International Journal of Project Management 42 (2024) 102559

Contents lists available at ScienceDirect

International Journal of Project Management

journal homepage: www.elsevier.com/locate/ijproman

Facilitating and improving learning in projects: Evidence from a lean approach

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ARTICLE INFO

Keywords:
Learning in projects
Individual learning
Project learning
Organisational learning
Lean
Lived experiences
Project management

ABSTRACT

A lean approach in projects offers the opportunity to better connect people, processes, workflows, and delivery within projects. This is particularly important in contemporary project environments which is characterized by high levels of uncertainty, complexity, and pace of change. While knowledge from previous learning may exist, though it is often inaccessible or untapped and different levels of understanding about delivery approaches can prevail. We investigate how a lean approach in projects facilitates and can improve learning in project environments. Through thematic analysis of 40 semi-structured interviews, we found that applying a lean approach considers individual, project and organisational levels of knowledge and understanding, and triggers action underpinned by improved socio-behavourial interactions, leadership, and support. A lean approach enhances the quality of learning, better integrating timely actions and reducing the likelihood of lessons lost, to achieve effective project management.

1. Introduction

Project management (PM) has found the capitalization and improvement of existing knowledge challenging (Söderlund, 2011). Projects often experience difficulties extracting, distributing, and applying learning across both cultural and structural boundaries (Bosch-Sijtsema & Postma, 2009; Prencipe & Tell, 2001) which makes it more difficult to exploit knowledge.

However, the highly specialized nature of projects requires action–oriented knowledge activities to improve decision making within the delivery phase of projects and to generate improvements across project and organisational systems (Bresnen, Edelman, Newell, Scarbrough & Swan, 2003; Brodetskaia, Sacks & Shapira, 2013; Vigour, 2015). The problem is that up to 90% of the value from knowledge is contained in the unexpressed experiences, social processes or tacit knowledge of the project contributors and stakeholders (Gardiner, 2014; Nonaka & Takeuchi, 1995).

The combined wisdom of "know-how," "know what" and "know why" (Gardiner & Eltigani, 2014; Hussain, Ajmal, Khan & Saber, 2015; Javernick-Will, 2013), requires formal creative and collaborative processes, value creation and appropriation across the stages of knowing, thinking, and understanding (Hines, Holwe & Rich, 2004; McIver, Lengnick-Hall, Lengnick-Hall & Ramachandran, 2013; Pemsel & Wiewiora, 2013; Zhang & Chen, 2016). Jugdev and Wishart (2014) suggest that sharing and learning about PM practices requires a processual approach to improving tacit knowledge.

This suggests that the concept of lessons learned is insufficient to create, make use and share the knowledge needed within projects to improve PM practice that extends beyond identification of learning (Anbari, Carayannis & Voetsch, 2008; Bakker, Cambré, Korlaar & Raab, 2011; Duffield & Whitty, 2015; McClory, Read & Labib, 2017). The continued failure to disseminate and apply lessons learned from projects has created a need for more research in understanding the role that learning can play within the PM discipline (Botha, Kourie & Snyman, 2008; Lindner & Wald, 2011). Implementing lean approaches to project working provides an opportunity to enhance learning.

The general desire to improve PM practice is acknowledged in the PM literature (Jacobsson & Söderholm, 2011). However, it is also recognised as being difficult to achieve (Cusumano et al., 2021; Fernandes, Ward & Araújo, 2014), despite the need to improve (Brady & Maylor, 2010). Project environments are characterized by complexity, inter-disciplinarity and multi-disciplinarity (Thiry, 2014). The rise of

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https://doi.org/10.1016/j.ijproman.2024.102559
Received 27 January 2023; Received in revised form 13 November 2023; Accepted 3 January 2024
Available online 7 January 2024

projectification and increased awareness of complex reality is demanding a move away from the traditional management approach to the lean approach (Jensen, Thuesen & Geraldi, 2016; Lundin et al., 2015; Packendorff & Lindgren, 2014). We note an increased interest and growth of lean as a PM approach in recent years (Antony, Rodgers & Cudney, 2017; Artto, Ahola & Vartiainen, 2016; Bateman, Hines & Davidson, 2014; Kakouris, Sfakianaki & Tsioufs, 2022; Kristensen, Saabye & Edmondson, 2022) in response to Söderlund and Maylor's (2012) call for an integrated approach between lean thinking (Womack & Jones, 2003; Womack, Jones & Roos, 1990) and PM philosophies, systems, and tools. This was suggested to address and manage complexities especially in the instance of the delivery of major projects, which have a tendency for high failure rates, excess waste, and failure to learn and improve (Holweg & Maylor, 2018; Maylor, Turner & Murray-Webster, 2015).

We suggest there is a need to identify which approaches are favorable for learning processes and practices, especially given that project learning, sharing actions, practice and knowledge creation do not exist in isolation. Our aim is to investigate how a lean approach could facilitate learning in projects, enhancing the project's ability to integrate and improve the knowledge sharing processes and outcomes (Bechky, 2006; Ivory, Alderman, Thwaites, McLoughlin & Vaughan, 2007; Kim & Wilemon, 2007). Such a practice-based view (PBV) allows us to challenge the cultural norms at play which can foster or hinder motivation to share knowledge and learning (O'Dell & Grayson, 1998; Pemsel & Wiewiora, 2013; Sense & Badham, 2008; Zhao, Jiang, Lin, Liu & Wu, 2022) and for reflective practice to take place, thus promoting and embedding behavioural change (Mahani & Molki, 2012; Tran & Anvari, 2014). This enables us to view learning as an outcome-based process as well as an output-based activity, and hence, respond to the call from scholars (Jugdev, 2012; Papadopoulos et al., 2011; A. Wiewiora, Smidt & Chang, 2019; A., 2020) to adopt more organic, fluid, and informal learning mechanisms, to create positive and sustainable impact on PM practice.

We posit that a lean approach could provide a foundation for managing contextual complexity, through processes of emergent scenarios at organisational and disciplinary intersections, frequent feedback loops and periodic corrective measures (Cusumano et al., 2021; Kautz, 2012; Klein, Biesenthal & Dehlin, 2015) orchestrating better, more valuable, meaning creation (Hopp & Spearman, 2021; Whitney & Daniels, 2013). Therefore, we investigate the following research question: *How does a lean approach to learning in projects facilitate and improve learning?* We seek to extend understanding of the concept of lean by proposing its utility as a practice as well as a tool, but one that shapes meaning making, developing, and improving processes of learning that are essential to effective project management. The next section provides an understanding of the extant literature on project learning, followed by a conceptual overview of lean and lean project management. The relevance of linking lean and learning as an effective approach for enhancing learning in projects is demonstrated. We then provide the methodological and theoretical considerations, before demonstrating the findings and discussion. Finally, conclusions are drawn where we draw attention to theoretical contributions and practical implications.

