the technology transfer gap in universities. This study reveals all three investigated attributes namely Knowledge, Attitude, and Practice (KAP) scores were below 55% which are considered low as compared to other critical studies. It is also evident that, the KAP interaction effects are significant to which they cause the technology transfer in the universities not to prosper as expected.

KEYWORDS: *Technology Transfer; Technology Commercialization; Technology Transfer Office (TTO); Knowledge-Attitude-Practice (KAP); Innovation*

1.0 INTRODUCTION

Universities have been established to generate and disseminate new knowledge through research. Most new knowledge generated in the universities are to be translated into technologies benefitting industries and communities at large. The technologies are then expected to contribute towards societal benefit while the nation generates economy value through various stakeholders and activities. With innovation being strongly said about globally, a huge innovation initiative has been embarked in Malaysia called 'Malaysia Innovative Year 2010', launched by the 6th Honourable Prime Minister. This provided a great avenue for innovations to be kick-started by researchers and innovators at universities. Preliminary studies show that, it has been more than a decade since its embarkation to generate outcome of innovation namely technology transfer, but the achievements to date are far behind the expectation although the resources, support and expertise are in place. Therefore, the primary aim of this study is to investigate the score level of KAP attributes and their respective interaction effect over technology transfer process in the universities.

Various studies have been conducted on why the technology transfer has not taken place as expected by considering resources, technical attributes, and expertise as noted by Megnigbeto [1]. Unfortunately, no one has investigated the performance of technology transfer employing human behavioural attributes namely, Knowledge, Attitude, and Practice (KAP) even though they have been applied for social sciences. As commonly known, universities are the 'knowledge factories' expected to engineer new solutions and technologies. The generated technologies are also expected to be translated to various means including industries, spin-offs, start-ups, and communities which are expected to bring benefits to the respective parties at large, as mentioned by Ivanova and Leydesdorff [2]. Technology transfer focuses on the idea of transforming research output into knowledge, services, and technology commercialization which not only uphold reputation but also generates income for the institution and nation. Weckowska [3] claimed that the research outcomes were highly potential for creation of industries to offer the economic growth. Doganova and Eyquem-Renault [4] explained that the innovative

solutions were highly prone for wealth creation and societal well-being through technology transfer and commercialization such as the iPhone personal assistant application known as SIRI.

Malaysia strongly embraces quadruple helix model in the context of technology transfer as one of the research outcome to benefit industries, government, university, and community at large. Thus, universities in Malaysia are led by Technology Transfer Office (TTO) within campus to help-out universities in managing technology transfer process as highlighted by Razak and Saad [5]. Adding to that, the technology transfer achievements over the years do not tally with the efforts made by the Malaysian government as emphasized by Zain et al. [6]. Although, universities in Malaysia have capable and credible researchers, majority of the industries seem to think otherwise as the technologies from universities are not much evident helping them [7-8]. When the government has the authority to control both the universities and industries to a phase called "laissez-faire", in most cases both parties expect their deal engagements to be initiated and settled by the government itself as noted by Razak and Saad [5]. Etzkowitz and Leydesdorff [9] stressed that the university and industry have explored the triple helix model and the culture of the innovation network as for their collaboration.

A powerful Knowledge-Attitude-Practice (KAP) characteristics study has been conducted to reveal the inner perception of individuals in various fields by the studies in [10-16] where the findings were significant to address the gaps associated with relevant challenges. Therefore, this study employs the similar KAP approach to investigate if the KAP attributes could be the reasons for the technology transfer in Malaysia universities not progressing as expected.

2.0 METHODOLOGY

Figure 1 shows the methodology flowchart of the study. The entire methodology consists of four distinct phases and the information relevant to technology transfer is gathered accordingly to ensure of its adequacy prior to execution.

