A Conceptual Model for Selecting Early Contractor Involvement (ECI) for a Project

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Abstract: Amongst different aspects of a capital construction project, procurement is found to be the most important area and represents over 80% of the contract value. The selection of an appropriate procurement strategy is an important contributor to overall project success. Within several procurement methods, Early Contractor Involvement (ECI), a relatively new strategy to procure a construction project, is becoming more popular for infrastructure projects across Australia. However, it appears that ECI has been adopted as a preferred procurement option with little research or piloting, and decisions to select ECI for a project have been mostly judgmental, and subject to biases of the decision-makers. This paper focuses on this important issue and proposes a conceptual model for selecting ECI for a construction project. Grounded Theory research methodology is employed for this study that facilitates the generation of categories and contextualises theory. Validation of the theory was ensured by carefully practicing the theoretical coding procedures through ‘open coding’, ‘axial coding’, and ‘selective coding’. The data is collected through individual interviews with experts within client organisations who held senior management level roles in their organisations and were involved in the selection process of ECI and could provide input into their experience in that area. The proposed selection model integrates the procurement selection criteria specifically related to the project characteristics, client’s objectives, and internal and external project environments with alternative selection approaches and practices. This paper also discusses the notion of social, process, and output control by using ECI.

Keywords: early contractor involvement; procurement selection model; construction management; client organisations

1. Introduction

The Australian economy is significantly impacted by the construction industry. There are also a number of other industries indirectly linked to the construction sector such as building materials supply, components manufacturing, and a range of related finance industries. Among different aspects of a capital construction project, procurement is found to be the most important area and represents over 80% of the contract value [1]. It has become evident that the way procurement is managed determines the success of a project. Studies show that procurement strategies impact the overall performance of the building industry [2]. It is generally agreed that to effectively implement procurement procedures clients must have a high level of confidence in, and hold positive attitudes about, the impact of procurement implementation on project outcomes. Clients, therefore, should have a good understanding of novel procurement methods and how using these methods actually affect project performance [3,4].

One of the relatively new strategies to procure a construction project is the involvement of a contractor at the early stage of the project. This strategy is widely known as Early Contractor involvement (ECI) where the designer and constructor work together in a
contractual relationship with the client to scope and price and then design and construct the project [5].

While the use of early contractor involvement is becoming more popular for infrastructure projects across Australia [6], it appears that ECI has been adopted as a preferred procurement option with little research or piloting. This results in the client lacking the ability to set sensible budgets, challenge Target Prices and manage the process effectively [7]. As a result, decisions to select ECI for a project have been mostly judgmental, and subject to biases of the decision-makers. There is, therefore, a need for a system to define a process to facilitate the selection of ECI in order to ensure that ECI is an effective procurement method for the project.

This paper focuses on this important issue to address the following research question: RQ—How, and under which circumstances, should an ECI be adopted for a project?

This paper will first review the current studies on the Early Contractor Involvement procurement method and discuss its characteristic as well as the advantages and challenges in implementing this delivery system for a project. This will be followed by a review of the procurement selection process and frameworks essential for formulating the elements embedded in the development of a conceptual model. Then the research methodology is presented, describing how the study is carried out and how the data was collected. The paper continues with an analysis and discussion of the data followed by the development of a conceptual model for selecting ECI for a project, and ends with conclusions.

2. Literature Review

2.1. Early Contractor Involvement

Early Contractor Involvement (ECI) is a relationship-based procurement system that brings contractor construction knowledge and experience into the preconstruction phases of projects [8] to develop a long-term relationship between project participants throughout the design and construction process and provide the best value to the project [9].

