

LEVEL 7 ASSESSMENT SPECIFICATION

Student name:	Kwan Hok Ming	Student ID number:	2031099
Programme:	DBA		
Module:	Quantitative Research Methods		
Module code:	HKBM7004	Contribution to Overall Module Assessment (%):	100%
Lecturer:	Dr Andrew Chan	Internal Verifier:	Prof. Luk Chung Leung
Assignment Title:	Quantitative Research Methods Project Report	Word count (or equivalent):	6850
Submission deadline:	13 December 2021	Return date of provisional marks & written feedback:	14 January 2022
Submission method:	All written assessments, where practical and possible, must be submitted via Turnitin unless otherwise instructed by the Lecturer. (Please DO NOT put this assessment specification into Turnitin or it will match many similarities with other students' submissions.) Alternative submission method (if applicable): Late submission of the assessment will result in a late penalty mark. Penalties for late submission: Up to one week late, maximum mark of 50%. Over one week late, 0%. Only the Extenuating Circumstances Panel may approve a change to submission dates.		
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The Influences of Knowledge Sharing on Innovation Capability of Small Medium Educational Technology Enterprises in Knowledge Transfer Partnership with Universities in Hong Kong

1. Introduction

The topic of this paper is to study the influences of knowledge sharing on the innovation capability of Small Media Enterprises (SME), with a particular focus on the companies in the educational technology (EdTech) industry and knowledge transfer partnership with universities in Hong Kong. It aims to examine the effects of modes of knowledge sharing in a knowledge transfer partnership and to investigate the relationship of knowledge sharing on the innovation capability of SMEs in the EdTech industry.

1.1 Problem under investigation

In recent years, knowledge transfer and EdTech are two keywords of sustainable economic growth. Knowledge transfer, also called knowledge exchange or technology transfer, is about commercialising and implementing research outcomes of universities into actual application and practice in daily life and business. Knowledge transfer can be a return of a society's investment in academic research. In the UK, Oxford University received £ 6.08 million for the knowledge transfer activities in 2021 (Oxford University Innovation. 2021). In Hong Kong, the annual spending on research and development is approximately USD 2 billion, and the universities generated an income of over USD 12.5 million in the year 2019 (Lap-chee Tsui *et al.* 2020). With the government as the driver, more and more funding from public money, charity, and industries will be invested in developing innovation and technology. It is crucial to study how knowledge transfer activities in universities were converted into economic impact.

The other keyword, EdTech, is an integration of education and technology development. Education is traditionally a huge market, especially in the Great Chinese Region. Technology is driving the evolution of all industries, particularly expanding the EdTech market. IBIS Capital's measured the EdTech expenditure valued at USD228 billion in the global market in 2019 and will increase by no less than 15% per year. Meanwhile, the global education expenditure reached USD5 trillion in 2019,

eight times the software market and three times the media and entertainment market. However, education was only 2% digitised (IBIS Capital et al., 2019). This means there is a 98% blue ocean for new forms of EdTech, for instance, gamification of learning and edutainment development. An analysis forecast that the digitisation of education is changing fast, which is projected to grow to USD404 billion by 2025. The impact of COVID-19 can boost up the market with the transformation of education models (Holon IQ, 2021). The COVID-19 pandemic has ushered in the world's most giant real case experiment in remote learning, simultaneously across countries and regions. The year 2020 was largely about moving to learn online, and many educators looked into how technology can assist and even advance the delivery of pedagogical values (Esperanza, 2020). It is essential to study the interaction between academics, technology and business to foster the growth of the EdTech market, especially under the current situation that there are no traditional big names in this market-dominating (IBIS capital et al., 2019).

1.2 Research Aim and Objectives

The primary goal of this study is to determine a quantitative research instrument to examine the effects of the transfer of university knowledge on building up the innovation capability of start-ups in the EdTech industry. Universities conduct various types of research and development. Technology invention provides new technology as the media to deliver educational value to the learners. Intervention innovations are learning sciences, including novel pedagogies and new practices that create new educational value to the learners. They can create different values in different aspects of an EdTech start-up. There are various quantitative research instruments done by researchers on studying the performance of innovation and technology ventures. This study develops, and pilot tests an instrument adopting the theory-based questionnaires to measure the reliability and the correlation of knowledge sharing on EdTech SMEs' innovation capability. This study seeks

- RO1: To examine the effects of modes of knowledge sharing in a knowledge transfer partnership
- RO2: To investigate the relationship of knowledge sharing on innovation capability of SMEs in the EdTech
- RO3: To study whether the theory-based instruments for measuring technology firms would be valid in EdTech firms

1.3 Contributions of the Study

The rest of this paper is organised as follows. Section 2 reviews the literature. Section 3 describes the research methodology and hypothesis. Section 4 is a report of the collected data and analysis.