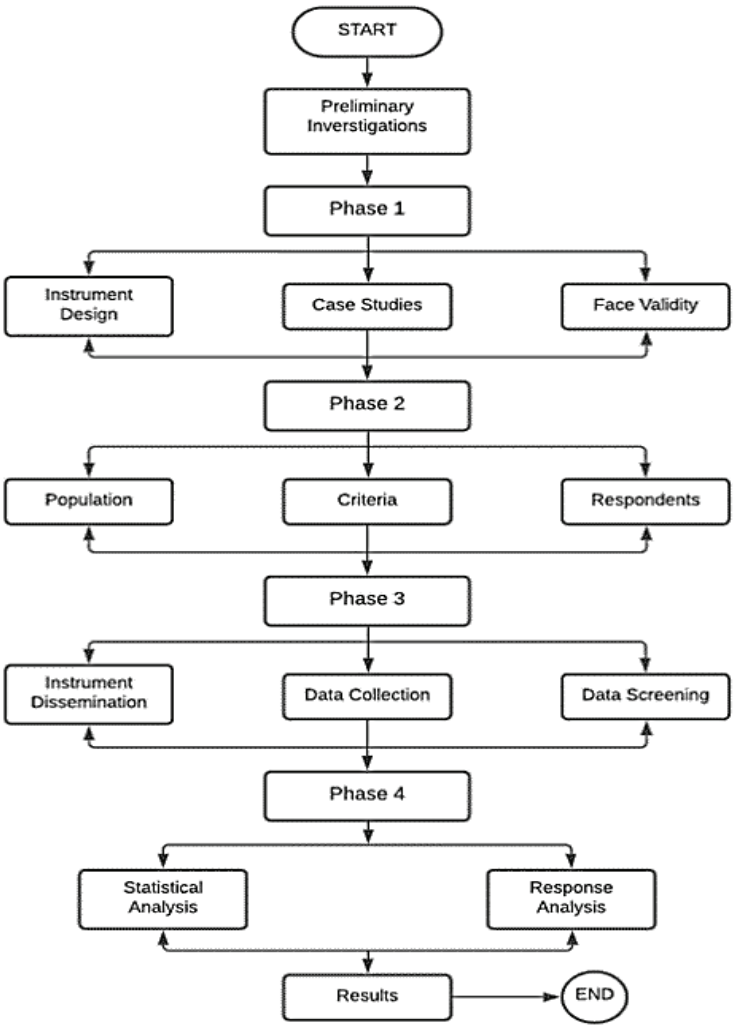

Figure 1: Flow chart of the study

In phase 1, the survey instrument is critically designed and developed to ensure the aim of the study is attained. A guideline by Macías and Glasauer [17] is used to design the questionnaire. The questionnaire is then validated by NGOs related to the innovation and technology fields in Malaysia. In phase 2, the populations, respondents and criteria sets are determined. In this study, the selected populations are the researchers from seven selected public universities in Malaysia consisted of various categories to guarantee a fair balance. The total of 250 respondents are identified from the population group namely, the active postgraduates and lecturers with at least 5 years of working experience. These respondents are also considered as the significant

contributors for the technology transfer by the top management of the universities. Among the universities involved in this study are Universiti Kebangsaan Malaysia, Universiti Sains Malaysia, Universiti Teknologi Malaysia, Universiti Malaya, Universiti Teknikal Malaysia Melaka, Universiti Teknologi Tun Husein Onn and Universiti Malaysia Perlis.

In the third phase, the instruments are using online survey through the Google forms and an interview session to ensure the responses yield within an expected range of time. The received responses are then tediously screened, recorded and verified to ensure intactness and fit for the next phase. Finally, in phase 4, the data sets from the respondents are clustered and gathered accordingly for the related analysis. The total of 250 questionnaires are sent out and 92% of them are received with the complete details. The remaining 8% are not considered since the questionnaires are received after the deadline and also the incomplete sets.

3.0 RESULTS AND DISCUSSION

Figure 2 shows the holistic findings of the knowledge (K), attitude (A), and practice (P) scores in percentage which have been attained by lectures and postgraduates in this technology transfer study. In general, all the three attributes namely KAP for lecturers fall within the range of 60% to 70%, with dominance of K, P and A in sequence. On the other hand, score for postgraduates are within 40% to 45% with slight variance of dominancy bringing A, K, and P in sequence. The KAP study conducted by [10-16] has generally scored more than 85% for at least one of those attributes. Comparatively, this study indicates the technology transfer is seriously in need of intervention by the top management. The trend of the postgraduates scoring much lower than the lectures for all three attributes is seen relevant as most of the technology transfer elements are usually learnt from their lecturers who are also their postgraduate supervisors. The details of KAP scores and their associated reasoning with support and cross validation are explained in the next section.