Since ECI involves the main contractor at the early stages of the contract, it enables the contractor to participate in the design, risk management, and programming process [10]. Early involvement of the contractor in the project also improves the communication between client and project teams and allows effective exchange of information at the earlier stage of the project lifecycle. According to Rahmani [11], the biggest opportunities ECI can create for a project are the enhancement in constructability, improving working relationships, greater certainty in price and scope, and enabling innovation. However, some studies report a number of challenges in implementing a successful ECI that public clients have experienced for their projects delivered under ECI including demonstrating value for money, unfamiliarity with the ECI process, the inadequacy of remuneration, lack of adequately trained resources, change in relationship protocol, cultural barrier, misusing the relationship by the contractor, and imbalanced leadership [11]. Therefore, ECI as a project delivery system, is not a ‘one-size-fits-all’ solution and should be adopted for a project carefully through analysis of the project constraints and stakeholders’ objectives.

2.2. Procurement Selection

The selection of the most suitable procurement method is critical for both clients and project participants and is becoming an important and contemporary issue within the construction industry [12]. There is evidence that the selection of an appropriate procurement strategy is an important contributor to overall project success [13] and this has been a driving force for the development of various procurement selection approaches.

The decision as to which procurement system to adopt for a given construction project is a complex and challenging task for clients [14]. Since the range in choice of procurement system is now so wide and projects are becoming more complex, the selection process needs to be carried out in a disciplined and objective way within the framework of the client’s overall strategic project objectives [15]. This need has been well recognised by a number of academics and practitioners in the field and led them to develop structured
methodologies, tools, and models of various types to aid the procurement selection process. Depending on the type of client’s organisation (i.e., experienced or inexperienced), the selection of a procurement approach can be undertaken by the client’s organisation itself or through an external experienced professionals’ consultancy [14]. Regardless of what approach the client uses to select a procurement method, the decision is made through a process of assessing the project and the client’s objectives, and considering the most appropriate procurement strategy by evaluating the available options to satisfy the defined objectives [16]. However, the most challenging task in the process is identifying the criteria for the project and the client [14]. Since finding a procurement approach that satisfies the client’s requirements and project constraints is a complex and difficult task [17,18], the use of only factors of time, cost and quality should not be a basis for selecting the procurement method, although the selection process dominantly revolves around these three criteria [19].

While there are a few models developed to guide owners in selecting an appropriate procurement method for a proposed project [20–25], no systematic techniques or tools are available to systematically assess the criteria required for adopting an ECI for a project.

3. Methodology

The objective of this research is to investigate how and why clients should select ECI correctly for a project. This study can be considered an exploratory study. Exploratory study is advocated when not much is known about the situation or information is not available in the way that the past studies have addressed similar problems or research issues [26]. Data was collected from the perspectives of four leading Australian public organisations and one professional consultant. Amongst various qualitative approaches, grounded theory was employed in this part of the research that facilitated the generation of categories and contextualised theory. Grounded theory was used in this study as it is appropriate for answering questions of process, that is, ‘how’ rather than ‘why’. Subsequent to an initial review of the literature it was decided that the concept of ECI was new to the construction industry and there is a dearth of research in this area. On account of the novelty of ECI, grounded theory can provide an efficient means of generating theory and illustrating the current situation. The data gathered through individual interviews were analysed by using a thematic analysis technique to identify patterns, themes, biases, and meanings through a careful, detailed, systematic examination and interpretation of interviews.

This research was carried out in three phases. In Phase 1, salient literature was reviewed to develop an understanding of the existing knowledge elements. In undertaking this study, initially, it was important to explore the definition of ECI and its perceived structure as practiced in the industry and different procurement selection models. A preliminary literature review was conducted in response to this inquiry. Phase 2, focused on the research data collection, data analysis, and the development of the theoretical components. Fifteen experts within client organisations who held senior management level roles in their organisations were invited to participate in this study. Table 1 provides a summary of the research participants. The strategy for recruitment of participants for this study was driven by the principles of ‘purposive sampling’ advocated by Corbin and Strauss [27]. The main purpose of purposive sampling is to elaborate and refine the categories constituting the emerging theory [27].