2. Literature review

2.1. Project learning

Learning in projects has been defined as "the set of actions the projects create to create and share knowledge within and across projects," (Kotnour, 1999, p36). Scholars and practitioners value the effective implementation of continuous learning through exploiting the importance and usefulness of lessons learned as a way of improving project knowledge as well as project management practice (Duffield & Whitty, 2016; PMI, 2017; Schindler & Eppler, 2003). Lessons learned is a well-established concept as part of formal post-completion review mechanisms which is narrowly defined and descriptive (Jugdev, 2012). However, they are often insufficiently incorporated into current PM activities due to resource pressures and individuals moving straight to the next project without sufficient time or means to embrace the lessons learned, failing to deliver the intentioned improvements for future project use (McClory et al., 2017; Terzieva & Morabito, 2016).

Packendorff and Lindgren (2014) declared that knowledge alone is insufficient in successfully executing projects and that cultural and discursive processes and practices were needed to improve project outcomes. This extends beyond the identification of learning (Anbari et al., 2008; Bakker et al., 2011), and reflects appropriate methods of learning as well as formats and processes of the information transmitted.

Extant literature still appears to categorize knowledge and learning as a functional product or output of a project (Filstad, Karp & Glomseth, 2018), despite the argument that knowledge is shared through a process of transformation of diverse knowledge where co-creation of common grounds and understanding occurs, which leads to new practices (Nonaka & Takeuchi, 1995; Bechky, 2003; Joia & Lemos, 2010). Additionally, projects often involve the development of new processes and products and therefore require cross-functional learning that requires not only project level learning, but individual and organisational levels of learning (Bresnen et al., 2003; Moh'd, Černe & Zhang, 2021; Wei & Miraglia, 2017).

For the purposes of this study, we define project learning to denote actions and processes of learning within projects (Kotnour, 1999). An essential aspect of learning in projects is the highly relevant process of embedded knowledge as it emphasizes the link between knowing and action (Gamble & Blackwell, 2001; Paraponaris, 2003). This includes (individual) understanding, sharing knowledge between individuals, and the transfer of knowledge across project(s) and organization(s).

2.2. Lean approach

We recognize there are many definitions of lean and acknowledge the challenge in achieving a consensus-based definition despite its use as a worldwide management concept (Arlbjørn & Freytag, 2013; Modig & Åhlström, 2020). However, as a practice-based phenomenon, lean continues to diverge and evolve rather than converge (Cusumano et al., 2021) with established challenges in the application of the concept (and subsequent extension of its application), together with difficulties in execution (Amran, Saraswati & Harahap, 2019; Gao & Low, 2014; Maszke, Dwornicka & Ulewicz, 2018; Tan, Carrillo, Anumba & Bouchlaghem, 2006). Lean is a philosophy "derived from a repetitive manufacturing context, that seeks to eradicate undesired waste and variation from the process", as noted by Holweg and Maylor (2018, p1373). Lean shares many commonalities across industries in terms of its use as a production system (Ballard & Tommelein, 2012; Pasquire, 2012), strategic purposes, e.g., waste reduction, efficient scheduling, and a goal-oriented tactical method through the many tools and techniques (Bernstein & Jones, 2013). A lean approach is one which is underpinned by the key principles of value, defined by multiple stakeholder perspectives, a focus on waste minimization, flow and pull processes, implementation of goal-seeking behavior, and the pursuit of perfection through continuous improvement (Staats, Brunner & Upton, 2011; Womack & Jones, 2003). The advantages and benefits of lean can lead to higher quality, greater customer satisfaction, greater productivity, improved safety, reduced scheduling, better risk management, greater profitability, and reduced costs (Bernstein & Jones, 2013; Netland & Powell, 2016), as well as wider benefits such as social, economic, and environmental improvements (Hopp & Spearman, 2021; Rosenbaum, Toledo & González, 2014).

However, lean has been cited as causing a lack of consideration of human aspects (Belhadi, Touriki & Fezazi, 2017; Hines et al., 2004; Longoni, Pagell, Johnston & Veltri, 2013), including but not limited to more worker injuries and poorer health (Brenner, Fairris & Ruser, 2004; Papadopoulos et al., 2011) and a stifling of workers' creativity and

entrepreneurship (Belhadi, Touriki & El Fezazi, 2018; Chen, Lindeke & Wyrick, 2010) which found workers' perceptions and understanding of the lean work environment appeared to influence subsequent lean behavior. Such criticisms have relevance for PM because many of the generic principles, tools and techniques are assumed to simply transfer to PM, without understanding their origin, challenges, and benefits.

2.3. Lean project management

Practicing lean as a PM approach is generally defined in the literature as a system of production control, project delivery system (Howell, 2011), or as a conceptual model of the production process (Green & May, 2005; Koskela et al., 2002). Lean PM is not a new PM methodology (Saier, 2017), but is recognised as the pursuit of adding value for customers/clients and removing (project) waste through continuous improvement (Ballard & Howell, 2003; Joosten, Bongers & Janssen, 2009; Jørgensen & Emmitt, 2008). Lean PM (LPM) necessarily focuses on delivery, improving communication between stakeholders, and process design, and differs from traditional PM in that decisions are taken at the last responsible moment so that exploration and/or development of the best alternatives can be met (Ballard & Howell, 2003; Besner & Hobbs, 2013; Cole, 2019). Furthermore, the alignment of values, concepts and criteria bridges the gap between project definition and lean design which lean PM facilitates. It achieves this through social interaction, and time taken to understand, develop and align production and process design at the level of function systems (Ballard & Howell, 2003).

2.4. The role of learning in lean project management

Learning is a significant feature of LPM as it is both exploitative and exploratory in nature. Exploitative learning includes the creation, acquisition, and integration of knowledge within projects and the consequential transfer of this knowledge to the broader organization(s) involved (Bartsch, Ebers & Maurer, 2013; Eriksson, Leiringer & Szentes, 2017). Existing and new knowledge is controlled and also investigated to address customers' needs in achieving high levels of consistency and efficiency, often at the same time by and for multiple parties (Liu, Amini-Abyaneh, Houwing, Hertogh & Bakker, 2021; Zerjav, Edkins & Davies, 2018). The following section outlines and discusses the relevance of a lean approach relating to learning in projects.

