Software Project Managers' Knowledge Transfer: An In-Depth Interview

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Abstract: There have been many studies in the past that have demonstrated knowledge transfer in a variety of settings. However, only a small proportion of research has focused on knowledge transfer for software project managers. This study explores knowledge transfer factors with the goal of gaining a better understanding of those factors for software project managers at all levels, including those who have prior expertise in the field and those who are new to the field. Qualitative data was acquired through in-depth interviews with 12 software project managers using semi-structured questions to investigate all factors involved. In accordance with the findings, nine potential factors have been identified as influencing knowledge transfer among software project managers. It is anticipated that the findings of this study will be advantageous to the corporate sector, public authorities, and entrepreneurs in the field of project management. The findings can be used as guidelines for software project managers' practices and progress in knowledge transfer within project management to maximize profits in the business.

Keywords: Knowledge Transfer, Knowledge Transfer factor, Project Management, Project Manager, Software Project Manager, Thai Project Manager

1. Introduction

Within an organization, software project managers are responsible for ensuring that software and digital projects are completed on time, within budget, and on schedule. They are responsible for the successful completion of all software projects and for overseeing employees who work on those projects on behalf of the organization. Meanwhile, organizations around the world are evolving in tandem with technological breakthroughs in order to energetically drive digital transformation (Baiyere, Salmela & Tapanainen, 2020; Bharadwaj, El Sawy, Pavlou & Venkatraman, 2013; Dal Mas, Piccolo, Edvinsson, Skrap & D'Auria, 2020; Verhoef et al., 2021; Vial, 2019) with the intent of enhancing product sales and revenues, improving customer satisfaction, and streamlining procedures (Baiyere et al., 2020; Caliskan, Özkan Özen, & Ozturkoglu, 2020; Hess, Matt, Benlian, & Wiesböck, 2016; Sebastian et al., 2020).

The drive toward digital transformation encompasses a diverse array of digital technology and software-related projects (Karimi & Walter, 2015). Each project is frequently headed by a software project manager who coordinates operations across schedule, scope, and budget constraints (Ehsan et al., 2010; Gillard & Price, 2005; Kaleshovska & Pulevska-Ivanovska, 2019) , achieving business objectives and long-term organizational performance (PMI, 2017) with predictions indicating that the Asia-Pacific area will require two million project managers over the next decade (Pant, 2021).

There are numerous skills that a project manager must possess in order to successfully manage an organization's project, including leadership skills, administrative skills, and communication skills (Alvarenga, Branco, Guedes, Soares, & Silva, 2019; Yoon, Yan, & Kim, 2020). These skills can be honed and enhanced through training, on-the-job experience, and knowledge transfer by more experienced project managers. Thus, businesses must prioritize the transfer of this knowledge and skills. Additionally, having an effective knowledge transfer process provides firms with a competitive edge (Osterloh & Frey, 2000; Pawliczek & Rössler, 2017; Yeong & Lim, 2011) but the majority of project managers continue to lack adequate transfer of project management expertise (Carbone & Gholston, 2015; Palm & Lindahl, 2015).

Previously published research has examined knowledge transfer in a variety of contexts (Dameri & Demartini, 2020; Greser et al., 2021; Haglund & Wåhlberg, 2015; Karanikić & Bezić, 2021; Kuciapski & Weichbroth, 2021; Tshuma, Steyn, & Van Waveren, 2018). However, there are few studies which have concentrated on the knowledge transfer of software project managers, despite the explosion of digital and software initiatives. Furthermore, due to a lack of adequate project management expertise, these software project managers must spend considerable time developing their skills without being rewarded with promotion by existing project

managers. With the increasing number of digital transformation projects, Thailand is experiencing a shortage of software project managers and the country's companies tend to be relatively underdeveloped.

As a result, this research asks the following question. 'What factors influence knowledge transfer for software project managers?'. To address the question, the authors conducted a literature review on knowledge transfer and project manager, followed by an explanation of the methodology. Then the findings and conclusion are discussed in detail, and closes with a discussion and limitations section.

2. Literature Review

2.1 Knowledge Transfer and Project Manager Definition

There have been numerous definitions of knowledge transfer in the past (Argote & Ingram, 2000; Carlile & Rebentisch, 2003; Liyanage, Elhag, Ballal, & Li, 2009; Singley & Anderson, 1989; Szulanski, 1996), all of which are consistent in theme, stating that knowledge transfer is the transfer of experience and expertise from a sender to a receiver within a particular environment until the receiver acquires new expertise in that environment. Meanwhile the project manager is a job title associated with the management of projects within a business or industry, such as construction, research, or software development. This comprises the planning, execution, monitoring, and control of the project, as well as its closure (Wessels, 2007). The project manager is accountable for the overall project management, including goal development, project staff management, resource stewardship, and ensuring the project's success through the use of project management skills, techniques, and tools (Millhollan & Kaarst-Brown, 2016). The success of a project is highly dependent on the project manager's ability (Millhollan & Kaarst-Brown, 2016; Wessels, 2007).