Targeted participants were in the infrastructure departments of public sector client organisations including state government departments and one leading professional consulting organisation specialising in the establishment and delivery of collaborative contracts for complex projects and programs. Ideal individual participants had been involved in the selection process of ECI and could provide input into their experience in that area. Targeted organisations were identified through the Internet and since they were public sector organisations and one well-established professional consultant, their websites were publicly accessible. The organisational chart of each organisation was obtained, and the relevant department was identified. Approval to conduct the study within the organisation
was sought from senior executives through emails. Four departments in Victoria, New South Wales, Queensland, Western Australia, and South Australia responded to the request and agreed to participate in the research project. Upon receipt of the approval, a list of candidates who had an interest in participating in the research study including their contact details was requested. Initially, participants were sought through invitational emails sent directly to them or their secretary. As the study continued, additional participants were identified through referrals from the other participants during the interview. This is termed a ‘snowball sampling’ approach.

Table 1. Overview of research participants.

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<tr>
<th>Role</th>
<th>Number of Participants</th>
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<td>Program Delivery and Operations Manager</td>
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<td>Infrastructure Management and Delivery Director</td>
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<tr>
<td>Project Review and Procurement Manager</td>
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<tr>
<td>Construction Team Leader at Delivery and Operations</td>
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<td>Principal Engineer/General Manager</td>
<td>2</td>
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<td>Contracting Services Manager</td>
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<td>Project Manager/Director</td>
<td>2</td>
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<tr>
<td>Network Safeguard and Development Manager</td>
<td>1</td>
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<tr>
<td>Senior Procurement Consultant</td>
<td>2</td>
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<tr>
<td>Executive Officer</td>
<td>1</td>
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<td><strong>Total number of participants</strong></td>
<td><strong>14</strong></td>
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<th>Experience in construction (in years)</th>
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Fourteen out of 15 selected participants responded to the research participation request and confirmed their willingness to partake in this research study. The major study involved in-depth telephone interviews with 14 experts and key management representatives. The 14 people who were interviewed all performed senior leadership roles for their department with several decades of experience within their field of practice. An in-depth interviewing methodology enabled a detailed discussion of the issues tackled in the research. Analysis of this study predominantly follows the coding process incorporated in the Straussian interpretation of Grounded Theory and was guided by the ‘constant comparison’ of participants’ responses considered as one of the core Grounded Theory analytical tenets highlighted by Suddaby [28] in order to attain theoretical saturation of the concepts under exploration. In order to facilitate the process of coding and analysis, the latest version of a qualitative analysis toolkit, QSR Nvivo was utilised. Upon the receipt of confirmation from the respondents on the accuracy and plausibility of each interview, the transcription was imported into the software for the analysis process including Open, Axial, and Selective coding. In Phase 3, the expounded theory was tested and validated. Whilst building each block of the theory, literature in the substantive area of the theory was brought to support and ground the theory. This iterative process continued until the entire theories were developed, theoretically saturated, and grounded by the extant substantive literature. Validation of the theory was ensured by carefully practicing the theoretical coding procedures through open coding, axial coding, and selective coding. Finally, all findings were integrated and collated to produce discussion and the subsequent conclusion.

4. Analytical Procedure

In the Open coding stage, the text is opened up to expose the thoughts, ideas, and meanings contained in the documents in an attempt to uncover, name, and develop concepts [27]. This is an iterative process of analysis consisting of reading and re-reading, and creating extensive memos that lead to identifying, naming, exploring, and describing the emerging concepts and categories. During open coding, the collected data was
broken down into discrete parts and closely examined and compared to other parts to find similarities and differences. Different categories were identified at the stage where some of these pertained to a phenomenon while others referred to conditions, actions or interactions, or consequences. The labels placed on categories were carefully selected to make this distinction. In the Axial coding stage, identified categories were assigned to their related sub-categories along the lines of their meanings to form more precise and complete explanations of the phenomena. This process is termed axial coding because coding is undertaken around the axis of a category, linking categories in accordance with their core meanings [27].

During open coding, an overall sense of the data was perceived and the initial categories at dimensional levels were formed. The emerging connections between categories and subcategories were identified and validated through continued comparisons of data incident to incident in which to develop the axial coding structure. The axial and open coding proceeded naturally together and led to forming the framework that guided the continual analytic process until the attainment of theoretical saturation for each category. Theoretical saturation is a matter of reaching the point where any new emerging concepts just extend the scope of research rather than adding to the explanation.

