Values and Enablers of Lessons Learned Practices: Investigating Construction Industry Context

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Abstract: In the realm of construction project management, the value of "lessons learned (LL)" cannot be overstated. LL, as an important approach for effective project management and continuous improvement, is analysed in this study, with the aim to advance the impact of LL by determining the values of LL practices and examining the enablers that positively influence LL practices in the construction industry. A detailed literature review has revealed nine (9) values and seven (7) enablers of LL practices relevant to the construction industry's context. Using a questionnaire survey involving 129 Malaysian construction professionals selected based on non-probability techniques, the significance of the values and enablers is prioritised based on mean scores. Findings reveal that LL practices help to avoid making similar past mistakes, optimize project performance and engender collaborative learning in the project team. Individual-related enablers are perceived to be more influential than organisational-related enablers in implementing LL in construction projects. Collective and conscious efforts in fostering a learning culture are crucial to encourage the construction industry to embrace LL practices and help individuals and organisations thrive.

1 INTRODUCTION

The construction industry acts as a catalyst for economic growth in a developing country such as Malaysia - increasing the country's income, work opportunities, and infrastructure. However, the industry is under ever-increasing pressure to deliver projects faster, with better quality and with lower costs. Good management practices are crucial in achieving these demands. As Disterer (2002, p. 519) advocates, "success of projects depends heavily on the right combination of knowledge and experience". Correspondingly, Meredith et al. (2017, p.302) accentuate, "past knowledge...should be built into estimates of future project performance". In advocating knowledge representation for efficient re-use of project memory, (Bekhti et al., 2011) underscore the need for designers to learn from past project experiences to deal with new design problems. Construction companies are project-based organisations since much of their knowledge is generated on-site, from projects they carry out. As such, the development of knowledge and expertise from project learning practices is critical in construction.

Knowledge is critical for construction companies to succeed and maximization of value through enhancing competencies, confidence, effectiveness, competitiveness, and sustainability. Knowledge management (KM) processes can prevent re-invention of the wheel, facilitate innovation; and lead to increased agility, efficiency, flexibility, quality, learning, better decision making, better teamwork and supply chain integration, improved project performance, higher client satisfaction, and organisational growth (Eken et al., 2015; KPMG Consulting, 2000; Yap & Lock, 2017). A recent Malaysian study in the construction industry reveals the most important benefits of KM are to improve quality, enhance decision-making, raise quality, circumvent the repeat of past mistakes and enable knowledge exchange (Yap et al., 2022). Likewise in Portugal, the practitioners acknowledged the most significant aspects of KM in the management of construction projects are associated with the exchange of experiences between project team

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members, the sharing of information among stakeholders and continuous improvements (Marinho & Couto, 2022).KM practices can positively enhance the effectiveness, efficiency and efficacy of project personnel. The construction industry is project-based but very much knowledge-intensive. Multi-disciplinary teams (i.e. architect, engineer, quantity surveyor and contractor) are involved and project delivery relies heavily on previous experience/heuristics. Thus, lessons learned (LL) in construction projects should be captured and reused in future projects.

Effective management of LL is vital for the generation of project knowledge and supports continuous learning in project-based industries such as construction. In this vein, decision-making processes are further enhanced by gaining insights from the "know-what", "know-how" and "know-why". The value-addedness of learning is directly linked to project performance. This being the case, it is necessary to determine how LL can add value to construction project delivery and examine the enablers that positively influence LL practices in the construction industry. The research questions in the present study are:

Q1: Why do we need to capture LL in construction projects?
Q2: What are the enablers that positively influence LL practices in construction?

2 LESSONS LEARNED (LL) PRACTICES AND THE CONSTRUCTION INDUSTRY

LL is a critical variable for success (Kerzner, 2017) - providing a platform for reflection, growth, and development by extracting knowledge from past experiences. The four dimensions of LL are: When? What about? How know? and What is included? In the construction industry's context, LL is the intellectual asset used to create value based on previous projects and contribute to the organisation's learning agenda (Carrillo et al., 2013). Likewise, the Project Management Institute's PMBOK Guide (Project Management Institute, 2017) underscores the need for using existing knowledge and creating new knowledge to achieve the project's objectives and contribute to organisational learning. Considering this, the positive and negative aspects of projects are needed to learn from past experiences, particularly in avoiding the repetition of costly mistakes that can jeopardise project performance and damage a company's reputation as well as increasing the likelihood of attaining success that proved to be effective and profitable. Thus, LL is very beneficial for similar future work and improves the company's competitiveness, such as improved decision-making, problem-solving and innovation. LL is particularly vital for improving future performance (Love et al., 2016) and for organisations to realise a competitive edge if used properly (Hlupic et al., 2002).