2.2 Knowledge Transfer in Project Manager Context

From the author's literature review, it was found that there has been a lot of past research on the factors affecting knowledge transfer for project management as well as the outcomes of knowledge transfer from various industries)Ajmal & Koskinen, 2008; Al-Gharibeh, 2011; Al-Salti, Ali, & Hackney, 2011; Argote & Ingram, 2000; Bacon, Williams, & Davies, 2020; Bellini, Aarseth, & Hosseini, 2016; Davenport & Prusak, 1998; Ekambaram & Økland, 2018; Eskerod & Skriver, 2007; Glaser, Blake, Bertolini, te Brömmelstroet, & Rubin, 2021; Haglund & Wåhlberg, 2015; Hlova, 2019; Ibidunni, Kolawole, Olokundun, & Ogbari, 2020; Jalil & Shahid, 2008; Karlsen & Gottschalk, 2015; Li, Sun, Shou, & Sun, 2020; Liyanage et al., 2009; Lockett, Kerr, & Robinson, 2008; Osterloh & Frey, 2000; Owen, Burstein, & Mitchell, 2014; Porrawatpreyakorn, Quirchmayr, & Chutimaskul, 2009; Quinn, Anderson, & Finkelstein, 1998; Reagans & McEvily, 2003; Sarker, Sarker, Nicholson, & Joshi, 2003; Simonin, 2004; Sutling, Mansor, Widyarto, Lecthmunan, & Arshad, 2015; Tshuma et al., 2018; Voigt, 2009; Wei & Miraglia, 2017; Zarinpoush & Gotlib Conn, 2006; Zhao, Zuo, & Deng, (2015. Some studies examine the sender of project management knowledge (Disterer, 2002; Landaeta, 2015; Waveren, Oerlemans, & Pretorius, 2014; Wiewiora, Trigunarsyah, Murphy, & Liang, 2009); others examine the receiver of project management knowledge (Bakker, Cambré, Korlaar, & Raab, 2011; Vinke-de Kruijf, Hulscher, & Bressers, 2013; Zhao et al., 2015); and yet others examine environmental factors (Ajmal & Koskinen, 2008; Bellini et al., 2016; Disterer, 2002; Karlsen & Gottschalk, 2015; Ren, Yan, Wang, & He, 2019).

These previous studies have identified potential roles connected to knowledge transfer in the context of project manager, including sender, receiver, and environment roles. Additionally, they discussed a variety of factors that contribute to such responsibilities.

In addition, past studies have attempted to examine the relationship of knowledge transfer to project managers (Eskerod & Skriver, 2007; Mannan, Haleem, & Jameel, 2013). However, there is a only a modicum of research stating factors affecting knowledge transfer in software project managers context. Consequently, the authors gathered the factors and indicators discovered during the studies in order to propose a set of potential factors, as illustrated in figure 1 while the sender of knowledge is an expert software project manager, and the receiver is a less experienced software expert project manager. Also, the details on the source of each indicator were revealed in table 2 so as to make a comparison with those factors.
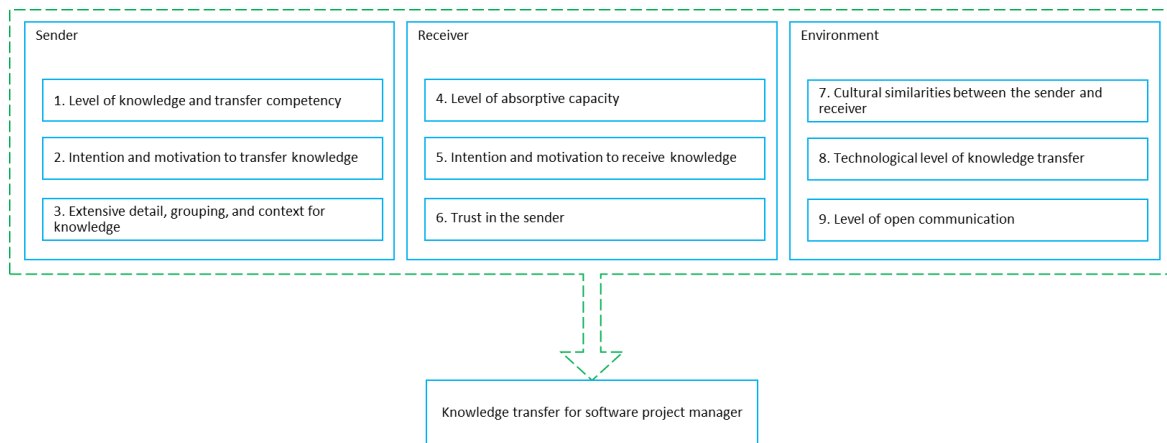
Figure 1: Potential factors from Literature Review