2.4.1. Flow/pull

A specific focus on flow in lean PM differs from the traditional PM processes, in that it exposes inefficiencies rather than hiding them; including removal of wasted effort and time that is not value-adding, strongly reinforcing the first principle of lean (Klein, Vieira, Feltrin, Pissutti & Ercolani, 2022). This facilitates thinking about preventative measures, building in quality, responsive problem solving and solution seeking, and, most importantly, the removal of traditional 'batch and queue' thinking in favor of continuous flow thinking (Liker, 2004).

2.4.2. Continuous improvement (pursuit of perfection)

Scholars and practitioners continue to value the effective implementation of continuous learning through exploiting the importance and usefulness of lessons learned as a way of improving project knowledge as well as PM practice (Duffield & Whitty, 2016; PMI, 2017; Schindler & Eppler, 2003). The practice of continuous improvement may be understood as a constant and "never ending" activity to manage and improve processes, thus keeping projects and their organizations in a learning process aligned with strategic objectives (Maldonado, Leusin, Bernardes & Vaz, 2020). The principles of continuous learning often build and develop new knowledge in an incremental manner, moving beyond compliance with processes and procedures and generating system-wide improvements (Brodetskaia et al., 2013; Powell & Coughlan, 2020; Sacks, Koskela, Dave & Owen, 2010; Salem, Solomon, Genaidy & Minkarah, 2006). A focus on lean tools (of which we note a plethora) may contradict short term process excellence gain despite the principles of longer-term knowledge sharing, collaboration, and creativity (Bertolini, Braglia, Romagnoli & Zammori, 2013; Fernie, Green, Weller & Newcombe, 2003).

2.4.3. Human behaviours

An underpinning lean principle of respect for people was to "grow leaders who understand the work, live the philosophy, teach it to others, develop exceptional people and teams and respect extended partners by challenging them and helping them to improve" (Liker, 2004, p169). A lean approach places reliance on information and collaboration, visual techniques, sense-making, and decisions based on human creativity and interpretation to determine best practice (Hopp & Spearman, 2004). One of the most significant challenges faced by PM is the prevalence of behaviours, which tend to prioritize and focus on project level specific activities (Chronéer & Backlund, 2015; Loo, 2002) for example project delivery, or at the functional or task level. However, behaviours are derived from a wide range of experience working as an individual, team, and part of a task or function. This experience is also sourced not only from the process level, but organization levels (Müller, Glückler & Aubry, 2013), forming the basis and the foundations of practice. The interrelated process and interactivity of transferring knowledge across individuals, projects, and organisations supports an enduring change in behavior that can transform and enhance the solution-focused ability of individuals to make meaning of change, building capacity (Cowan, 2014; Lee-Kelley, 2018; Massingham, 2020).

2.5. Linking lean and learning in project management

The process and practice of learning in projects is subject to individual and organisational level experience which may be influenced by a multitude of behaviors that can impact on the development of practice. We agree with Ballé et al's (2012, 2014; M. 2019) suggestion that lean is a learning system not a management system, evidenced by the continued importance and prevalence of the successful synergy between desire to learn, knowledge, learning, improvement, and growth (Powell & Coughlan, 2020). Few studies have attempted to link lean principles with learning in projects despite its close relationship. Notable exceptions are Radnor and Osborne (2013), who focus on the importance of cultural and contextual situated learning; and Thirkell and Ashman (2014) who proposed further consideration of human resource processes, techniques, and outcomes. This is despite a continued focus in the PM literature on the requirement to understand and explore lived experiences (Brunet, 2019; Cicmil & Hodgson, 2006; Kalogeropoulos, Leopoulos, Kirytopoulos & Ventoura, 2020; Svejvig, 2021). This has tended to be more output-based, highlighting singular process-related, task-driven systems, and identifying barriers in improving operational procedures (Lukrafka, Silva & Echeveste, 2020; Mustapha, Hasan & Muda, 2018; Poksinska, 2010; Staats et al., 2011).

There is a general paucity of research on the applicability and specificity of lean practice to address the link between desired outcomes and behaviours (Nidumolu & Subramani, 2003). We suggest this has limited the progress of lean as a viable change initiative in solution-focused project environments that require social and behavioural processes (Dowson, Bryde, Marcano, Al-Hilou & Douglas, 2019).

Extant literature has largely ignored the practice-based view, which connects practice and knowledge for wider learning (Seidl & Whittington, 2014; Suddaby, Seidl & Le, 2013). We posit that the lean approach offers an opportunity to make sense of, interact with, respond to, and often shape practice that not only relates to learning in projects, but which may contribute to future PM practice improvements. We provide evidence to strengthen the link between behaviours and outcomes of learning in projects, seeking to understand how behaviors may have an impact on practice.

2.6. Practice theory

Although project managers may use tools and practices from different management disciplines, the progress of the field of PM justifies research that focuses on the specificity of their practice and highlights the need to investigate the reality of practice empirically (Besner & Hobbs, 2013; Gupta, Sharma & Vijaya Sunder, 2016; Lee--Kelley, 2018; Lee-Kelley & Turner, 2017; Waterbury, 2015). It has been argued that tools have been adapted and skills have been developed in their use—skills that can be documented, learned, and transferred to configure PM practices as strategic assets (Besner & Hobbs, 2013). We suggest that the practice of learning in projects is an important strategic asset and an essential process, and our study aims to analyze how learning can be facilitated through adopting a lean approach. We agree with Hermanrud and Haukåsen's (2022) view of learning as the process of thinking, sensemaking and practice, where actors negotiate their understandings and their interactions to develop and implement everyday PM practice.

The focus on practices informed the theoretical positioning of our research and justifies the adoption of Practice Theory as a theoretical lens. A praxis (or practice-based) view is important as it can help us to understand what is done by the practitioner, how it is done, as well as how that praxis influences and is influenced by what happens around a practitioner (Blomquist, Hällgren, Nilsson & Söderholm, 2010). This is underpinned by Bourdieu & Passeron, 2000; Bourdieu's (1977, 1984, 1990)) "Theory of Practice" which combines concepts of *habitus* (creating operating principles of human actions, establishing personal practice from past experiences), *field* (a game or arena which is created and developed through time, with unique characteristics, stakes, conflicts, competitions) and *capital* (cultural, economic, social and symbolic) which suggests that social actors (in this case practitioners) are both responsible for, and influenced by prevailing and potential practice, power relations and available capital within and outside of the actor's environment. We conceive practice as being threefold, consisting of the PM practice generally, the practice of learning in projects specifically, and the practice of lean within the project environment.