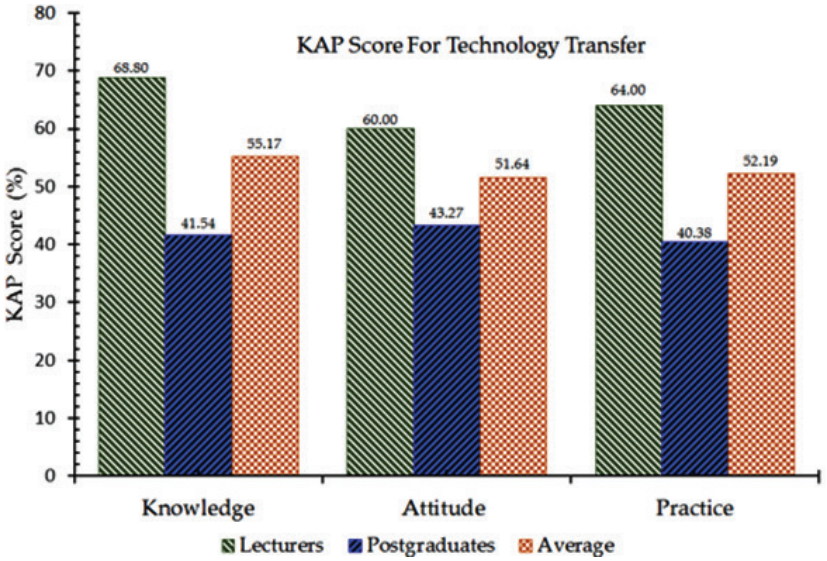

Figure 2: KAP comparative plot

3.1 Knowledge (K) Score

The knowledge (K) score for lecturers as shown in Figure 2 reflected to be the highest as compared to attitude (A) and practice (P) attributes. As for the postgraduates, the knowledge score stood as the second highest attribute and attitude is scored the most. The plot indicates that the lecturers scored 68.80% as compared to 41.54% by the postgraduates. Lectures, are being the faculty member with minimum of 5 years of service, their scored percentage are still considered marginal. The lecturers are expected to be equipped with the sound knowledge of technology transfer and be the game-changing catalyst. In conjunction to that, the score of the postgraduates which is very much lower than the lecturers is not to be surprised as the baseline score of the lecturers itself is considered remarkably low.

This KAP study has the similar finding with Ahmad et al. [10] on adoption of the green fashion innovation has attained the knowledge (K) attribute as the highest percentage of score. While Memon and Martina [14] through their plagiarism study in the aspect of research has revealed that, the respondents scored the highest level of knowledge (K), indicating they are very clear of why plagiarism should not be taken lightly by the researchers. Moreover, the plagiarism rate is considered as high among the researchers due to the malfunction of adherence to good practices even with the

excellent level of knowledge is obtained. Featuring the food safety associating K, A, and P among the food handlers in lower-middle income countries, Ncube et al. [15] found that the knowledge (K) has been attained the highest even the food handlers are not highly competent or rather fully trained by the professionals.

The knowledge score conducted by Ahmad et al. [10], Memon and Martina [14] and Ncube et al. [15] are all above 85% and considered good as compared to only 68.80% attainment in this study. The differences of score attainment are found to be correlated with the subject matter of the study. When it is general in nature, most of the respondents are able to understand better and highly potential to conquer adequate knowledge of the subject matter. Looking in the perspective of technology transfer in this study, it is considered very technical and complex, which requires the competitive knowledge to understand better in getting their research work translated to market in the context of the commercialization. Kirby and El Hadidi [18] implemented a study towards an awareness of Egyptian academics on technology transfer process and found that, lack of understanding and commitment are the significant reasons for the universities not achieving the technology transfer expectations. Therefore, it is clear that the knowledge on technology transfer is the most important element to be emphasised in the universities before a greater knowledge (K) attribute score can be expected.

3.2 Attitude (A) Score

Referring to Figure 2, the attitude (A) score among the lecturers and postgraduates are slightly deviated with the latter scoring much lower percentage. The lecturers scored 60%, while the postgraduates are only 43.27% being the lowest and highest, respectively among all three attributes. The lecturers who have been serving with the university for the period of more than five years are hypothesised to stand significantly high, but unfortunately, it is only with the difference of 16.73%. This clearly indicates the lecturers are not strongly associated with the attitude in the context of technology transfer in the universities in Malaysia. Looking into prior study, Winham et al. [12] performed the KAP study on cooking experience of Midwestern United States Universities in the pulse consumption. This study is aimed to investigate if the consumption is actually made based on the knowledge of pulse nutrient or some other factors. Fortunately, the attitude (A) attribute score is the highest. Thus, it is clear that, when it comes to the postgraduates or students in general, they pose very positive attitude along the knowledge gain phases