3.   Research Methodology

Many studies which involved the generation of knowledge transfer factors employed a qualitative approach (Al-Salti et al., 2011; Glaser et al., 2021; Lockett et al., 2008; Porrawatpreyakorn et al., 2009; Zhao et al., 2015). For this study, the authors therefore compiled the potential factors and indicators that they had uncovered during their literature review and executed a qualitative study to explore their findings. The qualitative data was acquired through in-depth interviews with 12 participants using semi-structured questions (Morgan, 1993; Morse & Field, 1995) since they enabled objective comparisons of persons while also allowing for natural investigation of subject matter relating to that individual. The findings are then used to complete a holistic investigation into all factors. Since it has been shown that project management jobs require a higher level of skill, experience, and effort than routine tasks (Havermans, Van der Heijden, Savelsbergh, & Storm, 2019), the authors constructed the sample into six senior managers with more than four years of software project management experience in Thailand and six junior managers with 0-4 years of software project management experience in Thailand, using non-probability sampling with purposive sampling (Tongco, 2007). Given the authors' skills and experience in software project management, a sample group that is representative of the research goal could be selected. The in-depth interview took approximately 90 minutes per interviewee and occurred between March and April 2021.

In this regard, the author used the field note technique to independently collect all data from the sample at each step (Harrelson, 1994) and provided data collecting instruments such as a sample group interview form, notepad, and audio recorder. After the research was completed, confidentiality was maintained, and information was erased. The author began by introducing himself explaining the objectives and benefits of the research to the informants, and obtained permission to record information, and recording audio during the interview. The interview was then initiated by obtaining the respondent's first and last names, gender, age, education level, current position, and years of experience as a software project manager's contributor, before shifting on to interview questions about their experiences as a sender, the perspective of the receiver of the knowledge transfer, and the environment that affects knowledge transfer, as well as asking a few follow-up questions to ascertain the factors and metrics affecting knowledge transfer in all dimensions for software project managers.

Following the conclusion of the interview, the author discussed the results with the informants. The data from the interviews were then compared to the proposed prospective elements to corroborate the factors affecting knowledge transfer for software project managers, and the results were distributed to all interviewees to ensure that the author accurately understood the informant's account. The author then use thematic analysis (Braun & Clarke, 2006) to determine the data's theme by transcribing the data in order to synthesize meanings consistent with the research objectives by considering data similarities and differences in order to organize the data and eliminate superfluous data, and finally interpret the data by attempting to extract meaning from the available data and correlating it.

Afterward, the triangulation approach was used to validate the data (Carter, 2014), which considers the source of data to be individuals with varying levels of experience in project management, supplemented by

observations and questioning during the interview, as well as the examination of data from pertinent document sources to establish validity.

Along with the interview analysis and approach outlined above, the authors monitored the project managers' knowledge transfer activities without participating in order to gain an even more complete insight.

The authors chose software project managers with varied years of experience in software project management, spanning from 0 to 25 years to generate a representative sample. The information is included in table 1.

Table 1: Qualitative Research Contributors

No.	Code	Software project management experience (years)
1	SPM1	15
2	SPM2	5
3	SPM3	10
4	SPM4	25
5	SPM5	20
6	SPM6	23
7	JPM1	0
8	JPM2	1
9	JPM3	3
10	JPM4	0
11	JPM5	0
12	JPM6	2

4.   Findings

The author discovered that the findings were consistent with the majority of the potential factors. The 12 respondents agreed that the sender's Level of knowledge and transfer competency (factor no.1), Extensive detail, grouping, and context for knowledge (factor no.3), and the Intention and motivation to receive knowledge (factor no.5) are factors affecting knowledge transfer for software project managers. While 11 informants interviewed agreed that the Technological level of knowledge transfer (factor no.8) is also a factor. In addition, 10 respondents said the factors included the Intention and motivation to transfer knowledge (factor no.2) and the Level of absorptive capacity (factor no.4). Nine respondents viewed agreed that the Trust in the sender (factor no.6) is one of the factors that affect as well.

However, 5 respondents, comprising three senior software project managers and two junior software project managers, considered that the Cultural similarities between the sender and receiver factor (factor no.7) had no effect on knowledge transfer for software project managers and 6 respondents, comprising three senior software project managers and three junior software project managers, believed that the Level of open communication (factor no.9) factor had no effect on knowledge transfer as well.