Practice Theory within PM can be situated empirically and theoretically in a way that focuses on understanding the relationships and relations between actions people take and the realities of their daily organisational (social) lives (Feldman & Orlikowski, 2011). By focusing on how daily practices and processes are generated and how they may operate in different contexts, it is possible to observe the journey that practice, and process necessarily involve, from production to outcome, re-generation, and change (*ibid.)*. Practice Theory is especially pertinent within multi-disciplinary project environments, where there is a tension between those coordinating mechanisms and processes and those responsible for enactment (Jarzabkowski, Lê & Feldman, 2012). Practice Theory offers project managers and researchers a way to illuminate the complex lived actuality of projects (Cicmil & Hodgson 2006), identify responses to learn and share knowledge (Hopp & Spearman, 2004), acknowledging contradictions and tensions without losing focus and commonality (Söderlund, 2011). This lens affords the opportunity to analyze social, technological, and organisational phenomena and relationships (Feldman & Orlikowski, 2011) by making sense of and characterizing the interactions between social actors (Goffman, 1959), and considering the conceptual meaning of the learning practice(s) under investigation (Giddens, 1984). Since learning is a social practice that is driven by individuals making sense of their own and other's knowledge and understanding, a lean approach could facilitate and improve this process.

3. Methodology and methods

Our research is informed by a social constructionist philosophy and critical realism theoretical perspective (Bhaskar, 1978; Harré & Madden, 1975) which recognizes humans as social actors and emphasizes the importance of understanding differences between them (Creswell, 2013; Saunders, Lewis & Thornhill, 2019). We seek to understand the reality of the social condition that develops both knowledge through data collection and the understanding of its meaning through interpretive means (*ibid*). We focus on describing and deriving meaning from the perceptions and experience of project managers by characterizing the types of learning in projects, detailing the actions, processes, and mechanisms of learning, and we investigate how this is facilitated by a lean approach (Gioia & Pitre, 1990).

We focus on the value of research that may translate directly to an effect on practice as a desired outcome (Hogue, 2011), placing a strong emphasis on the way in which practice is experienced, as well as its historical and social context. As our research investigates the socially constructed reality of human behavior, a qualitative approach is relevant (Myers, 2013). We use an inductive approach to data analysis, as we seek to develop a better understanding of the interplay between individual, project, and organisational levels of learning, as well as the concept of lean and any relationship between them (Svejvig, 2021). This is guided by the data collected and the meanings and perceptions that prevail (Saunders et al., 2019). Individuals with at least three years of PM experience (from any industry) were identified using and purposive and a snowball sampling approach (Warren, 2011). The focus for selection was the individuals' job role, indicating experience and involvement with lean as an underpinning practice, rather than the project type or industry.

40 in-depth semi-structured interviews were conducted, which focused on facilitating discussion, detail, meaning and exploration of often subjective and complex elements of lean PM and learning in projects (Kvale, 2007; Marshall & Rossman, 2011; Seidman, 2006). Data collected by interview method sought to elicit rich data from attitudes, beliefs, thoughts, actions, and experiences (Dana & Dumez, 2015; Schultze & Avital, 2011) which facilitates co-creation of understanding and meaning (Järvi, Kähkönen & Torvinen, 2018). The context and essence of a lean approach and learning in projects were specific elements which were important in gathering evidence to generate credible answers to address the research question. A topic guide for the exploration of elements was used, involving follow-up questions, verbal and non-verbal probes and gestures (Legard, Keegan & Ward, 2003) to achieve breadth and depth. Questions included: What do you understand by the term lean PM? How would you define learning in projects managed by lean principles? What is your understanding of organisational learning? When and how does learning take place (if so), and by whom? Data collection took place between May 2018 and May 2019 with 30 males and 10 females who work across global locations, organization types and industries including construction, engineering, manufacturing, IT, health, utilities, nuclear, transportation, petrochemical and social enterprise industries (as shown below in Table 1).

Data saturation occurred after 27 interviews. Interviews were fully consented, audio-recorded, and transcribed verbatim. The duration of the interviews varied from 20 to 90 min, and we obtained in total around 26 h of audio recording. The transcripts resulted in over 95,000 words, which were analyzed firstly using directed content analysis, (Hsieh & Shannon, 2005) which helped structure initial and provisional categories based on anticipated responses and theoretical sensitivities (Maxwell, 2013). This was followed by reflexive thematic analysis (Braun & Clarke, 2006, 2020) which provided a systematic, interpretive approach to the development and refinement of codes, themes, and patterned meaning. Data yielded 2367 unique coding references (segments of text). Extracts of these segments are referred to as "statements" within this paper.

We applied relatively broad descriptive coding directly to the data at the lowest levels, then similar codes were gathered into more distinct conceptual categories. We developed an initial coding structure based on the first 10 interviews. To obtain the final node structure we undertook a cleaning process which involved removal of any duplicates and creating or merging of relevant nodes that had emerged throughout

Table 1
Demographic characteristics of interviewees.

Participant number	Gender	Project type	Organization type	Current job title
1	F	Construction	SME	Senior PM
2	M	Construction	SME	CEO/MD
3	M	Construction	SME	PM
4	M	Construction	Large- Private	Senior PM
5	M	Construction	SME	PM
6	M	Construction	SME	Senior PM
7	M	Manufacturing	Large- Private	Senior PM
8	F	Health & Medicine	Large-Public	PM
9	M	Construction	Large- Private	Senior PM
10	F	Construction	SME	PM
11	M	Construction	SME	PM
12	M	Construction	SME	Senior PM
13	M	Construction	SME	CEO/MD
14	M	Petrochemical	Large- Private	Senior PM
15	F	Health & Medicine	Large-Public	Senior PM
16	M	Utilities Management	Large- Private	Senior PM
17	M	Engineering	SME	Senior PM
18	M	IT	SME	CEO/MD
19	M	Engineering	SME	Senior PM
20	F	Transport & Logistics	Large-Public	Senior PM
21	M	Engineering	Large- Private	PM
22	M	IT	Large-Public	PM
23	M	Construction	Large- Private	Senior PM
24	M	Construction	Large- Private	Senior PM
25	M	Construction	Large- Private	Senior PM
26	M	Construction	Large- Private	Senior PM
27	F	Construction	Large- Private	Senior PM
28	M	Construction	Large- Private	Senior PM
29	M	Construction	Large- Private	Senior PM
30	M	Construction	Large- Private	Senior PM
31	M	Construction	Large- Private	Senior PM
32	F	Construction	Large- Private	Senior PM
33	F	Engineering	Large- Private	PM
34	M	Construction	Large- Private	Senior PM
35	M	Facilities Management	Large-Public	PM
36	M	Social Enterprise	SME	CEO/MD
37	F	Nuclear	Large- Private	PM
38	F	Construction	Large- Private	Senior PM
39	M	Construction	Large- Private	Senior PM
40	M	Construction	Large- Private	CEO/MD