Section 5 interprets the results and evaluates the research instrument. Section 6 is a brief conclusion of this pilot study. This study reports empirical pilot test results in answers to the research questions posed in Section 1.2. The results advise the guidelines to assist the formation of strategic collaborations between EdTech SMEs and research institutes to effectively leverage each other's strengths and resources to achieve a win-win situation. This pilot test also provided an evidence-based ground for the development of a specific quantitative research instrument for examining the impact of knowledge sharing on innovation capability in university-company collaboration in the EdTech business.

2. Literature Review

For kids, knowledge is about the contents of their textbooks and sharing of school teachers. For companies, scholars describe knowledge as the acts, opinions, ideas, theories, principles, models, experience, values, contextual information, expert insight, and intuition that provides a framework for evaluating and incorporating new experiences and information to improve business values (S. Popadiuk, CW Choo, 2006; Mitri, 2003; Davenport and Prusak, 1998). EdTech is a young industry. It involves the knowledge flow that a company adopts new knowledge to develop a new way of knowledge delivery to learners with enhanced effectiveness of teaching and learning (Esperanza, 2020).

Because of constantly expanding the technology and knowledge pool, the business environment and various business models undergo a rapid and continuous change. Companies and organisations are forced to be flexible and quick to adapt to innovations and the changing environment. Organisational learning, a process of knowledge adoption and sharing, is vital at all development stages in a business development cycle, especially for start-ups and SMEs (J. Sekliuckiene, *et al*, 2018). Knowledge is a valuable asset for any organisation and serves as the main competitive advantage that differs one organisation from the other (S.I. Pradana, 2015).

2.1 Background of the EdTech Industry

The Association for Educational Communications and Technology suggested educational technology is the study and ethical practice of facilitating teaching and learning and improving performance by creating, using and managing appropriate technological processes and resources (Januszewski, A. *et al*. 2013). Adopting technology in education is neither as simple as the introduction of usage of computer equipment in teaching and learning nor bringing electronic devices to school and home. There is a more complex and ambitious achievement of seamless technology implementation as a catalyst for a shift toward new learning models in remote and hybrid settings (Osorio-Saez *et al.*, 2021).

On top of the traditional topics of medicine, science, engineering, information and communications, Educational Technology or commonly called "EdTech", is a new keyword of the innovation and technology industry. By nature, EdTech consists of two parts. Firstly, it is the education meaning. It is about the education system, involving students, teachers, schools, educators, classroom equipment, pedagogies and lesson content. Secondly, it is the technology to enable new formats of deliveries and receptions of education. It is about reform and re-construction of educational communication channels, media and tools. EdTech positively impacts traditional K12 in-school education from kindergarten to high school levels. In addition to the class contents, EdTech creates blended learning platforms and mobile learning platforms for a more efficient, interactive way of teaching and learning. More importantly, it boosts up the market development of community learning and employability platforms (Ramiel, H *et al.*, 2019; IBIS Capital *et al.*, 2019)

EdTech is not only limited to e-learning materials and smart classroom equipment. The development of new technologies in parallel evolves the advancement of the frontier of EdTech possibilities. The Multiple Reality, Internet of Things, plus the new ABCD "Artificial Intelligence, Blockchain, Cloud Computing and big Data," are new carriers realising people's imagination on delivery of teaching and learning. Nowadays, EdTech covers front end teaching and learning tools to back end education management systems, for instance, interactive displays for replacing blackboard, learning management systems, student record systems, mobile team project systems, AI-assisted assessment systems, personalised learning platforms, job-talent pool matching systems, employability advisory platforms, as well as learning-gamifying, experience simulation and edutainment solutions. Digital technologies make access to education cheaper, easier and faster than ever before. Learners are more willing to shift towards electronic books without the boundaries of time and locations. The digitalisation of educational materials also reduced the difficulties in translation, not only on written words but also on those with physical disabilities who can listen to the educational content in an audio format. As of August 2021, the market is enormous that there are 30 EdTech start-up Unicorns with a valuation of USD1 billion or above (Grand View Research 2021, Markets and Markets 2020, Holon IQ, Aug 2021).

The education technology business is a market of trillion dollars. Both academic and business studies agreed there is a hundred billion global education technology market, whose growth is non-stoppable, especially under the boosting of the COVID19 pandemics. The market is expected to witness a compound annual growth rate of 19.9% from 2021 to 2028 (Grand View Research 2021; Markets and Markets 2020; Holon IQ, Aug 2021; Renz, A., 2020). The IBIS Capital's measures the global market for educational technology products and platform services valued at USD228 billion in 2019. Without considering the boosting effects of the COVID 19 pandemic, the market's growth rate was

projected to be at least 15% each year. The HolonIQ Global EdTech Funding 2021 – Half Year Update indicates the venture capital investment on EdTech increased over 14 times during the period 2010 to 2019. Within only the first half of the year 2021, the global EdTech venture capital investment reached USD 10 billion. There are 27 EdTech unicorns at the end of June 2021, 53 mega-rounds (US\$100M+) and more than 3,000 funding rounds over US\$5M with a total of US\$26B deployed in the last 18 months (Holon IQ, 2021).