Furthermore, the findings led to the discovery of three novel control factors by the author as shown in figure 2 (factor no.11, 12, 13 in table 2)
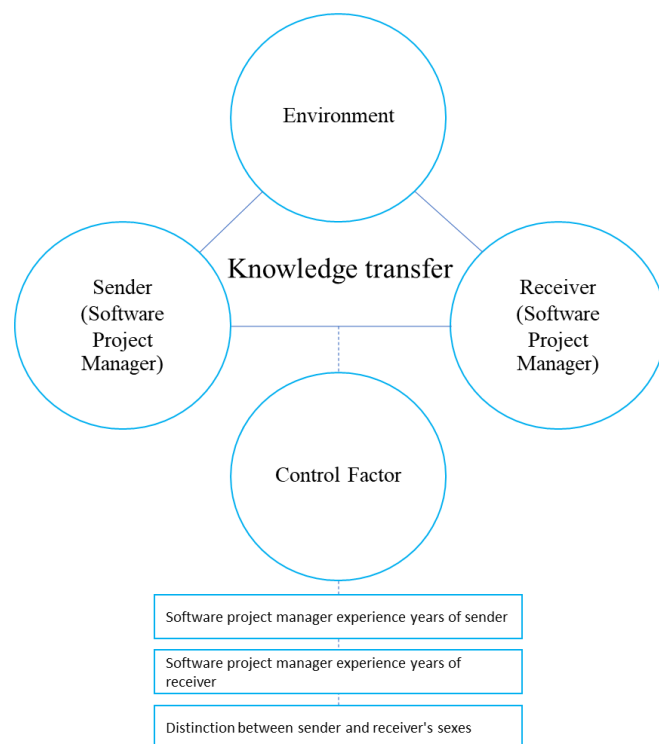
Figure 2: Potential factors after interview

Additionally, the findings enabled the creation of some new potential indicators within the existing factors on the condition that they are endorsed by more than 30% of interviewees. Additional statistical techniques should be used to validate all these potential factors and indicators. The findings are summarized in table 2.

Table 2: Origin of indicator

Group	Potential factors	Potential indicators	Source
Sender	1. Level of knowledge and transfer competency	The sender must have already-acquired mastery of knowledge in what is being conveyed.	In-depth interview and literature review (Davenport & Prusak, 1998; Liyanage et al., 2009)
		The sender must have the ability to transfer knowledge.	In-depth interview and literature review (Al-Salti et al., 2011; Davenport & Prusak, 1998; Glaser et al., 2021; Ibidunni et al., 2020; Karlsen & Gottschalk, 2015; Liyanage et al., 2009; Porrawatpreyakorn et al., 2009; Sarker et al., 2003; Zarinpoush & Gotlib Conn, 2006; Zhao et al., 2015)
		The sender must be trustworthy.	In-depth interview and literature review (Porrawatpreyakorn et al., 2009; Sarker et al., 2003; Zarinpoush & Gotlib Conn, 2006)
		The sender must possess knowledge transfer techniques.	In-depth interview and literature review (Glaser et al., 2021; Ibidunni et al., 2020; Karlsen & Gottschalk, 2015; Liyanage et al., 2009; Porrawatpreyakorn et al., 2009; Zarinpoush & Gotlib Conn, 2006)
	2. Intention and motivation to transfer knowledge	The sender must be motivated to provide knowledge.	In-depth interview and literature review (Liyanage et al., 2009; Lockett et al., 2008; Osterloh & Frey, 2000; Porrawatpreyakorn et al., 2009)
		The sender must have the intention of transferring knowledge.	In-depth interview and literature review (Argote & Ingram, 2000; Porrawatpreyakorn et al., 2009; Simonin, 2004)
		The sender must pass on the knowledge on a regular basis.	In-depth interview and literature review (Argote & Ingram, 2000; Simonin, 2004)