analysis. The categories, codes and themes that formed part of the eventual coding hierarchy were subject to continual splicing and linking (Dey, 1993) as a way of fusing together a set of codes under an overarching category or theme. We applied two levels of interpretation: self-understanding and critical understanding (Brinkman & Kvale, 2015) on a 'back and forth' basis between parts of text and the whole dataset (Gadamer, 2004). This enabled context, focus and meaning to be uncovered enabling associations and relations between themes thus contributing to a deep understanding of the study (Ritchie & Spencer, 2002). This process is illustrated in Fig. 1 below:

Nvivo Pro (v12) was used to assist with developing, refining, and finalizing a coding structure. This allowed us to identify common themes in the interviews to identify topics, ideas and patterns which were mentioned repeatedly. This rigorous coding process, which was undertaken seven times, in combination with the documented data collection process, ensured a final hierarchy of codes. This iterative process eventually led to the production of a final coding structure of 181 codes with 5 levels within the hierarchy (Table 2), which were checked and verified. Each node and sub-node were checked to ensure relevance of the content (text reference) to the node it had been coded to. This hierarchy comprised 3 overarching themes, encompassing successively narrower and more specific ones, including 7 high-level sub-themes, 41 middle, 95 lower, and 35 lowest-level sub-themes (Bryman, 2016; Jackson & Bazeley, 2019). When no further codes could be identified (theme saturation), coding was deemed to be complete, ensuring reliable and valid findings.

4. Findings

The data revealed a general willingness on the part of project managers to reflect on and share their own perceptions of learning, prior to exploring the ways in which, and how, learning was undertaken. This often took the form of interviewees relaying the content (or 'what' is learned), situating learning within their own specific projects and their environments. Although we are less concerned with 'what' is learnt, but rather focus on 'how' learning occurs, 'when', and by 'whom', to better understand learning practices as they are facilitated by a lean approach. Whilst we found a perception that learning does not happen or is not implemented correctly, learning can and does still exist ("*Yes, [learning happens] from one project to another, but I would say that's rare, that is very rare. It's an ideal rather than the norm. It's just lost.*" [INT 6]). There is a sense of expectation that learning could happen and that as a minimum, the lessons learned processes can and do still occur.

4.1. Responsibility for learning

Many interviewees felt that everyone does or is responsible for learning ("*the people who are transparent, they learn much more than the people who don't want to show what they are doing. We learn from these people much more, and with them.*" [INT 1]). There is a sense that the interviewees include themselves as individuals within the collective effort and action that is typical of a lean approach, rather than just assuming responsibility belongs to everyone else ("*each individual must be prepared or ready to learn and improve his own work and the individual in the project.*" [INT 31]). Where specific or named roles were mentioned, the project manager was deemed the person most responsible for any project learning ("*…it's the PM, or LPM, or Lean Consultant who is very much… who has more control over the process than the others, so it is on their side to make the right decisions and to reflect the meetings, reflect on the*

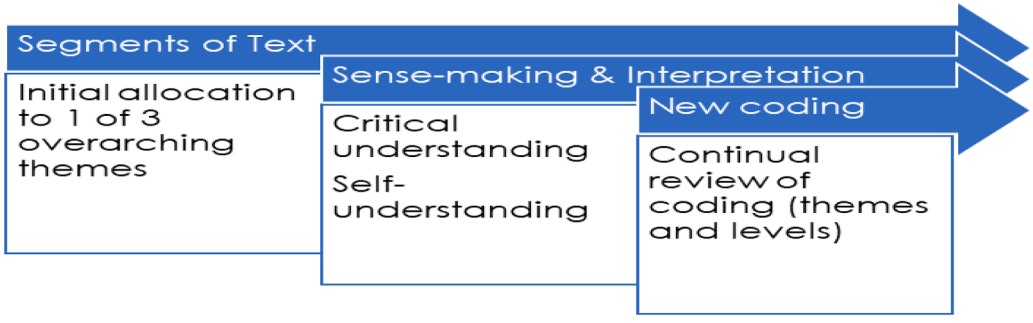

Fig. 1. Coding process.

Table 2
Coding hierarchy.

Final codes	Categorization of theme:	Conceptualisation of lean	Implementation of lean	Learning in projects	Hierarchy level
3	Overarching	1	1	1	1
7	High	2	2	3	2
41	Middle	12	5	24	3
95	Low	19	57	19	4
35	Lowest	0	29	6	5
181		**34**	**94**	**53**	

methods, reflect the tools, the techniques that are applied to see, ok, where can we change it? It's the Manager who has to foster and water the plant." [INT 31]).

4.2. Purpose of learning

The purpose of learning was generally perceived for individual benefit, whether for self or others ("*during the workshops, together with my colleagues, I want to know what problems people have faced and how they went about them.*" [INT 7]). The perceived purpose of learning includes both project-specific learning, that is learning for the purpose of current practice, as well as for the purposes of ongoing learning. Interviewees implementing lean principles for facilitating project progress did not consider project-specific learning to be limited as a "one-off" learning. That is, once the knowledge and (generally positive) experience of adopting lean principles is in place, its implementation is encouraged moving forward, by planning earlier, bringing in more team members and more frequently. This suggests the purpose and intended outcomes of learning is not restricted to project learning alone as they appear to be of particularly broader significance encompassing individual as well as organizational learning. The following section demonstrates these three characteristics of learning in more detail.

4.3. Learning in projects characterized by a lean approach

Our findings suggest that learning in projects underpinned by a lean approach can be characterized by actions, processes, and mechanisms.