Extensive knowledge is generated throughout the construction project delivery from start to finish. Most professionals acquire knowledge mostly through meetings with more experienced personnel as well as lessons learned from completed projects (Marinho & Couto, 2022). Knowledge gained from past projects can be leveraged to improve the capability and productivity of construction companies (Dave & Koskela, 2009). For example, knowledge reuse can significantly contribute to better expert judgment and improved time-cost performance (Yap & Skitmore, 2020). In a Spanish study, Forcada et al. (2013) observed the top KM benefits being: employee experience exchange, group work improvement and efficiency improvement. They further explained that effective management of project knowledge is vital in enhancing continuous improvements from LL. For example, the project team can better excel in project management via sharing LL and advanced practices, which can be transferred within and between projects (Terzieva, 2014). However, knowledge dissemination remains a challenge and the value of LL has yet to be fully capitalised (Debs & Hubbard, 2023).

To develop the competency of project personnel, Yap & Shavarebi (2022) proposed sharing past project experiences which lead to the expansion of cognitive ability, expert judgement and better-informed decision-making; ultimately resulting in better project results. Tacit knowledge is developed from experience and is hard to formalise but it is considered to be more important than explicit knowledge (Forcada et al., 2013; Teerajetgul & Chareonngam, 2008). Tacit knowledge can be captured by talking to experts and reflecting on the LL from others. For example, using storytelling learning to communicate LL (Duffield & Whitty, 2016). However, some construction companies fail to recognise the value of LL and perceive LL to be project-specific (Carrillo et al., 2013). Some construction professionals, on the other hand, do not want to share their problems or are not willing to learn from other people's mistakes (Carrillo et al., 2013). Knowledge sharing behaviour among construction project members are influenced by two driving

Table 1: Summary of enablers of LL practices.

Ref	Enablers	Authors																Total
		(Kululanga & Mccaffer, 2001)	(Levin & Cross, 2002)	(Tsai, 2002)	(MacNeil, 2003)	(Carrillo et al., 2004)	(Van Den Hooff & Ridder, 2004)	(Rego et al., 2009)	(Theriou et al., 2011)	(Javernick-Will, 2012)	(Tan et al., 2012)	(Carrillo et al., 2013)	(Duffield & Whitty, 2016)	(Longwe et al., 2015)	(Dang & Le-Hoai, 2019)	(Dang et al., 2019)	(Yang et al., 2019)	
Individual																		
B1	Sharing culture			√	√			√	√	√				√				6
B2	Honouring of commitment	√			√					√								3
B3	Peer recognition				√	√				√	√							4
B4	Reciprocity and trust		√					√		√						√		4
Organisational																		
B5	Perceived value						√			√		√						3
B6	Financial/ social motivation	√			√	√				√	√					√		6
B7	Workplace culture	√						√	√		√		√		√		√	7
B5	Perceived value						√			√		√						3

modes, namely trust-driven and incentive-driven (Cheng & Yin, 2024). According to the Construction Industry Institute (CII) (2012), best practice is "a process or method that, when executed effectively, leads to enhanced project performance". In the construction project management context, best practices or rather proven practices can be defined as something that works well on a repetitive basis that leads to a competitive advantage (Kerzner, 2017). Some of the learning in projects can evolve into best practices that can be standardized.

Table 1 presents a list of the most frequently cited enablers of LL practices from previous literature. There enablers are divided into individual- and organisational-related.

3 RESEARCH METHODOLOGY

A positivist paradigm employing the deductive approach is adopted to objectively examine the practice of capturing LL in the construction industry. A quantitative research design with a cross-sectional field survey was employed, as it provides an efficient and economical means to gather feedback from a large number of professionals currently working in the construction industry for statistical analyses. The methodological flowchart for the study is presented in Figure 1.