Group	Potential factors	Potential indicators	Source
	3. Extensive detail, grouping, and context for knowledge	The sender must have clear information of the knowledge transfer's content.	In-depth interview and literature review (Al-Gharibeh, 2011; Al-Salti et al., 2011; Lockett et al., 2008; Simonin, 2004; Zarinpoush & Gotlib Conn, 2006)
		The sender must group the knowledge transfer's contents.	In-depth interview and literature review (Al-Gharibeh, 2011; Bacon et al., 2020; Zhao et al., 2015)
		The sender must sequentially prioritize the content of the knowledge transfer.	In-depth interview and literature review (Al-Gharibeh, 2011; Bacon et al., 2020; Zhao et al., 2015)
Receiver	4. Level of absorptive capacity	The receiver must be capable of learning.	In-depth interview and literature review (Al-Salti et al., 2011; Argote & Ingram, 2000; Davenport & Prusak, 1998; Glaser et al., 2021; Liyanage et al., 2009; Porrawatpreyakorn et al., 2009; Sarker et al., 2003; Zhao et al., 2015)
		The receiver must have prior knowledge of project management.	In-depth interview and literature review (Jalil & Shahid, 2008; Li et al., 2020; Sutling et al., 2015)
		The receiver must make enquiries of and have interactions with the sender.	From in-depth interview
	5. Intention and motivation to receive knowledge	The receiver must be motivated to learn.	In-depth interview and literature review (Glaser et al., 2021; Liyanage et al., 2009; Lockett et al., 2008; Osterloh & Frey, 2000; Porrawatpreyakorn et al., 2009; Simonin, 2004)
		The receiver must be willing to learn.	In-depth interview and literature review (Glaser et al., 2021; Liyanage et al., 2009; Lockett et al., 2008; Osterloh & Frey, 2000; Porrawatpreyakorn et al., 2009; Simonin, 2004)
		The receiver must constantly acquire knowledge.	From in-depth interview
	6. Trust in the sender	The receiver must trust the sender.	In-depth interview and literature review (Bellini et al., 2016; Glaser et al., 2021; Lockett et al., 2008)
		The receiver must have a good relationship with the sender.	In-depth interview and literature review (Al-Salti et al., 2011; Bacon et al., 2020; Ibidunni et al., 2020; Porrawatpreyakorn et al., 2009; Reagans & McEvily, 2003; Zarinpoush & Gotlib Conn, 2006; Zhao et al., 2015)
		The receiver must respect the sender.	From in-depth interview
Environment	7. Cultural similarities between the sender and receiver	The sender and the receiver must have a similar cultural background.	In-depth interview and literature review (Ajmal & Koskinen, 2008; Al-Gharibeh, 2011; Bacon et al., 2020; Eskerod & Skriver, 2007; Karlsen & Gottschalk, 2015; Liyanage et al., 2009; Quinn et al., 1998; Sarker et al., 2003)
		Both the sender and the receiver's temperaments must be compatible.	From in-depth interview
		The sender and receiver must interact in the same language, for example, Thai or English.	From in-depth interview
	8. Technological level of knowledge transfer	Technology, such as equipment and software, is required for knowledge transfer.	In-depth interview and literature review (Al-Gharibeh, 2011; Liyanage et al., 2009; Lockett et al., 2008; Zarinpoush & Gotlib Conn, 2006)

Group	Potential factors	Potential indicators	Source
		Knowledge transfer must be accompanied by visual representations.	From in-depth interview
		Knowledge transfer must be accompanied by computer animation.	From in-depth interview
	9. Level of open communication	Knowledge transfer requires open and direct contact between sender and receiver.	In-depth interview and literature review (Bellini et al., 2016; Porrawatpreyakorn et al., 2009; Sarker et al., 2003; Zarinpoush & Gotlib Conn, 2006)
		The content transferred must have a legitimate cause for its origin.	From in-depth interview
		Knowledge transfer requires amicable conversation.	From in-depth interview
Control factor	10. Software project manager experience years of sender	Sender with greater expertise, and years of experience as a software project manager will transfer more efficiently.	From in-depth interview
Control factor	11. Software project manager experience years of receiver	Receiver with greater expertise, and years of experience as a software project manager will receive more efficiently.	From in-depth interview
Control factor	12. Distinction between sender and receiver's sexes	The transfer of knowledge is more efficient when performed with individuals of the opposite sex.	From in-depth interview
Transfer result	Efficiency of knowledge transfer for software project managers	Effective knowledge transfer to project managers will result in increased knowledge flow in project management.	In-depth interview and literature review (Ekambaram & Økland, 2018; Haglund & Wåhlberg, 2015; Hlova, 2019; Tshuma et al., 2018; Voigt, 2009; Wei & Miraglia, 2017)
		Effective knowledge transfer to project managers will contribute to the reduction of repeated problems throughout the project.	In-depth interview and literature review (Ekambaram & Økland, 2018; Haglund & Wåhlberg, 2015; Hlova, 2019; Tshuma et al., 2018; Voigt, 2009; Wei & Miraglia, 2017)
		Effective knowledge transfer to project managers will help to keep the project's costs down.	In-depth interview and literature review (Ekambaram & Økland, 2018; Haglund & Wåhlberg, 2015; Hlova, 2019; Tshuma et al., 2018; Voigt, 2009; Wei & Miraglia, 2017)

Findings are discussed in details along with interview excerpts as follows:

4.1 Sender

4.1.1. Level of knowledge and transfer competency (factor no.1)

The interview results corroborated the literature review. All 12 respondents agreed that the sender's knowledge level and ability to transfer knowledge is a factor affecting knowledge transfer for software project managers. The sender must be knowledgeable and competent in project management, possess excellent communication, presentation, and knowledge transfer skills on both broadly and in depth, and be able to easily explain the content to the receiver, as demonstrated by the following interview excerpts:

"Occasionally, project managers perform admirably but are unable to communicate their abilities to the receivers. The person transferring must be able to communicate and transfer to the receiver in order for the receiver to comprehend the sender's thoughts, which includes not only education from textbooks, but also bringing real knowledge and experience to the receiver." – JPM1

"We should develop positive relationships with learners and seek out individuals that are interested in participating in the beginning. Let us converse and play together to ensure that there are no disconnects between learners and lecturers. Utilize the tutorial to break the content into sections." – SPM6

4.1.2. Intention and motivation to transfer knowledge (factor no.2)

The interview outcome was consistent with the literature review. Ten contributors said that the motivation and intention of senders were factors that influence knowledge transfer for software project managers. The sender must be willing to pass on knowledge, pay attention to the receiver, and have a desire to develop people in their own careers. Examples of interview excerpts are as follows:

"Senders must be teaching people, closely supervise the students, keep simulating events and stimulating learners in different situations to show learners to visualize." – SPM1

"Senders must not be jealous of their own knowledge. Do not try to figure out how much knowledge the learners have and listen to the perspectives of the students. The senders must be friendly with the learners so that the learners have the courage to talk to them and not consider themselves superior." – JPM2

4.1.3   Extensive detail, grouping, and context for knowledge (factor no.3)

The findings of the interviews confirmed the literature review. Twelve respondents were questioned and agreed that specifics, groups, and a good understanding of the knowledge context influenced knowledge transfer for software project managers. The sender must employ effective instructional principles and methodologies, including continual training and knowledge verification, as demonstrated by the following interview excerpts:

"If trainers have teaching principles in place, such as describing what a project charter is and what deliverables are, they can communicate more effectively and help learners understand more concretely." – JPM1

"Must instill in learners an awareness of their issues and a desire to learn how to address them. We need to focus on teaching with a workshop for real practice, on teaching methods, on using content that is appropriate for learners, on creating a positive learning environment, on maintaining a teaching order, and on educating people to be honest by first bringing the learners' and teachers' emotions together. and teach without relying on books, but rather on actual practice, adapting knowledge to the learner's surroundings. You must recognize that you did not study for the exam." – SPM6

4.2 Receiver

It consists of 3 factors according to the potential factors.

4.2.1   Level of absorptive capacity (factor no.4)

The results of the interview matched those of the literature review. Ten respondents highlighted the belief that a software project manager's level of knowledge absorption capacity is a factor impacting knowledge transfer. The receivers must comprehend the content learned and organize their thoughts in accordance with the content, as well as interact with the senders to ensure their comprehension. The following are some examples of interview excerpts:

"If learners are adaptable and capable of swiftly learning and comprehending project management ideas, they will communicate more effectively with teachers." –SPM1

"If someone has the ability to comprehend what they have studied, there is a systematic order of cognitive processes in their head that facilitates thinking, analyzing, and making accurate distinctions, all of which contribute to good study." – JPM2

Furthermore, the findings recruit a new potential indicator within this factor: "The receiver must have inquiries and interactions with the sender". The following is an illustration of interview excerpts:

"The learner must interact with the educator, express ideas, consider them from a variety of angles, and ask the questions back to educator. While the educator is required to respond to these queries in order to ensure two-way communication." – SPM5

4.2.2 Intention and motivation to receive knowledge (factor no.5)

The results of the interview were in line with the literature review. All 12 interviewees agreed that a factor influencing knowledge transfer for software project managers is the receiver's motivation and willingness to learn. The receiver must have a love for project management and a desire to work in this profession, as well as an eagerness to learn, explore new chances for experimentation, set personal goals, and seek development and self-training. The following are some examples of interview outcomes:

"Not everyone has the ability to manage a project. You must consider how willing employees are to work in project management. How well do you understand this professional field? What are your thoughts on this line of work? How motivated are you to learn? Are you willing to fight in any circumstance?" – SPM1

"You must be inquisitive and attempt to ask as many questions as possible in your brain. You are not required to consider complicated questions. You can even pose a brief question. Tell me what you don't know. Always willing to learn. Personally, I believe that a successful project manager must be eager to learn, have a defined timeframe for learning, and then use that knowledge." – JPM2

Moreover, the findings identify a new potential indicator for this factor: "The receiver must constantly acquire knowledge". The following is an example of interview excerpt:

"The learners must be proactive, ready to learn, and always collecting knowledge in order to swiftly grasp the project environment." – SPM6

4.2.3 Trust in the sender (factor no.6)

The results of the interview coincided with the literature review. Trust in the sender is a factor impacting knowledge transfer for software project managers, according to ten contributors. The receiver must be receptive, show respect for, believe in, and trust the sender. As illustrated in the following interview excerpts:

"Typically, as people age, they work more, get more confidence in themselves, and become more sensitive to other people's comments, which prevents them from properly comprehending what they have learnt. As a result, learners must recognize that they do not know all about project management, without fluff or preconceived notions about the teachers, and attempt to open up and absorb what they teach us." – JPM2

"Must appreciate and accept the instructor or have already known the instructor. Otherwise, they would disregard what was taught to them. There could also be disagreements with the instructor." – SPM4

Additionally, the findings establish a new indicator for this factor: "The recipient must respect the sender.": "The receiver must respect the sender". The following is an excerpt from an interview.