4.3.1. Actions of learning in projects

Actions comprise practical activities such as scheduled weekly meetings throughout a project's duration, discussions of progress as well as receiving and sharing information that has been obtained from project KPI's ("*we certainly do take those learning points and we carry it forward and instill on site.*" [INT 28]). A lean approach facilitates and enables the creation of the learning content which leads to the practical action required. Statements reflected not only the importance of project learning for immediate action, but also consider further potential to sustain lean principles such as avoiding resource waste and generating cost-savings. ("*it's not only in lean projects, but in all of our projects, it's a thing, a point of lessons learned, so constantly make lessons learning, after important phases of the project and adjust maybe things to keep on track and in context of the lean philosophy, the continuous improvement of maybe, also only small things, but maybe try to continuously improve the working environment.*" [INT 39]).

4.3.2. Processes of learning in projects

The processes of learning in projects are concerned not only with ways in which learning occurs within a lean approach to project working, but also the timeliness or temporal nature of those processes. Over half of the interviewees perceived learning to occur on a continual ongoing basis, throughout the duration of projects, and others stated it occurred specifically at the end of projects ("*The project had been "live" in [location] for 2 years, so they'd learnt from that experience, of it being a miserable failure and how long it took for the implementation. So, our project plan did take that into account.*" [INT 8]). However, we found that a small number of individuals deemed learning only to take place at the start of the next project, without it having occurred previously (*"We are looking at how badly projects have been run and can we actually improve the next time round, here that idea of learning lessons is actually more than just project management methodology*" [INT 19]).

We noted that interviewees sometimes perceive learning occurring as an ongoing process as well as at the end of the project, whereas others generally perceived learning as either ongoing or at the end, but not both. This cross-level learning occurs at the individual as well as at the project level ("*It's not just general feedback for example at the end of a project and then drawing your learning for the next project, the PM's and Lean Consultants in such a lean project, they try to improve themselves, their techniques, their approaches from week to week, and try to see, ok what is working, not working, what and how can I do it better?*" [INT 31]). Our analysis suggests an emphasis on the anticipation of perceived positive benefits brought about for self and others by learning through a lean approach. For these interviewees, learning underpinned by lean principles appears to be valued as an ongoing mechanism to facilitate positive change more widely as well as the intended project outputs.

4.3.3. Mechanisms of learning in projects

The nature of learning in projects within a lean approach can be differentiated between formal and informal mechanisms of learning, although some mechanisms can include a blend of both. Formal mechanisms include officially organized and scheduled project evaluation meetings with agendas (in addition to scheduled weekly project progress meetings) and internal training workshops ("*Also, learning would be if you see that philosophy in practice, so not just writing the cards but talking about them, being transparent, not just doing the steps because that's the method, but talking about the problems, now or seeing that in 2 or 3 months there will be a problems and you hear people saying, hey guys, let's look at this problem.*" [INT 27]). These often tend to use figures and statistics, for example, changes in rates of progress over time, as an initial focus for learning.

Informal mechanisms of learning include provision of meetings and workshops, though the expectation in terms of attendance was generally lower ("*So you'd have chitchat and those with any questions, summary, and then small group activities. So that was a highway approach to learning.*" [INT 14]). These were typically quick due to the time pressures and agendas tended to be less formal – interviewees would not necessarily know what the subject was in advance of attendance. Often a specific problem or issue was presented for group discussion, for example, an observation of practice (positive or negative) or experience with specific clients was shared across project teams. Regardless of the formal or informal nature of project learning, interviewees intimated that learning was best achieved through informal mechanisms, such as talking through problems and issues, although they also accepted and responded well to formal mechanisms such as the use of KPI's. Some interviewees perceived formal mechanisms of learning as generally negative and non-lean ("*The more formal processes, procedures, standards and changes, they are relatively non-agile.*" [INT 18]).

4.4. Drivers for learning

For these characteristics of learning to flourish within and across

individual, project and organisational learning, the data revealed three context-specific drivers: 1) knowledge and understanding of lean; 2) socio-cultural and behavioral interactions; and 3) leadership and management support. The existence and interrelationships between these elements is visualized in Fig. 2 below and explained further.

The existence and inter-relationships between these three drivers lead to an understanding of learning in projects as an integrated practice and process facilitated by a lean approach. All four elements shown above are mutually interdependent, as depicted by dotted lines between boundaries. Arrows surrounding the diagram indicate continuous implementation between and across all drivers. The three drivers together influence the implementation and nature of the practice of learning (characterized by actions, processes, and mechanisms). Adopting a lean approach creates a unique environment where individuals can make sense of, interact with, respond to, and often shape essential PM practice. This is suggestive of Pettigrew's (1997) premise that people learn more by practice rather than theory.

4.4.1. Interactivity between elements

Findings from the research suggest that the process and practice of providing and sharing knowledge with others within a lean approach is achieved through multiple interactions. These interactions occur between individuals who demonstrate learning by acting, reacting, and responding to other individuals within, across and between their specific responsibilities, relating to and developing their own and others' knowledge. These interactions also occur within, across and between the processes that are required to undertake project work, sometimes under the direction or support of senior management and leadership, other times due to the lack of direction that is expected. Each driver enforces and reinforces practice that progresses necessary project working but additionally facilitates learning in projects to take place at the individual level, which also aims to improve learning at the practice level (project and organisational learning). These interactions also occur on a socially constructed practice basis using a combination of knowledge, understanding and behaviors.

This extends the purpose of learning beyond the traditionally espoused functional aspect of learning, which focuses on the acquisition and conversion of knowledge alone, and from a solely organizational viewpoint (Prusak, 2001; Sokhanvar, Matthews & Yarlagadda, 2014). Rather, the drivers found here work together to create multiple opportunities for the process and practice of learning in projects. This is demonstrative of more effective knowledge transfer which may improve and refine knowledge as well as articulating new knowledge that becomes re-used knowledge to inform and improve current and future project working.

A practice-theory perspective places emphasis on the establishment of 'divisions of practice' establishing where gaps exist between acquisition and sharing of knowledge (Scarbrough et al., 2004). Since knowledge sticks in the gaps between such divisions of practice, it can only become fluid when it is shared across boundaries, as suggested by previous research (e.g. Leybourne & Kennedy, 2015). However, knowledge that is held between individuals and projects is more elusive, personal, and influenced by structural and cultural boundaries (hence the dotted lines between the elements in Fig. 2 indicating permeability of knowledge and learning that cut across boundaries).

