

Construction ethnography: Emergent insights from construction experts

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Extended Abstract—Early project stages of Architecture Engineering and Construction (AEC) projects are critical because they lay the foundation for further project steps and are at the very front-end. The front-end is characterized with uncertainty because the project is still undergoing ideation at this formation stage. The further project steps provide the basis for appraising the project problem, strategically planning solutions to solve problems, idea generation, and budget estimations for seeking funding and statutory approvals. However, the main challenge which impacts the foundation on which all further steps are based is the limited information and data available at early project stages. This challenge is usually addressed strategically by recalling and applying acquired knowledge from past similar projects. This knowledge gathered from past similar projects is known as tacit knowledge of the expert. Therefore, it is expert practitioners who have their intrinsic tacit knowledge from previous practical experiences on similar projects who have the advantage over inexperienced practitioners, at the early project stages. The experts apply their implicit tacit knowledge of known approximate geometries and project constructs to craftily develop realistic project outcomes at the front-end early stages. This knowledge of the experts can be trusted as a gold standard [80].

That notwithstanding, the experts borrow and apply their tacit knowledge informally, rarely document the details of why, how, and what during the process, and therefore the undocumented tacit knowledge and process-steps are lost and cannot be transferrable. This limits the extent to which the knowledge can be replicated for future projects by either new project team-members when team compositions change or by the young inexperienced practitioners, especially at the early stages. Gathering, documenting, and formalizing the experts' tacit knowledge is essential as input for new projects, for knowledge management, and organizational learning. To address this problem, this study interviews expert AEC practitioners to harness, gather, and document their experiential accounts and instances at early project stages to identify key knowledge concepts, and best practices to derive logical experiential-based best-practice strategies (EBS) which are relevant for early project stages. Our main research question 'How can the front-end outcomes of AEC projects at the early project stages be improved through applying tacit knowledge from past project experiences?' was simplified by breaking it down into six open-ended questions to facilitate free-flowing discussions during each of the ten interviews. The discussion strategy was free flowing to support exploratory research which accommodates the incomplete knowledge of each project reality [41] and the back-and-forth dynamic forms of knowledge [76]. Knowledge is dynamic and unstable but keeps transforming with spontaneous consequences [81], therefore flexibility is required for strategic knowledge management. The knowledge can be either explicit or implicit or a combination of both types and it can exist in four different forms including experiential, conceptual, systemic, or routine [39]. Furthermore, our exploratory research

approach allows for knowledge combination from the various experts' experiences to summarize the wealth of information [69].

In this study, the exploratory research methodology involved conducting semi-structured interviews as the method for data collection. We conducted and recorded each of the interviews separately, during the period between July 2021 and February 2022. Each of the ten experts had at least fifteen years of practical experience in the AEC industry and was interviewed independently. The durations of the interviews lasted between 0.75 to 2.5 hours, for the shortest and longest interviews respectively. Prior to the interviews, each of the interviewees signed a consent form as part of the ethical procedures for the interview design protocol. Each of the recorded interviews is played back severally and manually transcribed. The ten transcripts are then merged into one document to enable us easily manage the thematic encoding process using open codes and by constant comparison. Comparing and contrasting helps to identify what is distinct about the transcript and its content [90]. A thematic encoding process is used to manually process and analyze the interview transcript by considering the words and sentences [90]. Analysis is extended with the aid of ATLAS.ti 2022 which was used to create network diagrams for connecting expert instances of best-practice strategies at early stages of AEC projects. The focus of this study was to combine the tacit knowledge of experts to propose experiential-based best-practice strategies which can be directly applied for future AEC projects to substitute missing information/data at the early stages. In relation to Nonaka and Takeuchi's legendary SECI model [76], this study focusses on the 'combination' quadrant which involves reviewing, connecting, and systemizing articulated knowledge to propose pathways for reprising the implicit tacit knowledge into the closest possible explicit form. This is because whereas tacit knowledge cannot be fully converted into explicit knowledge, it is still worth streamlining the varying degrees of personal knowing [87]. Therefore, our study attempts to concretize the tacit knowledge gathered into the closest explicit forms possible to make it more accessible for practical application. Concretizing knowledge fits the reigning model of human learning in which the generalized knowledge is transferred from a pre-defined past situation to another similar situation [88], in project contexts.

This study realized a total of twelve codes and five categories. From the thematically encoded expert instances, this study found that 21% of the 172 encoded expert instances reflected strategic technical aspects prioritizing project-specific requirements and adapting designs to the requirements instead of reliance on standard codes and guidelines. On the other hand, 30% of the instances represented strategic socio-environmental best-practice strategies, 7% of the instances reflected strategic statutory considerations, and 42% of the instances related to communication and teamwork best-practice strategies. This study focuses on the strategic technical aspects. The expert instances which are strategic technical best-practices from their experiences were analyzed and inter-relationships established. Linking

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and connecting the instances was done by creating network diagrams with the aid of Atlas.ti software. The linked instances are then combined to create experiential-based best-practice strategies (EBS) to represent the common implicit tacit knowledge. The set of EBS strategies can be implicitly applied for supporting new AEC projects to improvise for missing information/data at the front-end early stages.

The main contribution of this study is a set of experiential-based best-practice strategies (EBS) to improve early project stages. The EBS are logical statements of best-practices derived from the experts' accounts of evidence-based strategies which is borrowed from the wealth of their intrinsic tacit knowledge. The tacit knowledge-based strategies integrate the information from experts' knowledge and proven experience of approximate geometries and project constructs which are realistic for new projects which are like past similar projects.

Since the EBS are evidence-based, the main significance of our contribution is the proposed set of experiential-based best-practice strategies which will improve the front-end outcomes of AEC projects because realistic geometries and project constructs will be considered. In addition, this study provides a priority ranking of the AEC experts' strategic priorities as communication, socio-environmental, technical, and statutory aspects, at early project stages. The implication of our study is the evidence that understanding projects is more of a social strategic construct reflected by 73% instances and majority the 27% technical-related instances predominantly advocate for prioritizing project-specific requirements instead of standard AEC criteria and codes. The proposed experiential-based best-practice strategies will be useful to advocate for continuous flexibility and adapting own-specified criteria to suit project-specific requirements. Further work using serious games [36, 82] and ethnographic action research [35, 36, 91] is recommended.

Keywords—AEC, Codes and standards, Early project stages, Evidence-based design (EBD), Experiential-based best-practice strategies (EBS), Interviews, Tacit knowledge.

“Where the only certainty is uncertainty, knowledge is the only competing advantage. Knowledge management is more about strategy than organizational behavior.” (Nonaka, 2013)

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