"The learner must show respect for the instructor and have faith in him or her. This will help bridge the cultural divide." – SPM1

4.3 Environment

It consists of 3 factors related to the potential factors.

4.3.1 Cultural similarities between the sender and receiver (factor no.7)

The interview results accorded with the literature review. Seven respondents viewed cultural compatibility between sender and receiver as a factor in knowledge transfer for software project managers. This culture also has an effect on how each project is managed. While five informants believed that such factors had no effect on knowledge transfer, the following interview excerpts demonstrate otherwise:

"In my experience, I've met foreign students from a variety of cultural backgrounds, which is rather prevalent in contemporary times. As a result, it is unrelated to and irrelevant to teaching and learning. Teachers must conform to the highest international standards in order to be qualified to teach anyone." – SPM3

Additionally, two new indicators for this factor are established in the findings: "Both the sender and the receiver's temperaments must be compatible" and "The sender and receiver must interact in the same language, for example, Thai or English". The following excerpts are taken from interviews.

"The idea is that both sides' cultures, languages utilized during the transfer, and project management styles are relevant." – JPM1

"Learners and teachers must understand one another's cultures, temperaments, and goals for learning and teaching. It will help them communicate more effectively with one another. For instance, if the Thai people's culture collides with that of Japanese professors. We must recognize that Japan handles projects in an orderly, precise, rigorous, and timely manner, whereas Thailand is more adaptable. If we comprehend one another's cultures, we will understand what the other person wishes to learn and teach. Also, it is crucial that both the learners and the teachers have similar temperaments" – JPM2

4.3.2 Technological level of knowledge transfer (factor no.8)

The results of the interview mirrored what was found in the literature. According to 11 informants, the technology level employed to impart knowledge is a factor that affects knowledge transfer for software project managers. Documents, gadgets, and software are all examples of technologies that are used to present, communicate, and measure knowledge transfer. The following are some examples of interview outcomes:

"Today's technology is critical since it benefits both parties and creates learning opportunities. This enables us to communicate more frequently without needing to meet in person every time. Additionally, it aids in resolving the issue of when teachers' and students' available time do not coincide. Today, numerous internet tools are available. These tools should also include questions for learners to answer." – SPM1

"The recipient should have tangible results from their education. The instructor should provide the homework but leave the answer unframed and have the student attempt it to demonstrate their comprehension. Teachers must select the appropriate technologies and resources. If the educator picks simple-to-understand tools, learning will be simple. Additionally, we should have a mechanism to teach online without physically meeting." – JPM3

Also, the findings identify two new indicators for this factor: "Knowledge transfer must be accompanied by visual representations" and "Knowledge transfer must be accompanied by computer animation". Excerpts from interviews are included below.

"In order to facilitate the transfer of knowledge, technology and equipment such as a whiteboard or a graphical presentation should be made readily available. Do not speak exclusively in the absence of these items." – JPM6

"Technology-assisted transfer is preferable to manual transfer, particularly for video clips, animations, or presentation slides." – SPM3

4.3.3 Level of open communication (factor no.9)

The interviews supported the literature review. Half of respondents evaluated the effect of open communication on knowledge transfer for software project managers. This type of communication includes candid exchanges throughout the transfer of knowledge. The remaining half of respondents believed that such a factor had no effect on knowledge transfer, as evidenced by the following interview excerpts:

"Students appreciate friendliness. Open communication facilitates learning. because students expressed their entire thought." – JPM3

Furthermore, two new indicators for this factor are identified in the findings: "The content transferred must have a legitimate cause for its origin" and "Knowledge transfer requires amicable conversation". Below are samples from interviews.

"A more effective transfer is contingent upon experience, technique, and preparation. It is dependent upon one's ability to educate using the material of one's own experience. That is, we can communicate in a variety of ways, depending on the individual." – SPM3

"Our messaging should be clear and transparent. Our communications should be clear, and any content transferred must have a justifiable reason for its origination." – SPM4

4.4 Control factor

Apart from those nine potential factors, the interview results showed the following new control elements that may affect knowledge transfer for software project managers: "Sender with greater expertise, and years of experience as a software project manager will transfer more efficiently", "Receiver with greater expertise, and years of experience as a software project manager will be more efficiently transferred" and "The transfer of

knowledge is more efficient when done with individuals of the opposing sex", as evidenced by the following interview excerpts:

"It is necessary for instructors to have extensive project management expertise. In both the wide and deep perspectives, it will improve knowledge transfer. Receiver will have little difficulty understanding."
– JPM6

"If the receivers are highly qualified and have previous experience working as a project manager, they will grasp the concept immediately." – SPM2

"Sexes are frequently oppressed against one another. The transfer of knowledge between different sexes draws the attention of both parties' attention. make it more effective." – JPM2

5. Discussion

The findings of this study comply with what has been discussed in the literature review with some new indicators having emerged. The authors summarized the findings in the table 3.