4.4.2. Knowledge and understanding of lean

Our findings indicate that learning in projects is facilitated by knowledge and understanding of lean principles themselves. This is enacted initially by individuals taking responsibility for their specific functions and tasks which contribute to overall project team progress. Missing knowledge of lean and a lack of knowledge of lean was considered a significant barrier and this included generic lean knowledge as well as specific lean PM knowledge ("*learning in the project, like in terms of content, what's the learning about in topics, that's touched upon in the project and then there's of course, learning about the methodology, how to manage projects, what to look out for*" [INT 7]).

Findings suggest that this additionally cuts across levels of seniority within the project team. It is apparent that lean principles offer an opportunity for learning *about* lean, in addition to using lean knowledge to effectively implement lean principles, providing context as well as content ("*So I think that in that sense, every time we make projects with lean methodologies, then the principles are learned. People learn more about lean as they are undertaking the project.*" [INT 11]).

4.4.3. Socio-cultural and behavioral interactions

Socio-cultural and behavioral interactions are important elements in facilitating the practical actions, processes and mechanisms of project learning facilitated by a lean approach, and in subsequently providing the learning opportunities at all levels. These include reflecting on individual and project-based experiences, mistakes, problems, and issues raised, for the purposes of progressing the immediate (current) project.

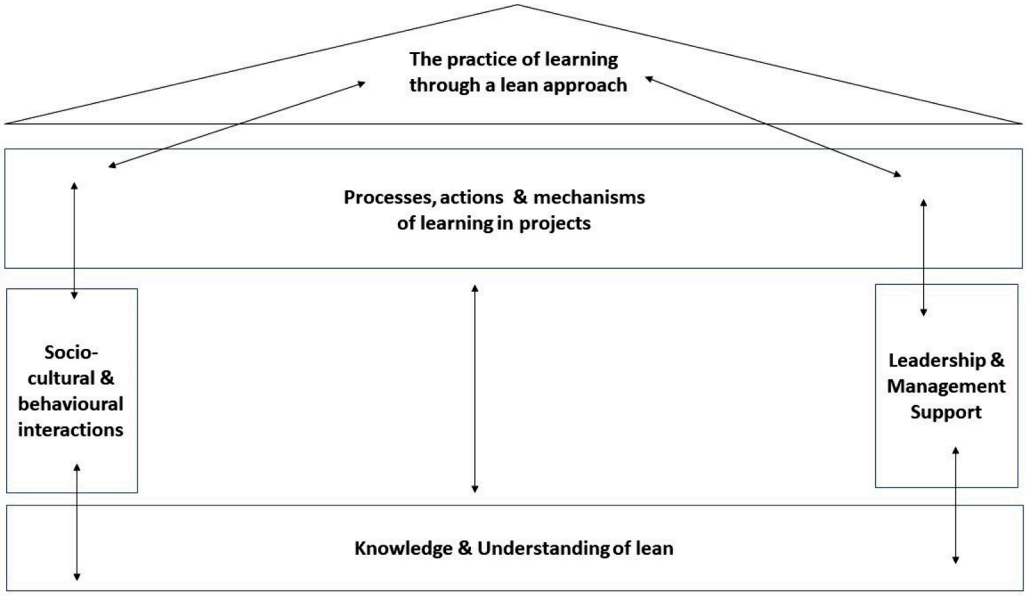

Fig. 2. Inter-relationship of elements and drivers for learning in projects.

By interacting as an individual with the team, sharing any best practice, but also by reflecting on things that have gone wrong, this is considered to be an opportunity to quickly respond to issues that may hinder current progress and additionally generate future opportunity for improvements (*"Learning is giving support, because when any new project comes in, it's change and we don't know everything, so learning can only happen with the support you give to people, so people feel they can ask questions*" [INT 8]).

A lean approach has been found particularly suitable to facilitate these socio-cultural and behavioral interactions due to the underpinning collaborative approach and focus on relationship building (*"I think that the principle of greater communication allows you to learn because…you're sharing ideas and everyone will have experience of something that went wrong that they learnt a lesson from more collaborative approach you tend to that, you build up better relationships so you're more likely to share that information than traditionally."* [INT 30])

4.4.4. Leadership and management support

The support of senior managers and leaders working to lean principles was perceived as an essential enabler to fully exploit the positive outcomes of learning in projects. Senior leaders and managers with decision-making responsibilities were expected to have lean knowledge and understanding, those without them engendered disappointment and mistrust from some interviewees. (*"I've learned this by experience you need your managers to buy in. If they do not buy into it, that's a problem, and you need to address them and convince them otherwise."* [INT 28]). This expectation was considered to impact positively on interviewees' own individual practice, and the development of the profession as well as facilitating success of projects. For example, interviewees had the desire to implement similar effective lean practices in further projects or within their organizations and expected this desire to be shared or at a minimum, supported by their seniors (*"What we find is that its only now we're getting engagement from our own local senior managers, it's a bit embarrassing to hear them say, "Oh I hardly ever use it!" in the meeting."* [INT 8]).

5. Discussion

5.1. Impacts of a lean approach on learning in projects

Learning in projects is practiced throughout all stages of projects i.e. it forms part of essential ongoing project processes as well as following a project's conclusion. The processes of learning within a lean approach extends the traditional learning curve making learning ubiquitous and not at prescribed times, stages, or phases. Although the lean approach maximizes opportunities for individual, project, and organisational learning, it can also take individuals longer to understand, apply and adopt the lean principles of collaboration, transparency, and continuous improvement, despite the benefits of context-based, dialogic reflexive learning and informal knowledge sharing. This is because the adoption of lean principles in the project environment is a learning process in and of itself. Learning processes are characterized by knowledge sharing mechanisms, largely as an individual endeavor for the purpose of sense-making for self and others.

Formal mechanisms of learning in projects, through streamlined communication and hypothesis-driven behavior, are strengthened through the adoption of a lean approach. This would suggest that there is a value and an appetite for socially driven processes of learning within such project working that may develop beyond traditional formal and instructive means. Embedding of knowledge of lean principles facilitates the transformation of learning in projects since its practice offers a unique way of "blurring the boundaries" (e.g. Gherardi & Nicolini, 2000; Orlikowski, 2010; Yap, Abdul-Rahman & Chen, 2017). This supports and extends Pemsel and Wiewiora (2013) and Wiewiora et al. (2019) review of research bridging mechanisms of culture, leaders and interventions that impact learning on a multi-level basis.

