

Understanding The Talent Requirement for Technology Transfer Professional

Sofia Adrianna Ridhwan Lim, Samsilah Roslan, Mohd Faiq Abd
Aziz, Azlin Abd Jamil

Faculty of Educational Studies, Universiti Putra Malaysia, 43400 Serdang, Selangor
Corresponding Author Email: samsilah@upm.edu.my

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Abstract

Technology transfer (TT) constitutes a primary focus of government initiatives in Malaysia, aimed at augmenting the forecasted compounded annual growth rate (CAGR). Notable governmental investment has been channelled into research, development, commercialisation, and innovation, with the overarching objective of catalysing technological innovation conducive to the application and adoption of technology within industries and communities. Despite the engagement of various stakeholders in this endeavour, previous studies have underscored the capability of Technology Transfer Professionals (TTPs) as a central constraint, thereby complicating the process. Through qualitative inquiry, this study identifies several factors contributing to these obstacles, including commercialisation awareness, government support, technology maturity, and TTP skillset, which may impede the technology transfer process. Accordingly, the study aims to explore the challenges hindering TTP performance and propose fundamental talent requirements – training model for enhancing their work efficacy.

Keywords: Technology Transfer (TT), Commercialisation, Technology Transfer Professional (TTP), Training Model.

Introduction

Technology transfer (TT) is delineated as the process whereby the technical innovation knowledge of a particular technology or process is disseminated to another organisation to enhance its business performance (Rahman et al., 2022). It stands as a crucial wellspring for innovation generation and an integral facet of business advancement (Woodfield et al., 2023). Where does innovation begin? Research institutes and universities serve as reservoirs of knowledge, housing a cadre of experts and skilled individuals proficient in specific areas of invention (Soares & Torkomian, 2021). These entities function as hubs for innovation cultivation, furnishing indispensable infrastructure and knowledge expertise to nations and regions, thereby fostering survival and success in the knowledge economic and contributing to economic growth and social development within communities. Technology Transfer Office

(TTO) - this division plays an important role in scanning discoveries, securing valuable intellectual property (IP) protection, and managing the licensing and assignment of IP (Sutupo et al., 2022; Nugent & Chan, 2023; Olawore et al., 2023). To overcome obstacles and propel the country towards becoming a knowledge-based economy, the presence of proficient talents known as Technology Transfer Professionals (TTPs) is crucial. TTPs serve as skilled mediators facilitating the transfer of knowledge and innovation to industry stakeholders, thereby playing a pivotal role in ensuring the successful execution of technology transfer and commercialisation endeavours. TTP, often referred to as technology transfer officer, play a pivotal role in commercialising research outputs originating from universities and research institutes. Essential skills for TTP include strategic thinking, business and commercial acumen, effective communication, research orientation, and entrepreneurial behavior (Mom et al., 2012; Takata et al., 2022; Soares & Torkomian, 2021; Boguszewicz-Kreft et al., 2021). TTP must apply a diverse skill set to achieve key performance indicator (KPI) in technology transfer and commercialisation, including goal setting amidst high uncertainty, translating scientific discoveries into business value, and initiating stakeholder engagement. Given the heterogeneity of individual TTP capabilities, as noted by scholar (Cunningham & O'Reilly, 2018), it is crucial to explore the barriers and challenges impeding TTP performance and to identify solutions for enhancing their effectiveness in dealing with technology transfer. Our study aims to address this gap by investigating obstacles influencing TTP efficiency and proposing strategies to optimise available resources.

Research Objectives

- 1) To comprehend the barriers obstructing TTP in execution of their job.
- 2) To explore the needs of talent requirement model for TTP.

Issues and Challenges in Technology Transfer

The process of technology transfer and commercialisation involves multiple stakeholders with diverse missions and objectives. Stakeholders encompass entities such as ministries, agencies, academic institutions, businesses, and communities (Markman et al., 2008; Soares & Torkomian, 2021). The success of this endeavour hinges on effective coordination among these parties to realise their respective organisational goals. Apart from educating student and conducting scientific research, technology transfer and commercialisation is the third "mission pillar" of universities and research institutions (Boguszewicz-Kreft et al., 2021). Nonetheless, previous research has identified several challenges hindering the commercialisation efforts, including lack of capability and skill of TTP to perform the job, inadequate time commitment from academic staff to manage their task between academia and TT management, lack of business capability to commercialise innovations, difficulties in achieving technology transfer (TT) key performance indicators (KPIs) due to academic workload, poor evaluation on technology assessment, and insufficient technical skills to transform the prototypes to commercial products (Brantnell & Baraldi, 2022; Ismail et al., 2015; Sachani, 2020; Takata et al., 2022).