Once the major categories have been identified, they were integrated to form a larger theoretical scheme that the research findings were able to convey what the research was about. Corbin and Strauss [27] define this analytical process as selective coding pertaining to the process of integrating and refining categories towards forming the theory.

Through a process of selective coding, central themes of the process for selecting ECI were shaped. The conceptual model for selecting ECI was developed after an intensive review of the data. Once the themes of the ECI selection process appeared in the participants’ description as to how they select an ECI, they were developed as the central core category that could explain the diverse variations and exhibit explanatory power. After identification of the core categories, supporting categories were integrated through revisiting and re-reviewing the data.

5. Findings

Two main categories were identified in interviews including ‘Selection criteria’ and ‘Selection practices’:

5.1. ECI Selection Criteria

The category of ‘selection criteria’ identifies the circumstances in which clients consider the use of the ECI model over other contractual methods. These criteria are grouped into four separate clusters namely, ‘project characteristics’, ‘client’s objectives’, ‘internal environment’, and ‘external environment’. This classification conforms to the underlying themes portrayed by Mohsini and Botros [22] and Ambrose and Tucker [29], however, an additional cluster of ‘Internal environment’ has been identified when clients are considering an ECI for a project.

It is noteworthy that the only criteria pertinent to the ECI in particular, have been reported in this paper and hence the other procurement selection criteria proposed by several authors [30,31] should be also considered during the ECI selection process.

Although there was an effort to identify independent factors for selecting an ECI, it should be emphasised that an implicit interrelationship between the selection criteria exists [13]. Classification of criteria is an artificial task and in reality, clients use their experience and knowledge to identify these criteria. It is not possible to formulate which criteria should be considered separately by the adoption of a simple set of rules due to the amalgamation of underlying factors in a construction project [19]. ECI selection criteria themes are illustrated in Figure 1. The following sections explicate each element of the identified criteria cluster and incorporated elements.
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### 5.1.1. Project Characteristics

Criteria related to the project characteristics address the factors inherent in the technical nature of the project and are specifically considered when the case of ECI is an option for the project procurement method. These criteria include complexity, uncertainty, risk profile, timeframe and size of project. Table 2 demonstrates the ECI selection criteria identified by the participants.

- **Complexity**: Complexity is the main project-related criterion for the selection of ECI. Complexity is the existence of interdependent variables interacting in a non-simple manner [32]. In a complex situation, cause and effect are only known based on the experience and knowledge attained from the previous projects, with unpredictable outcomes in the future [33]. When there is a relatively high level of complexity, the use of ECI can benefit the project due to the joint risk identification and assessment by the contractor and the client which caused substantial reduction in tender price reflecting the complexity involved in project delivery [34]. Nevertheless, ECI is not suitable for projects with a very high level of complexity. Alliancing is the preferable option in this situation since there is an ongoing need for collaboration between the designer, contractor, and client during construction [6,34].

- **Uncertainty**: Adoption of ECI is a strong option when a project is characterised by a relatively high degree of uncertainty in various forms, such as time, cost, and scope. Cost and time uncertainty are the situations when the price and the stipulated time and knowledge of how much the client has to pay at each period during the construction phase are not clear and the project completion on the agreed date is not ensured [13].

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**Figure 1. ECI Selection Criteria.**

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Table 2. Underlying criteria influencing the selection of ECI.

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Scope uncertainty presents in a project when scope may be difficult to define due to the potential emerging factors unknowable at the start of the project. In this situation, the amount of work and effort required to achieve the project objectives is not measurable and quantifiable. The use of ECI for a project with a relatively high level of uncertainty helps the client to remove or mitigate that uncertainty by exploiting the contractor’s knowledge and experience which eventually leads to an agreeable realistic tender risk-adjusted price [5].