5.2. Learning through a lean approach for improved PM practice

Learning in projects through a lean approach appears to occur as a continuous, ongoing practice which includes opportunities for improvements in processes and the overall PM practice. Our findings suggest that formal knowledge acquisition, such as gathering information and knowledge, whilst important and necessary, is articulated much less frequently than the process and action of learning through behavioral and social mechanisms, such as collaboration, communication, and reflection, which are particularly notable in our study. The reinforcement of positive socio-cultural and behavioral characteristics of oneself and others is important in facilitating improved PM practice. Where this happens, there is an increased likelihood of better overall levels of knowledge and learning of PM practice as well as lean principles. Thus, lean principles may enable diversity, address uncertainty, and facilitate continuous change, in order to thrive within projects and organisational environments.

We asked questions which were dynamic and multi-directional, drawing the focusing on a topic of significance and at the same time functioning as a lens to capture the nuances of the lives, experiences, and perspectives of others (Agee, 2009). Capturing, developing, sharing, and using knowledge remains a complex process that cuts across individual and project boundaries (O'Keeffe, 2002). A lean approach may overcome structural and cultural boundaries (Leybourne & Kennedy, 2015) by recognizing the value of, and interaction of individuals, their learning processes and practices, and the structures that exist around them personally, and within the project.

5.3. Transformational impacts of a lean approach on and for practice

It enables the differing levels of knowledge to surface, and as result, action-based project learning, processes and interactions emerge as a specific practice to acquire, integrate, and improve knowledge as well as knowledge sharing outcomes. By exploring and reflecting on situation-specific contexts, and identifying socio-cultural and behavioral interactions, project participants can acknowledge the transformational element of their own individual knowledge and experience.

5.4. Practicing lean and learning together

Thus, the lean approach emphasizes the importance of a situated, or context-specific practice approach, which is required in locating gaps and boundaries, optimizing knowledge, and learning transfer. This raises the profile of learning and knowledge within PM and more importantly, it highlights further the role and importance of lean as a practice for increasing knowledge, experience, and learning in projects.

Our study proposes the following takeaways to advance the field of learning in projects in a more nuanced way:

1. We suggest that a mutually beneficial relationship exists between lean and learning. Applying a lean approach to learning in projects strengthens the link between project outcomes and behavior, which in turn facilitates better integration of continuous learning and opportunities for improvement across the wider project environment. Focusing on the collaborative aspects of lean as part of an integrated learning system and practice, engenders respect for people, as well as enhancing the processes and practice of lean. The integration of lean principles and learning can help practitioners to make sense of, interact with, and respond to the challenges of contemporary project working.
2. The characteristics of a lean approach to learning in projects include actions, processes, and mechanisms. These characteristics provide the learning content required for the acquisition and use of knowledge, as well as facilitating the process of learning itself.
3. Learning in projects through a lean approach improves knowledge sharing processes and extends sharing beyond the individual and the

project levels, to include organisational levels. This also incorporates a level of expectation on the part of learners (practitioners), leadership and senior management as a shared responsibility for all to contribute to and benefit from the output and outcomes of learning in projects. There must also be a recognition that learning can take time, especially where the already existing level of knowledge of lean is lower than other practitioners.

4. Furthermore, we propose drivers for learning in projects as socio-cultural and behavioral interactions, knowledge and understanding of lean principles as well as leadership and management support. Our findings demonstrate that socio-cultural and behavioral interactions influence the willingness, transparency, and practice of individuals to learn within, across and beyond projects.
5. The presence (or absence) of knowledge and understanding of lean principles together with the support (or otherwise) of leadership and senior management can influence the level and quality of learning in projects within the practice environment. This could give project managers the space and time to establish and sustain collaborative, mutually beneficial working relationships in a complex and uncertain world.

6. Conclusion

Our research question focused on how a lean approach to learning in projects could facilitate and improve learning. In answer, the exploration of lean and learning from this research reveals a mutually beneficial relationship between the practice of lean and its impact on learning. Findings of the research engage with and strengthen the theory of practice, combining concepts of *habitus, field* and *capital* (Bourdieu & Passeron, 2000). It supports the argument that a lean approach to learning in projects provides valuable opportunities to create mutually beneficial social and behavioural outcomes that potentially improve and sustain effective PM practice (Feldman & Orlikowski, 2011; Jarzabkowski et al., 2012). Using Practice Theory as a theoretical lens to examine the socially constructed reality of project learning within practice illuminates and supports the principle that social actions are consequential, interdependent, and grounded in human agency. Our study contributes to the project management literature by demonstrating that a lean approach to project learning could lead to an increased, or at least more equitable sharing, of responsibility for project learning. Our findings reveal that a lean approach provides further, and more timely, opportunities for improved learning across individuals, projects and organisations; through the knowledge and understanding of lean. This approach provides the foundation for the additional drivers of socio-cultural and behavioural interactions, as well as leadership and management support to facilitate the actions, processes and mechanisms of project learning. We suggest that a lean approach to learning increases the quality of learning as well as raises the profile of lean as a project management practice. Exploring the existence and nature of the relationship between lean and learning in projects may facilitate continuous learning, which is regarded as the highest level of PM maturity (Kwak, Sadatsafavi, Walewski & Williams, 2015; Yazici, 2009).

6.1. Limitations and further research

The main limitation of our study is that it focused on the reflective, reported experiences and perceptions of interviewees, who may have biases or preconceived conceptual ideas about lean and/or learning. We do not claim generalizability, given the exploratory nature of the study and the preponderance of interviewees working in construction. The purpose of our research was to obtain an overview of the characteristics and mechanisms of learning in projects through a specifically identified (lean) approach, as informed by the lived actuality of the interviewee's practice. Therefore, we argue that we present authentic evidence. This initial study examined the concept of learning in projects within PM, seeking, through the collection of rich data, a deeper understanding of the relevance of a lean approach to learning in projects.

Further research could reveal illumination between life cycle phases within specific sectors, or cross-sector comparison between types of organization and levels of seniority. Other possibilities include development of a large-scale quantitative survey incorporating a wide range of project types to build on the findings explaining the relationships between independent variables such as measures of socio-cultural interactions, and dependent variables or degrees of IL, PL, and OL. Longitudinal studies to investigate how the processes and activities of learning changes over time would strengthen the evidence base for the definition and concept of lean, indicating maturity as a process and outcome-based phenomenon.

Declaration of competing interest

None.

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