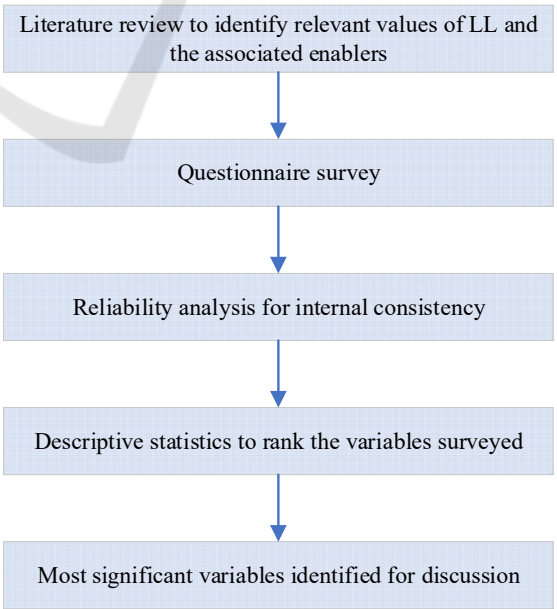

Figure 1: Methodological flowchart for the study.

The Statistical Package for Social Sciences (SPSS) version 23 was used to analyse the data collected. The analyses were done to prioritise the value of LL and the associated enablers/inhibitors according to their descriptive statistics (mean scores and standard deviations).

3.1 Questionnaire Design

The questionnaire was designed based on the literature review and consultation with industry subject matter experts. The questions were drafted clearly and concisely to create easy-to-understand materials and limited to a 15-minute completion time to prevent survey fatigue. The questionnaire contains three parts. Part I deals with the respondents' demographic information, in terms of their educational background, years of industry experience and the type of projects involved. Part II contains the question; Do you agree with the following value of lessons learned in construction projects? on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Part III provided a list of enablers identified through the detailed literature review (Table 1). For each enabler, the respondents were requested to indicate their level of agreement on a similar five-point Likert scale as in Part II.

3.2 Survey Respondents and Demographics

The sampling frame consisted of professionals from the three key parties in construction, namely clients, consultants and contractors in Malaysia. Non-probability techniques of purposive and convenience with snowball sampling are used to select respondents to yield reasonable responses. In this study, the unit of analysis is construction professionals, as they are the actors directly involved in project delivery. The reason for engaging a variety of professions (i.e. clients, consultants and contractors) was to ensure different perspectives pertaining to LL practices in construction are represented.

The questionnaire pilot involved 30 targeted construction professionals to ensure clarity and unambiguity. Following a successful pilot test, the questionnaire remained unaltered for the main survey whereby another 170 questionnaires were electronically distributed. Overall, 129 valid responses were collected after follow-up reminders, attaining a response rate of 64.50%. The sample size (> 100) is adequate for meaningful statistical analyses (Roscoe, 1975; Yap & Skitmore, 2018). Additionally, the Yamane sampling approach led to the determination of 100 samples at a 90% confidence level for a population size over 100,000 (Israel, 1992; Yap et al., 2022).

Table 3 indicates the demographic profile of the respondents, with 90 questionnaires (70%) from respondents with at least a bachelor's degree. Nearly 50% had more than 10 years of working experience in construction. 57.4% of respondents are involved in building projects. These are considered sufficient to obtain sound judgment from qualified respondents for this perception-based study.

Table 2: Demographic profile of respondents.

Profile	Description	Frequency	Percentage (%)
Academic qualification	Master's degree	33	25.6
	Bachelor's degree	57	44.2
	Diploma	37	28.7
	Certificate	2	1.6
Working experience	0 to 5 years	41	31.8
	6 to 10 years	26	20.2
	11 to 15 years	23	17.8
	16 years and above	39	30.2
Type of project	Building	74	57.4
	Infrastructure	55	42.6

4 RESULTS AND DISCUSSIONS

4.1 Questionnaire Reliability

Table 3 summarises the α values for the two categories of variables, viz. values and enablers of LL, which is greater than which is higher than the threshold of 0.70 needed to establish the internal reliability of the scale used (Yap, Lim, et al., 2021). This denotes that good overall reliability was obtained on the research instrument used.

Table 3: Measurement of internal consistency.