- **Risk profile**: Risk profile is a key factor influencing the selection of ECI. Risk is the prominent criterion that will determine the selection of a procurement method [35]. Projects with high risk but smaller than a typical alliance project are more suited to an ECI approach. In addition, a high level of complexity and/or uncertainty also creates a risk of excessive changes in the construction stage.

When risks are not initially well understood, early involvement of the contractor can assist in identifying the risks. Since risks in projects with a high-risk profile have significant impacts, the knowledge and experience of the contractor are essential in the early assessment of the risks in order to yield greater clarity about project risk. The fact that risk and reward go hand in hand also suggests that the contractor may be enthusiastic about securing opportunities to profit from the second stage’s risk transfer regime [36].

- **Time frame**: When early completion of the project is desirable for the client, the choice of ECI is included in the potential project procurement options. ECI procurement method offers a better assessment of constructability and a higher opportunity to select innovative methods for delivering the project. It leads to earlier completion of the project by accelerating project development and by avoiding delays in project.
delivery [36]. Time frame, therefore, is identified as one of the influencing factors in selecting an ECI. However, while ECI can be a solution for a project with a tight timeframe, there is a danger that the time constraint forces the client to enter an ECI scheme with scant knowledge about the project resulting from inadequate upfront planning. In this situation, the client does not have the project completed earlier and the unforeseen changes by the client during construction and potential pertaining disputes cause delays in project delivery [37].

- **Size of project:** The project size is normally measured by its estimated value. An ECI is considered for a project with a size that justifies the setup and management costs [6]. In the scale of infrastructure projects, ECI is used for a medium value project between $30 and $100 million.

In most cases, the size of the project represents the extent of complexity. The larger the size of a project, the higher degree of complexity project managers expect of the project and vice versa. However, this is not always the case as some high-value projects are technically straightforward and do not exhibit a high level of complexity [38]. On the other hand, smaller projects may have a large number of interdependent variables interacting in a way that displays a high level of complexity. This is in line with the Vidal and Marle [39] findings that the size of the project is a necessary condition for project complexity but not sufficient. That is the reason the criteria of complexity and the project size are separately identified, even though there might be interlinks between these two criteria.

5.1.2. Client’s Objectives

The selection of a procurement system depends largely on the client’s objectives and requirements [40]. In the case of ECI, These objectives include the need for demonstrating ‘value for money’, having ‘formal contract’, the need for ‘innovation’, ‘constructability’ considerations and establishing a ‘collaborative environment’.

- **Value for money:** Value for Money for public sector clients is defined as the interaction between system elements to improve the government policies and priorities while the best revenue for public expenditure is achieved. In a situation when demonstrating Value For Money (VFM) for clients is a fundamental objective, the use of ECI is preferred over pure non-price basis relational contracting such as Alliances. Value for money is a comparative analysis of all relevant costs and benefits of each proposal throughout the whole procurement cycle.

Clients can ensure value for money through utilising transparent approaches to price build up and the mechanisms that enable them to terminate the agreement with the contractor and obtain the prices from other contractors to complete the project [6]. ECI is characterised by these two elements and hence it is a good procurement option for clients when the value for money is one of the key criteria and a collaborative procurement approach is intended to be adopted together.

- **Contractual formality:** Despite a general belief that using a contract as the basis to manage the project activities might be counter-productive to the relationship [41–43], the tendency of having a formal contract is identified as a criterion to use the ECI.

Although relationship-based procurement encourages informal collaborative work relationships between parties instead of a working environment being ruled by a formal contract [44], the need for a contract is one of the client’s objectives to opt for selecting an ECI. When the project risks are able to be unfolded and the client is confident to obtain an acceptable risk-adjusted price for the delivery stage, a lump sum contract incorporated in D&C type of procurement offers time and cost certainty [31,45]. However, certainty resulting from a formal lump sum contract at the delivery stage is attained at the expense of undermining the quality of the working relationships initiated during the ECI phase, and hence a careful trade-off is required when a decision for using ECI is made.
- **Innovation**: Innovation is not always desirable for clients since it is associated with a significant number of risks and extra costs as well as the need for shifting to new technologies, changing the strategic methods, and breaking out of practicing patterns of decision-making [46]. Nevertheless, when the client realises the necessity of innovation for achieving the project goals, they would seek a type of contract to facilitate the adoption of innovation. Several authors suggest that collaborative procurement methods would be more capable of delivering innovative ideas [47]. ECI, therefore, is considered the clients when innovation is a key requirement.