Moreover, there were no traditional big names in this market dominating the technology development and business model trends (IBIS capital *et al.*, 2019). The SMEs, including start-ups, are the primary driving force. There will be ample space for development for university knowledge to contribute to the EdTech businesses' growth, technologically and educationally.

Keizer (2002) explains Small-to-Medium sized Enterprises (Small and Medium Enterprises or SMEs) have a reputation as boosters of employment, economic growth and economic dynamics (Keizer *et al.*, 2002). According to the statistics of the HKSAR Government, there are 340,000 SMEs in Hong Kong, which constitute over 98% of the city's business establishments and provide job opportunities to about 45% of the workforce in the private sector. Their vitality and business performance are crucial to the development of the city's economy (HKSAR Trade and Industry Department, 2021). As an advantage of the company size, SMEs are flexible and feasible for initiating and realising innovations. However, SMEs have limited organisational resources and are eager to adopt new knowledge, innovation, and technology. It is common for SMEs to formulate technological collaboration with universities or research institutes to carry out the R&D and product development, as an economical and safer strategy compared to doing all innovation development activities in-house (Keizer *et al.*, 2002). Chesbrough H.W. (2007) indicates that it is common for SMEs to build up inter-organisational partnerships and technological capital beyond their own boundary by assessing external sources of knowledge and technological expertise. University knowledge can upgrade the enterprises' capabilities, in terms of both technology and education, to catch the new waves in the marketplace.

2.2 Knowledge Sharing

Knowledge Sharing is the process of sharing tacit or explicit knowledge between two bodies within a single organisation or inter-organisation. It allows an organisation to access the knowledge within its capitals and other organisations (J.N. Cummins, 2004). Knowledge sharing is also about building an organisational learning culture, which starts creating capital and values the organisation since the business idea development (J. Sekliuckiene, *et al.*, 2018). Such a culture of learning and sharing advances the effective communications of information, practices, insight, experiences, preferences,

lessons learned, common as well as uncommon senses among the people in an organisation (S-h. Liao, *et al.*, 2007). An effective knowledge sharing enables the streamlining of the information, money and product flows across organisational boundaries, in turn, improving the agility, adaptability, and predictability of the organisation (Y.H. Chen, *et al.*, 2014). Knowledge is a crucial resource to support business growth. Partnership networks provide an organisation with knowledge on market opportunities, market trends, and technological developments (Yli-Renko, Autio, & Tontti, 2002; Loane & Bell, 2006). Therefore, the possibility to learn from knowledge sharing partners can result in successful product and service diversification, consistent growth of competitive advantage and forward-looking international marketing strategies (J. Sekliuckiene *et al.*, 2018).

2.2.1 Knowledge Transfer – A Way of Knowledge Sharing

Knowledge Sharing is closely related to the transfer of useful know-how and practical innovations among organisations (Lord, M. D., & Ranft, A. L., 2000). The literature increasingly describes university-industry technology transfer and knowledge exchange collaboration is considered as a crucial locomotive of the society's economy and innovation growth (de Wit-de Vries, E. *et al.* 2009; Passaro R. *et al.* 2020; Cheng, E.C.K. 2021). Universities, research institutes, and tertiary education establishments are responsible for developing original knowledge and technological advancement to drive the tendency of economic growth of the city while benefiting the wider community. In parallel, they want to leverage knowledge transfer to enhance the research and development funding return on investment. While research and teaching are institutional activities comparable among universities, knowledge transfer activities are influenced by several strategic goals at the university level ranging from having a positive impact on society to increasing economic income (D. Baglieri *et al.* 2018).

As the third common mission of universities and institutes in Hong Kong, knowledge transfer is the process to convert knowledge and technological advancement into business and daily life applications. All the eight government-funded universities in Hong Kong set up designated units under the research and development branches, which are usually named Knowledge Transfer Offices or Entrepreneurship Centers, to facilitate and foster internal academics' participations in knowledge implementation via commercial licensing or entrepreneurship development activities (Lap-chee Tsui *et al.*, 2020; Cheng, E.C.K. 2021). The knowledge transfer offices are platforms designed to bridge the interactions and collaborations between universities, researchers and industries (Brennenraedtset *et al.*, 2006; Sharifiet *et al.*, 2014; O'Reillyet *et al.*, 2019). Their activities, which covers both formal knowledge sharing and informal knowledge sharing, create new values and parameters in the fields of intellectual property, technology development and practical innovations (Stankevičienė *et al.*, 2007; Beltran-Morales *et al.*, 2020) to nurture companies to be innovative with the research and development findings of universities. In the recent decade, the local universities in Hong Kong were

catching up the global trend and increasingly profoundly committed to the interactions with and enhancements of the industry, in terms of their innovation and technology capabilities, and cultivation of creation to accomplish their third mission (Lap-chee Tsui et al. 2020; Huyghe et al., 2014; Etzkowitz 2003; Rasmussen et al., 2006). Knowledge transfer is also a channel to boost start-up activities and SMEs' development. The ecosystem of early-stage investments is yet to mature in Hong Kong. Some success stories will help inject a sense of confidence into young people and nurture social attitudes and support towards entrepreneurship (Lap-chee Tsui *et al.*, 2020). Globally, the universities created a high growth rate in business development and employment in their surrounding regions' clusters of high technology businesses (Lambert, 2003; Decter, M. *et al.* 2007; Lap-chee Tsui *et al.* 2020).