Category	Number of items	Cronbach's alpha, α
Values of LL	9	0.867
Enablers of LL	7	0.759

4.2 Mean Scores and Ranking LL Values

Table 4 presents the mean scores and standard deviations (SDs) of each value surveyed. A close

examination of Table 5 reveals that all 8 values have mean scores higher than 4.0, which is regarded as very significant in the rating scale. This implied that the majority of the respondents either agreed or strongly agreed with the evaluated values. The five most significant values of capturing LL in construction projects are:

1. A2: Avoiding the same mistakes from happening in upcoming projects (mean = 4.519, SD = 0.574);
1. A5: Better performance or procedure by adopting lessons learned from other projects (mean = 4.519, SD = 0.574);
3. A9: Promote a collective environment to attain the project team's shared goals through the sharing of personal experiences (mean = 4.519, SD = 0.651);
4. A1: Ensuring good practices in previous projects that are successful are being re-used in upcoming projects (mean = 4512, SD = 0.626); and
5. A3: Developing new ideas or methods through lessons learned (mean = 4.496, SD = 0.697).

The data indicates that there is a consistent emphasis on the value of integrating lessons learned from previous projects across several dimensions, with very similar mean scores suggesting a high level of agreement among respondents. The most valuable aspect of capturing LL for construction projects is to avoid the recurrence of similar mistakes. The interview participants from Yap & Skitmore's (2020) study specifically emphasized that "past experiences will tell you what you can do and enrich one's expert judgment" and "individual needs to learn from his/her mistakes and not repeat the same mistake twice". Given that project mistakes are the major contributing factor to rework and time-cost overruns, capturing and sharing critical LL can help construction professionals avoid repeating the same mistakes and reinventing the wheel in future projects. The other highly perceived importance of LL is to enhance productivity, efficiency and smarter working. LL is needed to build absorptive capacity and drive towards performance improvement in the construction industry (Love et al., 2016).

Third, LL practices are a collaborative technique to encourage project team members to share their personal experiences, which will then contribute to a collective environment in attaining shared goals. Sharing knowledge between team members is crucial to achieving organisational learning and collective competence (Yap, Shavarebi and Skitmore, 2021). It is worth noting that trust and collaboration are significant knowledge factors for construction projects (Teerajetgul & Charoenngam, 2006). The fourth value of LL is related to the reuse of some best practices from other successful projects. LL is handy project knowledge that can be reused and employed as best practices to increase the likelihood of repeating project delivery success (Yap & Shavarebi, 2022). The fifth value is making LL the base to foster innovation and developing new ideas/methods/solutions from long 'trial and error' ending with successes and failures in the construction projects. According to Kolb & Kolb (2009), people learn best in situations such as brainstorming sessions that call for the generation of ideas. The recent developments in information and communications technology (ICT) tools have further advanced the way people share knowledge and ideas – for improvement and innovation (Carrillo, 2005; Yap et al., 2022).

Table 4: Ranking the values of LL.

The values of capturing LL in the construction industry context	Overall (N=129)		
	Mean	SD	Rank
A2: Avoiding the same mistakes from happening in upcoming projects.	4.519	0.574	1
A5: Better performance or procedure by adopting lessons learned from other projects.	4.519	0.574	1
A9: Promote a collective environment to attain the project team's shared goals through the sharing of personal experiences.	4.519	0.651	3
A1: Ensuring good practices in previous projects that are successful are being re-used in upcoming projects.	4.512	0.626	4
A3: Developing new ideas or methods through lessons learned.	4.496	0.697	5
A4: Transforming individual knowledge to organisational knowledge by sharing lessons learned.	4.481	0.663	6
A6: Facilitate project planning (forecasting ability) using lessons learned from previous projects.	4.450	0.637	7
A7: Improvise project monitoring and control processes using lessons learned from previous projects.	4.326	0.709	8
A8: The quality and quantity of lessons learned in the construction industry are influenced by the size and difficulty of the project.	4.326	0.752	9

4.3 Mean Scores and Ranking LL Enablers

Table 5 presents the enablers of LL in the construction industry according to their significance. All the enablers have a mean value above 4.00 and are therefore considered relevant and very significant. The topmost five enablers are:

1. B3: Peer recognition (mean = 4.450, SD = 0.661);
2. B1: Sharing culture (mean = 4.434, SD = 0.705);
3. B2: Honouring of commitment (mean = 4.411, SD = 0.645);
4. B4: Reciprocity and trust (mean = 4.403, SD = 0.724); and
5. B7: Workplace culture (mean = 4.364, SD = 0.706);

Four of the five enablers are related to individual aspects.