- **Constructability**: The limited client’s knowledge and experience of construction methods and materials, compared to the constructors [48], draws the client’s concern about constructability issues. Better constructability solution is identified as being the key feature of ECI due to the exploitation of the project delivery contractor’s expertise and advice much earlier in the construction project lifecycle [4]. In order to achieve overall objectives, clients need to use the construction knowledge and experience in planning, engineering, procurement, and field operations effectively.

The concern about constructability considerations is pivotal, when the project is characterised by a high level of uncertainty and required methods, techniques, and technologies that are unfamiliar to the client. The importance of constructability considerations should be given when innovation is required for the project and as innovation improves constructability by introducing innovative methods, materials, or techniques that the client has not been familiar with.

- **Collaborative Environment**: The findings attributed to this study suggest that building a collaborative environment is one of the criteria to adopt the ECI contract for the clients who had the experience of working in a type of relational contract in the past. The collaborative culture developed through engagement with a relationship-based procurement approach has created a different way of working that set a collaborative ambience different from other traditional price-driven forms of project delivery. In such an environment teamwork, trust and commitment are encouraged and all parties seek to overcome uncertainty through developing and nurturing the cooperation mentality [41].

### 5.1.3. External Environment

External environment refers to the factors outside the control of the project and the engaged participant organisations that influence the decision to select the ECI for a project by the clients. These surrounding factors do not directly affect the decision-making process but because they have a significant impact on the project, clients also need to consider them as the selection criteria [49]. The external environment’s criteria in the selection of ECI include ‘market situation’, ‘regulations influence’, ‘secondary stakeholders’ impact’, and ‘political influence’.

- **Market situation**: Market situation refers to the demographic, economic, and political factors influencing the demands for the construction projects. In a highly competitive market, contractors compete against each other to win the contract. Competitions incentivise contractors to be innovative and efficient to obtain a competitive advantage [50]. On the other hand, in the downturn economy clients are eager to award the contract on a lowest-bid basis which causes an increase in the danger of tendering at the cut-throat level as contractors strive to remain in survival mode and are desperate to retain some level of turnover [51].

The market situation is identified as one of the critical criteria that clients look at when making the decision to select ECI. In a competitive market, using ECI can increase the opportunity to attain innovative solutions as innovation is one of the qualifications that the client requires contractors to demonstrate in order to win the contract. However, consideration should be taken to appoint the most competent contractor, who is sufficiently
qualified to fulfill the project objective, through a carefully designed pre-qualification selection process.

- **Regulation influences**: Selection of a procurement route for public projects is dictated by the governmental procurement regulations. In Australia, Australasian Procurement and Construction Council (APCC) is the peak council of government departments and authorities responsible for procurement, construction, and asset management policy for the Australian State and Territory Governments (see http://www.apcc.gov.au, accessed on 15 March 2022). In addition, each state government also specifically develops the procurement guides enforceable within their state jurisdiction. Depending on the type and size of projects, the use of ECI is largely instructed by the rules, regulations, procedures, work processes, and codes of practice and hence the influence of regulations is identified as one of the factors influencing the decision to adopt an ECI.

- **Secondary Stakeholders’ impact**: A stakeholder is any individual or group with the power to be a threat or a benefit [52]. Secondary stakeholders, as opposed to the primary stakeholders, are those who do not have a formal, official or contractual relationship and hence have an indirect influence on the project. However, since the secondary stakeholders still have the inherent potential to significantly affect the project and involved parties, it is essential to take their interests into account as well [52]. Considering the secondary stakeholders’ interests such as non-governmental organisations, activists, unions, communities, the public, and governments [53] is important when selecting ECI as the project delivery model. In a complex and risky project with a large number of stakeholders who need to be fully informed and managed, clients find ECI a chance to work with them through the design phase to satisfy the requirements, and get the job priced and programmed around the constraints.