2.2.2 Formal Knowledge Sharing in Knowledge Transfer

Scholars describe knowledge sharing can being formal and informal (Taminiau, *et al.* 2009; Nonaka, 1994). Formal knowledge sharing comprises all the forms of knowledge sharing that are institutionalised by the organisation management. These are resources, services and activities, which are designed by the organisation or organised with the aim of knowledge sharing or of learning from each other, i.e. organisational learning (Taminiau, *et al.* 2009). Nonaka (1994) defines the formal knowledge exchange mechanism as one that comprises procedure, a formal language and an exchange of materials to ensure that people can exchange and combine their explicit knowledge. This mechanism can be in the forms of official procedures, formal languages, and the exchange of handbooks. Other examples of formal knowledge sharing are well organised and scheduled meetings, structured innovation and technology fairs, and well organised brainstorm sessions. Formal knowledge sharing is a process of leverage and extension. Leverage is, as described, the process of making individual knowledge available for organisational needs, while the extension is the transfer of knowledge through shared knowledge. Martinez-Canas *et al.* (2012) express that an organisation can acquire new knowledge and skills via inter-organisational alliances to reinforce innovation activities and build up their key knowledge capitals to support continuous development. Specialised organisations engaging in knowledge-based activities can use their close social interactions to enhance both knowledge acquisition and innovation, which helps compensate for their internal resource constraints, especially in the knowledge economy era.

In typical knowledge transfer activities, the company and university usually enter into formal agreements, joint ventures or strategic alliances to collaborate on product development, intellectual properties commercialisations, fund bidding partnerships, business incubations and market explorations in formal knowledge sharing (Lap-chee Tsui *et al.*, 2020; de Wit-de Vries, E. *et al.* 2019;

Etzkowitz 2003; Rasmussen et al., 2006). These collaborations advance the inter-organisational joint R&D efforts, information exchanges, marketing trend updates and collective knowledge sharing, which are conducted under the formal organisational structures and mechanisms.

2.2.3 Informal Knowledge Sharing in Knowledge Transfer

Taminiau *et al.* (2009) express the view that informal knowledge sharing refers to informal communication and the conceptualisation of an informal network. Informal knowledge sharing can be all forms of knowledge sharing that exist alongside all the institutionalised forms of knowledge sharing. Literature refers that both senior management and employees often unconsciously share and exchange interorganizational knowledge, skills and information informal interactions (Taminiau, *et al.* 2009). The interactions relate to resources, services and activities, which are used to facilitate knowledge exchange, but are not necessarily designed for that purpose. The occasions taken place can be casual coffee breaks, social gatherings, conferences, workshops, events, phone calls, email conversations and even parties. Boh 2007 also suggests that informal knowledge sharing relies on the relationship between people. The transfer of knowledge can also take place via informal and unstructured interactions and communications, even where there is no specific intention to do so.

Informal knowledge sharing plays a significant role in the development of the Silicon Valley as a centre of innovation and technology businesses. The successful clusters there are characterised by frequent interpersonal social interactions such as informal inter-people interactions and social gatherings (Saxenian 1994). In Hong Kong, the universities and science parks are holding more and more informal knowledge-sharing events to enhance inter-industrial conversations and knowledge diffusion. In this study, informal knowledge sharing under knowledge transfer refers to casual activities, such as breakfast talks, luncheons, dinners, coffee chats, happy-hours gatherings, conferences and seminars, which are social networking opportunities for establishing interpersonal contact and sharing knowledge.

2.3 Innovation Capability

S-h. Liao *et al.* (2007) discuss innovation is about the changes in an organisation's products and services and the process and operation enabling their creations and deliveries. Innovation is a critical activity for organisations to prevent being eliminated from the market. The Oslo Manual 2018 (OECD/Eurostat, 2018) echoes that:

An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). Knowledge is a basis

for innovation, novelty and utility, and value creation or preservation as the presumed goal of innovation. The requirement for implementation differentiates innovation from other concepts such as invention, as an innovation must be implemented, i.e. put into use or made available for others to use.

The Oslo Manual 2018 defines two main types of innovation, product innovation and business process innovation. Product innovation is about how an organisation offers a new or improved good or service that differs significantly from its previous ones, and that has been introduced on the market. The business process innovation is the organisation's ability to develop new or improved business processes for one or more business functions that differ significantly from its previous practices. The business process innovation covers the elements of supporting operations and sales and marketing (OECD/Eurostat, 2018).