Table 5: Ranking of enablers.

Enablers	Overall (N=129)		
	Mean	SD	Rank
B3	4.450	0.661	1
B1	4.434	0.705	2
B2	4.411	0.645	3
B4	4.403	0.724	4
B7	4.364	0.706	5
B6	4.333	0.654	6
B5	4.248	0.729	7

4.3.1 Peer Recognition (Individual)

A construction project team involve various experts from different skills, knowledge, experience and professional background. All the parties work as a team to complete a project, although there is a hierarchical structure. Every stakeholder is allowed to share their perception or knowledge while carrying out a knowledge-sharing (KS) session. People like the feeling of being recognised and thankful when they share their knowledge, and information and contribute to the project team, especially agreement from seniors (MacNeil, 2003). Some people just need a "thank you" to get affirmation from colleagues, which in turn, helps to improve the workplace culture (Javernick-Will, 2012).

In addition, peer recognition from colleagues, employees or seniors encourages a person to be more self-confident and willing to share their knowledge with others (Rahman et al., 2018). It also encourages self-development as well as engenders innovative and new knowledge or ideas because they have self-confidence and allows them to feel and look like an expert. (Carrillo et al., 2004) believe that peer recognition is more significant than financial incentives because it only provides tiny opportunities for success. According to Tan et al. (2012), peer recognition also assists others in finding the solutions to problems, as a result of self-confidence in sharing knowledge with others.

4.3.2 Sharing Culture (Individual)

When individuals interact with each other in a team, it creates a learning environment and sharing culture in the organisation that brings benefits to the organisation (Longwe et al., 2015). People are actually learning by sharing tacit knowledge or their own experience with others and hence become explicit knowledge (Rego et al., 2009). Nonetheless, knowledge gained from LL is difficult to transform from tacit to explicit knowledge and be shared with others in a team. Communication is key to sharing knowledge. For example, breakfast or lunch gatherings are useful platforms for exchanging previous experiences (Fong, 2005). However, if an individual is capable of gathering, recreating, utilising and sharing knowledge, will bring advantages to an organisation (MacNeil, 2003). Moreover, knowledge sharing (KS) with competitors by an individual is a type of coopetition. Coopetition creates common interests between individuals and competitors. The knowledge gained from competitors allows individuals to benefit themselves and also benefits an organisation. In this circumstance, an organisation allows the development of new ideas, skills, information, knowledge and technology from others (Tsai, 2002).

People who contribute and share the tacit knowledge that is stored in their brains and minds create a sharing and learning environment (Chugh et al., 2015; Yap et al., 2022). It encourages other members of the organisation to share their knowledge because everyone knows that "knowledge is power" (Theriou et al., 2011). A workplace culture that encourages knowledge sharing and learning allows individuals to improve, which in turn, improves productivity and increases the competitive advantage of an organisation (Javernick-Will, 2012).

4.3.3 Honouring of Commitment (Individual)

A construction project involves a lot of professionals from different backgrounds/departments such as architecture, engineering, cost consulting and project management. During the management and delivery of

construction projects, the project team members want to appear consistent with the project objectives and have made their intentions to share their knowledge explicit – they will want to live up to these intentions and honour their commitment (Leal et al., 2017). Once team members are involved in a problem or issue, they would like to remain involved in it to give advice, information, knowledge or solutions until the problem or issue is eventually solved (Javernick-Will, 2012). This is because people like to show self-worth and be respected by others. Another way to explain is that people want to be compatible with others. After their purpose of sharing knowledge is made clear, the individuals want to stay up with these promises and respect their pledge or even to be a leader. In investigating knowledge exchange behaviours among virtual communities in China, Luo et al. (2021)observed that affective and normative commitment can significantly influence the knowledge contributors' sharing intention.

Leaders play an important role in an organisation, as a leader can inspire the team members to commit to the project (Kululanga & Mccaffer, 2001). An individual who wants to build a group should draft a sanction and attend a series of meetings on preparedness judgement or evaluation, to show that they are well-connected, leadership and management support. People ensure that they keep up to date and remain active in the society. All of the above is to ensure leaders of the teams or organisation merit their commitment and ensure they perform their own best. (MacNeil, 2003b).