- **Political influences**: The use of ECI is largely influenced by the political climate. Political issues guide the client to choose the procurement method. Many authors also recognise the pervasive impact of politicians and political activities on the project procurement process [19,54]. The political criterion is concerned with government policies and the effect of political decisions on the projects [23,55]. Political influence was seen as negative when the use of ECI is enforced based on the unrealistic project timeframes dictated by political reasons.

### 5.1.4. Internal Environment

The emergence of an ‘internal environment’ is due to the relational nature of the ECI system in which the client’s engagement at the front end of the project is essential. Internal environment, as opposed to the external environment, refers to the factors within the project and involved parties’ environment, both the soft factors relating to the human dimensions and hard aspects relating to the contractual and financial issues. The analysis of the interviews identified four main criteria for selecting ECI contractual model pertaining to the internal environment including ‘organisational culture’, ‘in-house resource availability’, ‘design process interaction’, and ‘budget’.

- **Organisational culture**: The procurement selection process is significantly influenced by the underlying culture of the organisation [14]. Although the benefits of a collaborative working relationship are acknowledged, the intra-organisational culture for working in such an environment needs to fit with these types of relationships. The innate culture of uncertainty avoidance and the inherent reluctance of experienced professionals in changing the working style compromise the potential benefits that a collaborative working relationship can offer [41]. The predominant culture of an organisation is identified as being an important influencing factor in selecting ECI that clients need to take into consideration.

- **In-house resource availability**: The factor of in-house resource availability has a key role to play when a procurement method is selected by the client. Clients should assess
their capability to use their own resources to be able to accomplish their project [13]. The potential for the use of ECI is higher when the clients recognise either the inadequacy in the level of competence of the staff for that particular project or the lack of required specialty and skills for undertaking the project. Although numerous procurement methods can address the client’s resource inadequacy (i.e., managing-oriented methods and partnering), the use of ECI is preferable when the pre-construction service from the contractor is of the client’s essential need due to the complexity and uniqueness of the project [55].

- **Design process interaction**: The degree to which the client wants to be involved in the design is another criterion related to the client’s internal environment. The client needs to assess how much interaction they want to have with the design teams during the design of the project. The level of the client’s involvement in the design depends on the innovation in the design and the client’s design capability for that particular project. According to Gordon [55], this interaction is normally important for the clients when the design is intended to be highly creative or the ability of the design to serve a function is essential. The use of ECI is preferred when clients require complete interaction and control over the design; however, the client’s understanding of the design process is of paramount importance to ensure that their involvement leads the design to the desired outcomes.

- **Budget**: The use of ECI requires the client to have sufficient funding to be able to pay the contractor on a regular basis. If the client has funding constraints the privately funded procurement methods, i.e., PPP, are preferable over ECI [36]. On the other hand, for projects with a restrictive budget, the client is unlikely to have the project scope developed adequately through a traditional hard dollar contract. Rather, the use of ECI gives the client the opportunity to utilise the contractor experience and knowledge to develop the scope with minimum redundancy in order to tailor the scope to meet the available budget.

### 5.2. ECI Selection Practices

After formulating the selection criteria, clients evaluate the suitability of the ECI for the project in order to meet the identified criteria. The approach by which the selection process takes place differs in each organisation. The analysis of the interviews led to the identification of three main practices that clients undertake for selecting an ECI including ‘systematic process’, ‘Intuitive decisions-making’, and ‘Industry consultation’. Table 3 demonstrates the ECI selection practices described by participants.

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Table 3. ECI selection practices.
5.2.1. Systematic Process

Systematic process approaches refer to any methods where personal judgments have the least influence on the decision-making process. This includes either a formal written instruction within the organisation that requires the decision-makers to follow or a structured objective mechanism that normally relies on a set of numerical utility rankings.