Despite the choice of wordings, scholars (S-h. Liao *et al.* 2007; Yam R.C.M. *et al.* 2004) use product innovation, process/operation innovation and marketing innovation as the dimensions to measure the innovation capability of knowledge-intensive industries. Their studies introduce frameworks for innovation auditing and examine the relevance among various types of innovation capabilities, discussing the effects on organisational performance. This study adopts the relevant part of Liao's and Yam's instruments to carry out a pilot study on the measurement of EdTech SMEs in Hong Kong.

3. Research Methodology

Commonly, academic studies on educational technology are about the operational and ethical practice of adopting the new technological solutions in teaching and learning, that is, from educators' perspective. The studies tend to focus on market size and technology development trends on the business side. Meanwhile, there are studies on commercial and incubation activities of technology firms from university knowledge transfer and knowledge sharing. This study adopts the theoretical models, frameworks and research instruments for technological innovation companies to educational technology, where the education value is another factor of consideration. This study fills the research gap to illustrate all the education, technology, and business values that an EdTech start-up can empower via a knowledge transfer collaboration with the universities.

3.1 Unit of Analysis

The study indicates the relevance of knowledge sharing practice and innovation capability of EdTech SMEs. The unit of analysis is the SME. These participants are mostly supported by incubation and business support programmes under the Hong Kong Science Park or the Hong Kong Cyberport. They

are also in at least one form of knowledge transfer partnership with local universities. Each SME must be active for at least one year and be in business operation in 2021 when the study is conducted. The founders and top management in the CXO level of the firms, who have a well-understanding and active participation in the SMEs' development and business operation, are invited to participate in the survey to respond on behalf of the SMEs. So the pool of respondents will have a comparable professional background and knowledge level.

3.2 Research Model and Hypotheses

Figure 1 shows the conceptual model describing the transfer of knowledge sharing into innovation capability of EdTech SMEs. The previous chapter of the literature reviewer explains the model's background and its successful application in measuring technological innovation companies. This pilot study seeks to clarify the model's reliability and investigate the correlations among the dimensions when it is specifically applied in examining the EdTech SMEs with knowledge transfer partnerships with local universities. Because of the timeframe and scale of this pilot study, some possible mediating variables, such as absorptive capacity and social capital of the SMEs, are not considered here.

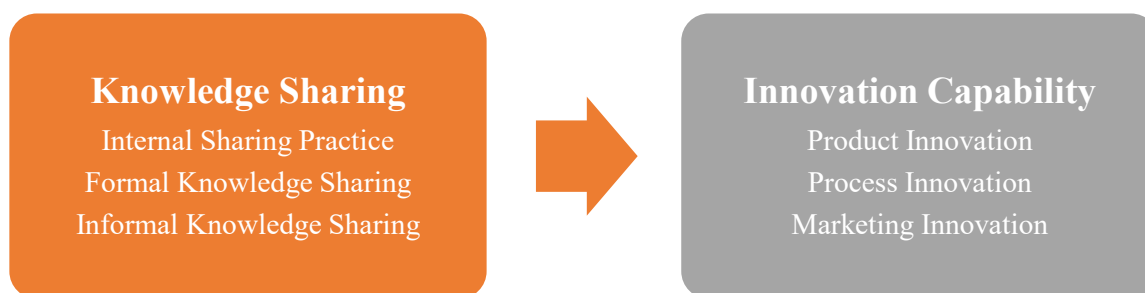


Figure 1: Conceptual model illustrating the contributions of knowledge sharing to innovation capability of an EdTech SME

When two people interact and exchange knowledge with each other, their pools of new ideas, experience and information gain linear growth. Afterwards, when they further share their new knowledge with else others and receive feedback questions, amplifications and modification, the benefits become exponential. So knowledge has to be donated and collected, inner-organisationally and inter-organisationally (Liao S.-h *et al.*, 2007). The growth of EdTech ventures is the attempt to construct a well-balanced construction of integration between the educational world and the technological innovation business field. The integration should involve the consideration of technology, teaching and learning, and business advancement, which are corresponding to product innovation, process innovation and marketing innovation. The discourse of educational practitioners, pedagogical innovators and technological inventors is the priority. The technological innovation

SMEs and digital entrepreneurs have become the model for educational changes (Ramiel, H *et al.*, 2019).

EdTech SMEs follow the steps of techno-business to leverage university knowledge and technology inventions to empower the venture's technology capital. As the same principle, they can also make use of the pedagogical and interventional research in university to advance their education value. In the previous chapter of the literature review, we understand that knowledge sharing can be formal and informal. Each way has its features. Passaro (2020) described that companies have to get the necessary knowledge to support the realisation of their key activities to achieve a successful transition in the business development life cycle. Sharing knowledge, competence, and business network from universities supports SMEs in developing their ideas into practical solutions and commercial products.

Moreover, the knowledge from universities can equip SMEs to evolve the process to deliver their goods and services. More practically importantly, the reputation and networking platforms of universities can open up new business models for SMEs. Therefore, university knowledge qualifies the innovation capability of an EdTech SME, influencing the product development, operation process and marketing. Based on this reasoning, the following hypothesis is presented.