Government Support

The success of technology transfer and commercialisation is not only depending on the series of negotiation conducted, but it also subjected to several stages including the technology maturity, market readiness, business strategy, financial investment and the most important is the commitment and accountability of each stakeholder in making sure the process is

successful. Since several years ago, based on the Economic Report 2013/2014, the Ministry of Finance has declared that Malaysia will remain the main agenda in developing an innovation that will boost the economic growth. Today, the government has continuously supported the initiative of creating wealth through technology commercialisation by intensifying allocations through grants, funding, subsidies, incentives, and venture capital. Additionally, it has strengthened support through tax, legal, and fiscal measures to encourage knowledge transfer to the private sector (Hepburn et al., 2020; Rahman et al., 2022). Research institutes and universities support technology commercialisation by assisting business partners through incubators. This means that business entities in the private sector are supported by being provided with expertise in knowledge innovation and business acumen to grow and expand their businesses based on the commercialised technology innovations. Most recent, the Ministry of Economy (MoE) and the Ministry of Science, Technology, and Innovation (MOSTI) in collaboration with Astro has organised the Innovation Reality Program, INNOVATHON. The Pre-Launch Ceremony of this show was completed by The Honourable Rafizi Ramli, Minister of Economy on 14 April 2023. The selected ideas span a wide range of domains - encompassing technology, healthcare, sustainability, education, and beyond. Through the illumination of these remarkable conceptualisations, INNOVATHON aspires to instigate inspiration and exhibit the remarkable reservoir of talent within Malaysian innovators. Positioned at the vanguard of fostering a novel wave of innovation, the programme endeavours to galvanise local innovators across myriad strata, accentuating technological and innovative conceptions to the Malaysian populace at large, while concurrently delineating the potential for garnering investment in the commercialisation of pioneering products via the program's auspices.

Technology Maturity

Despite the considerable attention given to the intricacies of the technology transfer and commercialisation process, it is imperative to underscore the importance of technology maturity to ensure readiness for practical application and commercial viability. Technology transfer and commercialisation entails the exploitation of new scientific developments in either production or consumption activities, enabling researchers to profit from business activities (Sutopo et al., 2019). Previous studies have highlighted the existence of a commercialisation gap, wherein innovations fail to transition to viable business prospects due to the so-called "valley of death" (Takata et al., 2022). This challenge often arises during the transition phase between technology development and commercialisation, particularly during the validation of commercial feasibility. Therefore, concerted efforts are required to expedite technology commercialisation and mitigate the valley of death gap.

Commercialisation Awareness

The value chain of TT, from the creation of an idea to technology commercialisation, involves multiple stakeholders, including internal and external organisations. Therefore, it is crucial for the TTO to possess comprehensive knowledge of the TT process, as it encompasses various types of knowledge at different stages. Additionally, the researcher needs to strengthen the understanding of commercialisation knowledge, particularly regarding awareness, benefits, and strategies (Ismail et al., 2015). Commercialisation awareness involves understanding the potential applications and marketability of a new technology. It includes recognising the commercial value of research outcomes and identifying suitable markets and customer segments. This awareness is essential for ensuring that innovations do not remain confined

to academic or research settings but are successfully transitioned into viable commercial products or services. By strengthening commercialisation awareness, researchers and TTOs can gain a deeper understanding of the commercial potential of their innovations and develop effective strategies to bring them to market. This, in turn, can lead to more successful technology transfer and commercialisation efforts, driving economic growth and societal benefits.

Skillset of TTP

To enhance the efficiency of the technology transfer and commercialisation process, it is imperative to recognise the evolving role of TTP. Understanding the diverse skill set of TTP is crucial as they serve as intermediary agents bridging organisations and industries. TTP also interface with governmental entities to secure financial support aimed at facilitating technology adoption within industries. Moreover, TTP assist researchers by providing insights into market opportunities, developing financial plans, establishing business frameworks for new innovations, identifying venture capitalists, aiding in the recruitment of startup teams, and securing incubator space (Chau et al., 2017; Mom et al., 2012; Wu, 2007; Takata et al., 2022). However, the multifaceted functions of TTP present significant challenges, including competency gaps and qualifications. In light of the competitive landscape surrounding TTP capabilities, scholars have underscored the necessity of training programs to enhance their competence and skills in executing their responsibilities (Mom et al., 2012; Soares & Torkomian, 2021). Prioritising such training initiatives can help bridge the commercialisation gap and mitigate the valley of death phenomenon in the technology transfer and commercialisation process.