Table 3: Findings compare to literature

Past Literature	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Control factors
(Davenport & Prusak, 1998)	x			x						
(Quinn et al., 1998)							x			
(Osterloh & Frey, 2000)		x			x					
(Argote & Ingram, 2000)		x	x	x						
(Reagans & McEvily, 2003)						x				
(Sarker et al., 2003)	x			x			x		x	
(Simonin, 2004)		x	x		x					
(Zarinpoush & Gotlib Conn, 2006)	x		x			x		x	x	
(Eskerod & Skriver, 2007)							x			
(Jalil & Shahid, 2008)				x						
(Lockett et al., 2008)		x	x		x	x		x		
(Ajmal & Koskinen, 2008)							x			
(Porrawatpreyakorn et al., 2009)	x	x		x	x	x			x	
(Liyanage et al., 2009)	x	x		x	x		x	x		
(Al-Salti et al., 2011)	x	x	x	x		x				
(Al-Gharibeh, 2011)			x				x	x		
(Karlsen & Gottschalk, 2015)	x						x			
(Zhao et al., 2015)	x		x	x		x				
(Sutling et al., 2015)				x						
(Bellini et al., 2016)						x			x	
(Ibidunni et al., 2020)	x					x				
(Bacon et al., 2020)			x			x	x			
(Glaser et al., 2021)	x			x	x	x				
In-depth Interview										x

According to Table 2 (Origin of indicator) and Table 3 (Findings compare to literature), senders must have mastery of Knowledge of what they are transferring and must be capable of transferring information, as well as trustworthy and skilled in their field. Subsequently, their motivation to supply knowledge, intention to transmit knowledge, and willingness to do so on a regular basis are all required. They should also be familiar with the content of the knowledge transfer, be able to group it, and prioritize it in a progressive manner.

Simultaneously, receivers must be able to learn and possess prior understanding of project management, be eager to learn and motivated to do so, and have trust in the sender, a positive relationship with the sender, as well as respect for the sender. However, the author discovered that receivers must also engage in inquiries and exchanges with the sender and must constantly acquire knowledge.

Meanwhile, both senders and receivers must consider environmental variables, such as cultural context, technology, and direct communication. These indicators match the literature review. However, the findings reveal new emerging indicators, including temperament compatibility, same-language contact, visual representations, computer animation, content origin, and amicable dialogue.

Furthermore, the findings reveal previously unknown control indicators, including years of experience as a software project manager from both senders and receivers, as well as individuals of the opposite sex. This could be a set of indicators unique to software project managers in the context of Thailand.

6. Conclusions

The purpose of this study is to identify potential factors that influence knowledge transfer among software project managers at all levels. Based on the review of literature, the authors identified potential roles connected to knowledge transfer in the context of project manager, including sender, receiver, and environment roles. The authors also addressed a number of potential factors that play a part in such roles. Following the results of the interviews, it was discovered that these factors are consistently affecting knowledge transfer in the context of software project managers. Three new control factors, which are the number of years of experience in the role of software project manager of the sender, the number of years of experience in the role of software project manager of the receiver, and a distinction between sender and receiver's sexes were discovered. Also, some new indicators, which were not previously identified, were also uncovered.

The author believes that the findings of this study will be useful from both an academic and a practical standpoint. From an academic perspective, this study demonstrates the principles of knowledge transfer between project managers as well as the development of a body of knowledge at the individual level. It shed light on potential factors from three perspectives: that of the sender, that of the receiver, and that of the surrounding environment, Further research in other areas will benefit from these findings. Furthermore, these findings lend support to the elements' potential functions in knowledge transfer among project managers, which is useful in the practical world. Characteristics of both the sender and the receiver have been revealed in this context. Also demonstrated is the importance of environmental factors in knowledge transfer, as well as the proper potential element in such a context. Public institutions, commercial businesses, and entrepreneurs who are active in project management can use the factors as recommendations for project manager practice, improvement, and development to achieve a competitive advantage in the marketplace. Further research in this field could be undertaken to study the findings in greater depth using statistical methods compared against the control factors so that the potential factors may be validated across all factors.

Finally, the scope of this study is limited to the context of Thailand. Future research in a more international context could definitely be undertaken in order to develop the performance of software project managers worldwide.

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