H: Knowledge Sharing is positively related to an EdTech SME's Innovation Capability

With the sub-hypotheses as follows

H_{a1}: Internal Sharing Practice is positively related to an EdTech SME's Product Innovation

H_{a2}: Internal Sharing Practice is positively related to an EdTech SME's Process Innovation

H_{a3}: Internal Sharing Practice is positively related to an EdTech SME's Process Innovation

H_{b1}: Formal Knowledge Sharing is positively related to an EdTech SME's Product Innovation

H_{b2}: Formal Knowledge Sharing is positively related to an EdTech SME's Process Innovation

H_{b3}: Formal Knowledge Sharing is positively related to an EdTech SME's Process Innovation

H_{c1}: Informal Knowledge Sharing is positively related to an EdTech SME's Product Innovation

H_{c2}: Informal Knowledge Sharing is positively related to an EdTech SME's Process Innovation

H_{c3}: Informal Knowledge Sharing is positively related to an EdTech SME's Process Innovation

3.3 Research Design

The conceptual research framework and the survey instrument are designed based on literature. As a pilot study, we conducted a quantitative survey to collect primary research data from twenty-four EdTech SMEs in Hong Kong. The company level is the unit of analysis. The constructs of the survey are measured under the Likert's five-point scale, with 5 = strongly agree and 1 = strongly disagree. The study is cross-sectional research to investigate the correlations between knowledge sharing and innovation capability of an EdTech SME under a knowledge transfer partnership with a university in Hong Kong. This will provide a view of various variables in a single time point.

In this study, knowledge sharing is the independent variable, which describes the practice of a SME's internal employee interactions and communications on sharing knowledge, as well as the formal and informal inter-organisational exchanges in the knowledge transfer partnership with an university. In measuring the internal knowledge sharing practice, this study utilises the concepts of Liao S.-h. *et al.* 2007, who measure the employees' knowledge donation and knowledge collection as the indications. Knowledge donation is the motivation of employees to pass on their own intellectual capital to others; knowledge collection refers to employees' active practice in gaining new intellectual capital from each other (Liao S.-h *et al.*, 2007). In the formal knowledge sharing and informal knowledge sharing measurement, we employ the key concepts from Martínez-Cañás, R. *et al.*, (2012): the amount of useful market knowledge and valuable information on customer needs and trends and technological know-how are the constructs. On top of Martínez-Cañás, R.'s instrument, we added pedagogical know-how as a measurement item to better fit the EdTech industry, where educational value and technological value are both crucial. Another item on useful information about future development trends of the industry is also added under the construct of informal knowledge sharing. This item is one of the main objectives for universities to conduct inform knowledge sharing activities, according to the personal experience of the researcher as an experienced professional in knowledge transfer units of universities.

Innovation capability is the dependent variable of the research framework of this pilot study. We refer to the Oslo manual that product innovation, process innovation and marketing innovation are the constructs of measurement under the innovation capability. We employ four items from Liao S.-h. *et al.* (2007) 's survey instrument to examine product innovation and process innovation, and four items from Yam, R.C.M. *et al.* (2004) 's questionnaires to measure marketing innovation.

4. Results and Data Analysis

A total of 24 SMEs have completed this pilot survey. All of them are in knowledge transfer partnership(s) with universities in Hong Kong. We use the Jamovi software to access the reliability and correlation coefficients of the constructs and variables of the instrument of this study. We measure the reliability using the Cronbach's alpha and test the construct's correlation using the Pearson's correlation coefficient.

4.1 Survey Respondents

Among the 24 companies, the company size ranged from 3 staff to 20 staff. The mean reads 8.1 staff. All the respondents are in the position of either CEO or Founder/Co-founder. The mean of the years of services for the respondents in the reported position is 3.0 years. All companies are with in-house research and development teams. Eight companies indicate their over 50% of the workforce are R&D staff, 11 companies reported 21-50%, 4 companies reported 11-20% and 1 reported less than 10%.

4.2 Reliability Analysis

In the Cronbach's alpha analysis, the variables exhibit the coefficients as follows: Internal Sharing Practice = 0.819, Formal Knowledge Sharing = 0.707, Informal Knowledge Sharing = 0.521, Product Innovation = 0.840, Process Innovation = 0.451, and Marketing Innovation = 0.443. In general, Cronbach's alpha greater than 0.70 indicates constructs' reliability in the study (Rossiter, 2002). However, some scholars claim Cronbach's alpha in the level of 0.50 is acceptable for initial construct development (Srinivasan A., 1985; Peterson, R. A. 1994). Therefore, Process Innovation and Marketing Innovation may not be reliable constructs. Table A below shows the details of the measurement items for each construct, means, standard deviations and Cronbach's alpha coefficients.