Research Questions

The research questions underscore the imperative to delve deeper into the gaps and underlying factors that render technology transfer and commercialisation challenging, as well as to identify optimal strategies for harnessing talent among TTP to elevate them into high-potential, high-performing individuals.

- 1) What are the primary gaps and challenges that contribute to the complexity of technology transfer and commercialisation processes?
- 2) What are the perspectives among practitioners on the needs of training model as strategic tools to enhance their performance and potential in facilitating successful technology transfer and commercialisation endeavours?

Methodology

A qualitative research method has been adopted for this study. The selection of the respondent is based on purposive sampling to ensure in-depth understanding on the phenomenon, and it is the most strategic sampling in qualitative research (Patton, 2002). Six respondents were selected based on their achievement in getting KPIs in commercialised technology and they are considered as key person in technology transfer and commercialisation with more than two years' experience. The sample size is determined according to the study's purposes and the selection of the sample is based on the criteria developed to guide the process. The criteria established will be part of the indicator that may contribute to the accuracy of the data.

Face-to-face and online interviews (using Microsoft Teams) were conducted using semi-structured interviews to get in-depth understanding on the technology transfer and commercialisation. The structure of the interview question was developed to capture the informants' real experience, insight and expectations Patton (2002) related to research area. The interview sessions were conducted at different session according to the availability of each respondent. The session lasted for about one and a half hour. The interview data was transcribed, and the transcription is email to the respondents for their approval – the process is thoroughly conducted to achieve an accurate finding in qualitative study to ensure its validity and reliability achievable. They were allowed to improve the transcript which they felt did not represent their views and experiences. This process ensures that the researchers' bias and views do not dominate the findings (Holliday, 2007; Patton, 2002).

The analysis of the qualitative semi-structured interviews follows the recommended steps in existing literature. The following procedures were considered: (i) summarising the data to become generalise (ii) coding the data (iii) presenting and conclusions. The interviews data were coded and analysed by using the suggestions of (Miles and Huberman, 1994). This process consisted of coding the transcript to identify the categories and themes.

Results and Discussion

From the data findings, four key factors have hindered the process of technology transfer and commercialisation, including (i) consistency of government support throughout the process, (ii) low commercialisation awareness, (iii) low technology maturity, and (iv) low skillset of TTPs. Table 1 indicated the summary of the findings gained from the interview session with the practitioner in the area. Overall, 100% of respondents critically commented on the lack of skillsets among TTP to perform tasks related to the area. Additionally, 67% highlighted the need of consistency in government support, including funding and grants that align with the various stages of technology commercialisation. While 83% of respondents mentioned low commercialisation awareness, and 67% noted issues related to low technology maturity.

Table 1
Summary of Findings

No	Issues Respondent	Consistency of Government Support	Low Commercialisation Awareness	Low Technology Maturity	Low Skillset of TTPs
1	R1		/		/
2	R2		/	/	/
3	R3	/		/	/
4	R4	/	/	/	/
5	R5	/	/		/
6	R6	/	/	/	/
Percentage (%)		67%	83%	67%	100%

Based on the feedback above, the researcher then explores the respondents' perspectives on the need for a training model as a strategic tool to enhance their performance and potential in facilitating successful technology transfer and commercialisation. According to the findings, all respondents agreed on the necessity of devising a strategic training model that ensures the delivery of purposeful, successful, and profoundly impactful training programs through a systematic approach. This approach will prioritise the development of high-quality content, maintain powerful consistency throughout the training program, and ultimately achieve the intended outcomes.