4.3.4 Reciprocity and Trust (Individual)

The environment and relationships within a group of people are very important, as they also influence the success or failure of a project. To facilitate LL practices in the construction industry, people must learn to reciprocate (Dang et al., 2019). Some people are more willing to share knowledge with those people who helped and supported them before when those people faced some issues or problems. People will think that it is the way to pay back as they helped them before. It is a mutual benefit relationship (Javernick-Will, 2012). This can be understood by the adage that "people treat you like the way you treat them". It is a two-way relationship.

The norm of reciprocity also indirectly creates trust relationships among people. People are also more willing to share knowledge when trust exists. Trust is also a two-way relationship same as reciprocity, to tighten the relationship within a team (Rego et al., 2009). Thus, knowledge exchange is better and faster if people in the organisation trust each other. When trust exists, people provide and share useful knowledge willingly. Therefore, people are also likely to hear, consume and learn the knowledge shared by other people (Levin & Cross, 2002). It reduces conflicts between the people in the organisation by the existence of reciprocity and trust.

4.3.5 Workplace Culture (Organisational)

In a successful KM system, organisational culture is the most crucial facilitating factor. An organisation should share their vision and mission with all the employees or team members (Yang et al., 2019). "Work as a team is better than one", because teamwork increases collaboration and allows brainstorming to develop or create more ideas and thus improve productivity (Theriou et al., 2011). When every party have the same vision and the same target as the organisation, they are more likely to contribute and complete the project efficiently and effectively (Kululanga & Mccaffer, 2001). The culture of the workplace highly affects a person's behaviour and attitude, therefore affecting the performance of an organisation (Rego et al., 2009b). A person who works in a positive workplace culture will be influenced by the environment of the organisation and participate in any activities actively. When working in a negative workplace culture, the person will have the same feelings and will not want to contribute to the organisation (Tan et al., 2012). For example, a student would perform better in a good class, because they are studying under positive influence, although the student does not have a good basic.

Furthermore, practitioner shares their visions, committed leadership and reward creativity and innovation depending on the culture of the workplace (Dang et al., 2019). Therefore, a workplace culture influences the success of LL practices and also affects the success of an organisation (Duffield & Whitty, 2016).

5 CONCLUDING REMARKS

From a detailed literature review nine (9) values and seven (7) enablers of LL practices in the construction industry were identified. The opinions of construction professionals currently working in Malaysia were obtained through a cross-sectional self-administered questionnaire survey. The underlying aim of ranking the values and enablers is towards recognizing and embracing the importance of LL practices in the

complex construction environment to increase the chances of project success as well as cultivate a culture of learning and improvement that can benefit construction organisations in all aspects of their operations. Findings reveal that avoiding the same mistakes from happening in upcoming projects, better performance or procedure by adopting lessons learned from other projects and promoting a collective environment to attain the project team's shared goals through the sharing of personal experiences are the leading values of performing LL. Construction organisations that prioritise LL practices not only can take advantage of lessons from previous successes and failures but also enhance project outcomes with improved ability to plan, schedule and estimate their future projects. The most influential enablers are peer recognition, sharing culture and honouring of commitment. Collective and conscious efforts in fostering a learning culture are crucial to encourage the construction industry to embrace LL practices – help individuals and organisations thrive.

While the study makes several contributions to LL practices in construction project management, it is limited by the single data collection method using field survey possibly causing mono-method bias. Nevertheless, this is substantiated by triangulating the findings by cross-referencing the research literature for theoretical validation. Although the use of a self-completion questionnaire form is widely used to gather quantitative data from a large and diverse sample for statistical analyses, it does not allow researchers to probe or clarify participants' responses. An interpretative approach using in-depth interviews and/or case studies could be further employed to collect rich real-world project experiences from construction professionals, as well as to validate the statistical results. The rating of the values and enablers of LL practices on a five-point Likert scale may not be completely reliable as different respondents may perceive the scale differently when they attach their interpretation of the different scale points. It is worth noting that the Likert scale is commonly used to measure people's opinions, perceptions and attitudes in behavioural sciences and construction project management studies. Further studies would benefit by investigating some of the formal and informal best practices for capturing LL at various phases of construction project delivery, particularly on how emerging digital technologies have revolutionized KM practices in the construction context.

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