4.3 Dependent Variable – Innovation Capability

Table B shows the correlation coefficients between the independent variable, knowledge sharing, and the dependent variable, innovation capability. The results demonstrate that only formal knowledge sharing (Pearson's coefficient = 0.429, $p \leq 0.05$) and informal knowledge sharing (Pearson's coefficient = 0.396, $p \leq 0.05$) exhibit positive effects on product innovation. The Hypothesis H_{b1} : *Formal Knowledge Sharing is positively related to an EdTech SME's Product Innovation* and H_{c1} : *Informal Knowledge Sharing is positively related to an EdTech SME's Product Innovation* are supported. The results illustrate no significant correlation between other constructs. Therefore, the hypotheses H_{a1} , H_{a2} , H_{a3} , H_{b2} , H_{b3} , H_{c2} , H_{c3} are not supported.

Table A - Knowledge Sharing and Innovation Capability Questionnaire Items

Construct and Item	Mean	SD	Cronbach α
Knowledge Sharing			
Internal Sharing Practice	3.93	0.828	0.819
1. You often share with your colleagues the new working skills that you learn.	3.84	1.281	
2. Your colleagues often share with you the new working skills that they learn.	3.64	1.036	
3. You often share with your colleagues the new information you acquire.	4.20	1.080	
4. Your colleagues often share with you the new information they acquire.	4.00	1.000	
5. Sharing knowledge among each other is regarded as a normal practice in your company.	3.96	1.020	
Formal Knowledge Sharing	3.92	0.853	0.707
6. Your company can obtain useful market knowledge through collaboration with university partner(s).	3.72	1.208	
7. Your company can obtain useful information on customer needs and trends through collaboration with university partner(s).	4.08	1.152	
8. Your company can obtain useful pedagogical know-how through collaboration with university partner(s).	4.16	1.179	
9. Your company can obtain useful technology through collaboration with university partner(s).	3.72	1.137	
Informal Knowledge Sharing	3.91	0.669	0.521
10. Your company can obtain useful market knowledge through either conferences, forums, seminars or social occasions of university partner(s).	3.32	1.314	
11. Your company can obtain useful information on customer needs and trends through either conferences, forums, seminars or social occasions of university partner(s).	3.92	1.256	
12. Your company can obtain useful pedagogical know-how through either conferences, forums, seminars or social occasions of university partner(s).	4.08	1.152	
13. Your company can obtain useful technology through either conferences, forums, seminars or social occasions of university partner(s).	4.08	0.862	
14. Your company can obtain useful future development trends through either conferences, forums, seminars or social occasions of university partner(s).	4.16	1.068	
Innovation Capability			
Product Innovation	4.09	0.881	0.840
15. Your company often develops new products/services well accepted by the market.	4.12	0.927	
16. A great majority of your company's revenue are generated by the new products/services developed.	4.48	1.005	

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17. Your company is capable of offering products with specialised features.	4.08	1.077	
18. Your company has better capability/partnership in R&D of new products or services than your competitors.	3.68	1.249	
Process Innovation	3.38	0.778	0.451
19. Your company always acquires new pedagogical skills to improve the manufacturing operation or service process.	3.04	1.136	
20. Your company can develop an efficient manufacturing process or operating procedure.	3.32	1.406	
21. Your company can flexibly provide products and services according to the demands of the customers.	3.72	1.242	
22. The new manufacturing process or operational procedure employed by your company always arouses imitation from competitors.	3.44	1.261	
Marketing Innovation	3.87	0.587	0.443
23. Your company has a close relationship with major customers.	4.28	0.792	
24. Your company has good knowledge of different market segments.	3.12	1.236	
25. Your company has a highly efficient sales force.	3.88	0.927	
26. Your company provides excellent after-sale services.	4.20	0.816	

Description Information

27. What is the size of your company?	8.1 staff
28. What is your current position in your company?#	CEO (6) Founder/Co-founder (18)
29. How many years of service have you been in this position?	3.0 years
30. What is the percentage of R&D staff in terms of the total workforce in your company?#	Less than 10% (1) 11-20% (4) 21-50% (11) Over 50% (8)

** Item 1-26 were set using the Likert's five point scale, 5 = strongly agree and 1 = strongly disagree
Item 28 were multiple choice questions that the respondents selected the most appropriate option among the listed ones. The bracketed figures represent the number of respondents who selected the particular answers.*

Table B – Associations among Knowledge Sharing and Innovation Capability

Correlation Matrix (i)

		ISP	FKS	IKS	PI	OI	MI
Knowledge Sharing							
ISP	Pearson's r	—					
	p-value	—					
FKS	Pearson's r	-0.008	—				
	p-value	0.968	—				
IKS	Pearson's r	-0.039	0.352	—			
	p-value	0.853	0.084	—			
Innovation Capability							
PI	Pearson's r	0.272	0.429 *	0.396 *	—		
	p-value	0.188	0.032	0.050	—		
OI	Pearson's r	0.005	-0.046	0.223	0.051	—	
	p-value	0.979	0.825	0.283	0.810	—	
MI	Pearson's r	-0.106	0.041	-0.147	0.039	0.438 *	—
	p-value	0.615	0.847	0.483	0.854	0.029	—