The findings reveal that the development of a training model for TTP is a critical necessity to equip them with the requisite competencies for effective performance in technology transfer and commercialisation activities. Recognising the varied demands across different stages of the technology transfer and commercialisation process, it is essential to identify the specific components required in the training model, tailored to address the distinct skills and competencies needed by TTP. Such a model will facilitate the continuous updating and upgrading of knowledge, skills, and attitudes among TTP, ensuring their readiness to meet evolving challenges and opportunities. TTP occupy a pivotal position within organisations, serving as the vanguard in assessing the feasibility of transforming innovations into viable business platforms. They are tasked with translating scientific and technological value into commercial value, thereby ensuring that innovations contribute to the economic growth and sustainability of social communities. Amidst the barriers and challenges inherent in technology transfer and commercialisation in Malaysia, TTP must possess intellectual acumen and comprehensive knowledge to support academics and researchers in monetising their scientific discoveries. TTP bear the responsibility of surmounting challenges associated with immature technologies by offering consultancy services on market and business strategies, enhancing researchers' awareness of commercialisation processes (Good et al., 2019), and remaining attuned to government initiatives in this domain. They must adeptly identify promising business partners and potential markets while staying abreast of technological trends and emerging opportunities. TTP play a critical role in positioning new innovations for market penetration and continuously updating their technological insights regarding frontier technologies. In certain organisation, they are tasked with monitoring post-commercialisation activities and validating business execution, all while navigating the uncertainties inherent in social and business environments (Takata et. al., 2022).

With the emerging role of TTP, it is important and crucial for the organisation to utilise the TTP training model as their guideline to leverage the TTP's talent to the greatest return for the organisation. This model can act as a parameter to ensure the training quality and the consistency of the training module in order to accomplish the goal setting of the training to TTP (Zahra et. al., 2014). Well-trained TTP serve as instrumental agents in achieving organisational goals (Gebrehiwot & Elantheraiyan, 2023). Training, in this context, is understood as the process of enhancing the skills, knowledge, exposure, and abilities of individual TTP (Afsana et al., 2015). The significance of training and development for TTP is multifaceted:

- i. Improving talent productivity: Training enhances TTPs' competency levels, efficiency, skilfulness, flexibility, and knowledge, thereby aligning them with organisational goals

- and long-term profitability.
- ii. Enhancing performance: Training serves as a supportive tool to enhance TTPs' understanding of the complexities of technology transfer and commercialisation processes, thus improving their performance.
 - iii. Boosting employee confidence and engagement: Access to training and development programs boosts determination, instils a sense of security, increases confidence, motivation, and engagement among TTP, fostering a positive organisational culture.
 - iv. Strengthening decision-making abilities: Training improves TTPs' decision-making abilities by enhancing problem-solving skills, emotional intelligence, critical thinking, and leadership qualities.
 - v. Enhancing organisational reputation: A strong training strategy enhances the employer brand, making the organisation attractive to graduates and mid-career professionals seeking opportunities for skill development and career advancement.
 - vi. Attracting top talent: Offering training opportunities makes an organisation more appealing to potential recruits who seek to improve their skills and capitalise on associated career opportunities.

However, the success of any training program is influenced by the effective construction of a pre-defined schedule, model, or framework. Such a framework should be meticulously constructed based on the identification of specific training needs and the mapping of individual competencies. It should ensure consistency in content delivery, execution, and outcome achievement to guarantee purposefulness and impact. Providing a standardised training model serves as a reference tool to optimise TTP talent utilisation, support organisational career management, and align with organisational goals.

Conclusion and Limitation

This study emphasises the importance of providing a comprehensive training model focused on TTP to bolster their competency and skill set in executing their roles effectively. By enhancing TTPs' competency and skill levels, it is anticipated that they can navigate and address the various obstacles and challenges inherent in technology transfer and commercialisation processes. The proposed model holds significant implications for refining technology transfer and commercialisation strategies and offers insights into talent management strategies tailored specifically for TTP. Implementation of such a model is expected to enhance the success rate of technology commercialisation endeavours and foster a multidimensional ecosystem supportive of innovation. Finally, this study proposes a new integrated training model aimed at equipping TTP with the requisite skills to proficiently conduct technology transfer and commercialisation activities.

Limitation of this study is, we adopt qualitative study through case-based approach with a limited number of respondents, conducted until saturation was reached. Therefore, the findings may lack generalisability to a broader population. Future research endeavours are recommended to empirically validate the findings, particularly given the growing number of practitioners involved in technology transfer and commercialisation. Furthermore, considering the increasing prevalence of Technology Transfer Offices (TTOs) within Malaysian universities, institutions, including private bodies, additional studies could provide further insights into the evolving landscape of technology transfer and commercialisation practices.

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