which make the knowledge attribute to be slightly lower at the beginning. On the other hand, Mida et al. [17] conducted the KAP study onto professional medical officers regarding periconceptional folic acid for women at low risk of a neural tube defect affected pregnancy. This study found that the attitude (A) ranked the highest. Hence, the professional medical officers firmly hold-up their attitudes to the work practiced by their superiors and never thought there could be an alternative approach based on the knowledge (K) which makes them to hold their positive attitude as the top most. Nevertheless, in some universities, the attitude of researchers in the context of technology transfer particularly to commercialize their research findings are not positively spun due to the restriction of technology transfer policies and guidelines by their own universities.

The above statement is supported by the findings, Kirby and El Hadidi [18] revealed that the researchers in Egypt are not allowed to become the partners in enterprises of which their technologies are commercialised. Similar hindrance is anticipated among the lecturers in this study which may make their attitude score not be as expected and worst still stood as the lowest of all attributes. Thus, the organizational innovation is seen to be tackled accordingly by taking into considerations of the parameters that may hinder or lag technology transfer process.

3.3 Practice (P) Score

Figure 2 also shows the practice (P) score for postgraduates with 40.38% is the lowest, and the lectures stood as the second lowest with 64% among all attributes. The ranking of practice (P) attribute reflects, there is a serious need to improve technology transfer management in universities. As explained earlier in Section 3.1, KAP studies conducted by [10, 14-15] are also found to have the practice (P) attribute as the lowest score while the knowledge (K) attribute as the highest, which are very much aligned supporting the findings of this study. Providentially, their practice (P) attribute scores are all far better than what is achieved in this study in terms of percentage even though the achievement trends are similar.

However, Moffo et al. [11] who studied the risk perception of rural poultry farmers in Cameroon to antimicrobial use and resistance, found the practice (P) attribute as the highest score among KAP. In fact, Della Polla et al. [13] who investigated the same attributes have concluded practice (P) attribute is the highest score when it comes to

the vaccinations of the community pharmacists in Italy. Adding to that, a study related to periconceptional folic acid for women at low risk of a neural tube defect affected pregnancy conducted by Mida et al. [16] also concluded the highest score is the practice (P) among all attributes.

Looking into the research types and criticality of the performed KAP study, it can be summarized that when it comes to the life safety of a person, the practice (P) attribute is seriously paid attention even it is difficult to be rehearsed. Unfortunately, the practice or operational is taken lightly when it comes to a process which bring no mortality to the practitioner or surrounding. Thus, the latter conditional situations could be the situation of why the score for practice (P) attribute has been the lowest among KAP for the technology transfer.

4.0 TECHNOLOGY TRANSFER CONCERNS

As a whole, average scores of all KAP attributes are found to be only about 55%, where the nominal fall shall be 80% and above. Based on the interview feedback from respondents, there are few concerns which potentially hold them back from being active in technology transfer. Among them are: *Rigid policies and guidelines* where the universities impose very strict procedures when it comes to the intellectual property, and technology transfer to protect its own interest. *Time consuming* where the universities are taking the minimum of three to six months and sometimes even longer in getting the technology transfer deal approved officially, but the industries need a quicker deal. *Imbalance weightage* where the technology transfer is much complex and difficult as compared to other measures of academic achievements such as publication and innovation award unfortunately, the promotional points and rewards are often not proportionally fair. *Too much of share cut* where the high percentage of the technology transfer monetary income is being cut to the university, claiming most of the activities are done during the working hours and double income should be reduced.

Considering these concerns, the universities in Malaysia could enhance their technology transfer by being more flexible and would, for this reason, take a certain degree of risk and liability in which it requires more autonomy from the government. TTOs are also expected to intervene in a much serious strategical and tactical manner to enhance the technology transfer awareness among the researchers in the universities.

5.0 CONCLUSION

As hypothesised, this study reveals on how the non-technical attributes, namely KAP could also cause technology transfer not to prosper as expected by the universities. The study has fulfilled its objectives within the scope and the results can be benefited by the universities, especially by Technology Transfer Office (TTO) to guide and motivate researchers for better performance.

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