Table B – Associations among Knowledge Sharing and Innovation Capability

Correlation Matrix (i)

	ISP	FKS	IKS	PI	OI	MI
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Knowledge Sharing

Note. * $p < .05$

ISP = Internal Sharing Practice

FKS = Formal Knowledge Sharing

IKS = Informal Knowledge Sharing

PI = Product Innovation

OI = Process Innovation

MI = Marketing Innovation

Correlation Matrix (ii)

		KS	IC
KS	Pearson's r	—	
	p-value	—	
IC	Pearson's r	0.339	—
	p-value	0.098	—

KS = Knowledge Sharing

IC = Innovation Capability

5. Discussions

Summing up the analyses above, formal knowledge sharing and informal knowledge sharing are positively related to the innovation capability of EdTech SMEs. The Cronbach's α coefficients indicate these three constructs are reliable measurements. The internal sharing practice shows a high Cronbach' α coefficient, however the correlation analysis does not read any significant relevance between it and the constructs under the dependent variable. Statistically, the internal interactions among employees on knowledge sharing does not have significant impact on the SME's innovation

capability. From the low Cronbach's α , we see the process innovation and marketing innovation may not be valid factors.

The mean values on formal knowledge sharing and informal knowledge sharing are 3.92 and 3.91, respectively. This reflects that the EdTech SMEs view both types of knowledge sharing are meaningful for their development of innovation capability. Among the constructs under innovation capability, the mean value of product innovation is significantly higher than the mean values of process innovation and marketing innovation. Given these mean readings and the significant correlation between formal knowledge sharing, informal knowledge sharing and product innovation, the results support the universities to carry out more knowledge sharing activities to benefit the development of the EdTech industry.

In accordance with the start-up development model of Passaro R. *et al.* (2020), a company passes four stages, namely Ideation, Intention, Start-up and Expansion. When zooming in to the Start-up, Passaro R. defines the final outcome of this stage is the launch of a new product/service on the market. Back-end scalability improvements, internationalisation, supply chain modification and massive customer acquisition, which are related to process innovation and marketing innovation, are under the Expansion stage. Given that the 24 participating SMEs in this study are mostly 2~3 years old start-ups or new joiners to the EdTech market, they have just gone via or going via the Start-up stage in Passaro R.'s start-up development model. Therefore, their developments are primarily product innovation-focused. This is an explanation why only product innovation indicates a positive correlation in this study.

The research model and instrument of this pilot study are utilised from some cross-industry frameworks developed by other scholars. Liao S.-h. *et al.* (2007) warned that opinions differ from one industry sector to another, which implies cross-industry framework may not be entirely applicable in a specific industry sector. Enterprises from manufacturing-based knowledge-intensive industries respond the same research instrument differently from those from service-based ones. This pilot study's results reflect that the cross-industry measurement constructs of process innovation and market innovation may not be directly applicable in the EdTech industry, where learning science knowledge can be equally important as technological innovation (Luckin R. and Cukurova M. 2019). In further research, we would take into consideration the research frameworks of information-based industry or even education-specific.

As in any other research, this pilot study has limitations. We use a judgement sampling method to select respondents for this study. The sample of respondents is confined to the specific type of companies that can conform to the criteria set of EdTech SMEs with knowledge transfer partnerships

with universities in Hong Kong. This non-probability sampling may not give results reflecting the real situation. Besides, the respondents are all in Hong Kong, and the cultural, industry environmental and political factors in other countries and regions are not considered in this study. Moreover, because of the timeframe and resource constraints, some other variables are omitted in this study. For instance, social capital and absorptive capability of the SMEs, may be intermediate variables or moderating variables.

6. Conclusions

As a pilot study investigating the influences of knowledge sharing on the innovation capability of SMEs in the EdTech industry, the results indicate the formal and informal knowledge sharing of in university-company knowledge transfer activities are positively related to the product innovation of the SMEs. However, the other two constructs, process innovation and marketing innovation, which are reported as evidence-based measurements of knowledge-intensive companies by other scholars, do not demonstrate a correlation with knowledge sharing. The possible reasons can be the ages and status of development of the sample of SMEs in this pilot study and the industrial specified characteristics in the EdTech. This pilot study serves as the base for further study on developing the proper framework in investigating the relationship between knowledge transfer and innovation capability of EdTech companies. Constructs from instruments for measuring education-based ventures should be taken into account together with those for technology-intensive ventures. Because of the rapid development and young age of the EdTech industry, a qualitative pilot study in the form of an in-depth interview of senior practitioners in the field can be useful to develop and validate the research design and conceptual framework. Moderating factors, such as social capital and absorption capability, shall also be involved in future studies. This shall assure the instrument is up-to-date and fit the market before stepping into the quantitative survey. Further research would be carried out as my Doctor of Business Administration thesis in the University of Wales Trinity Saint David.

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