The systematic selection process is also supported by many academic and professional bodies who emphasise the need to conduct a selection process in a systematic and disciplined manner by clients to avoid the selection of procurement methods on a subjectively driven basis [49,56]. The decision makers’ personal bias can mislead the selection of the procurement method towards the individual’s preferred method rather than the best method for the sake of the project.

The outcome worsens when it is coupled with a lack of adequate knowledge and experience of the decision-makers about the differences between various procurement methods which is not uncommon within the professionals in the construction industry [57]. Two approaches were identified for selecting the project procurement method including ‘multi-criteria analysis’ and ‘internal manual’.

- **Multi-criteria analysis**: The multi-criteria analysis (MCA) approach is often utilised in an effort to assist decision-makers to solve the selection problem or to facilitate the decision-making process on the selection of an alternative.

  Having adopted the classical MCA principles in the construction industry, a plethora of tools and techniques have been developed in an attempt to simplify or to rectify the shortcoming of this method in the selection of a procurement system. These tools range from the basic mathematical discriminant analysis [25] to more sophisticated methods such as the analytical hierarchy process [58,59]. Although the practicality and/or applicability of these tools and techniques are treated with skepticism [60], the majority of the clients have used one of the multi-criteria analysis techniques in their organisations for selecting ECI procurement system.

- **Internal manual**: Internal manual refers to published documents acting as a guideline in the organisation to instruct the decision-makers to choose a certain procurement method through a defined process based upon some particular criteria. The selection of the procurement method is largely dictated by these internal manuals. However, the internal manuals only respond to certain criteria and are only sensitive to more tangible factors, the chief amongst which are the value and the size of the project. For example, the use of a relationship-based procurement (RBP) method is only considered when the project size and value are perceived as medium or high.

  A project in that ballpark seems to be complex enough that it is suitable to run a relationship-based procurement method such as ECI. Nevertheless, the internal manuals generally fail to address the non-tangible essential criteria such as the importance of state-of-the-art innovative solutions [61], the value of developing a mutually trusting relationship [41], and the value of knowledge sharing and exchange [62] when selecting a procurement method for the project.

5.2.2. Intuitive Decisions-Making

While systematic objective approaches generally fulfill their intended purpose of rationalising procurement selection decisions [13] they fail to address the implicit subjectivity inherent in some of the procurement selection criteria.

Despite the diligent efforts by many researchers in an attempt to translate the subjectivity of the criteria into more objective factors [31] the final decision is a matter of decision makers’ judgement and influenced by subjective views about what is important and what it is not [31]. In the case of ECI, clients usually have no clinical solutions for the selection of the procurement system in their organisation. Rather, they select ECI based on their own judgments with reliance on their knowledge, experience, and/or the intuitive feeling about constraints and the environment obtained through a number of discussion meetings and
workshops. The findings of this study, therefore, identified two main approaches reflecting the intuitive decision-making approaches including ‘personal judgment’ and ‘workshops’.

- **Personal judgment:** Since it is generally argued that the key decision makers have limited knowledge about the different procurement methods [57], the selection of the project delivery system is significantly influenced by the decision makers’ familiarity and comfort with a method they have already been using [10]. However, due to a proliferation of the number of methods available to enable the procurement system to be adjusted to the clients’ circumstances and requirements [12], the selection of a procurement method in a cursory manner based on the individual’s judgment or the conservative decisions of the in-house experts may give rise to the selection of a suboptimal procurement system [18].

  On the other hand, it is recommended that procurement selection decisions should be made based upon the success or failure of previous similar examples and coupled with intuition in an effort to achieve the distinctive requirements of the current situation [13,45]. The finding of this study also shows that in organisations with no systematic procurement selection process, the selection of ECI is predominantly dependent on the decision makers’ personal judgment which is largely influenced by past experience. When the overall perception of previous projects procured under an ECI was reported as satisfactory, the chance of using ECI is increased.

- **Workshops:** When the influencing stakeholders’ insights on the adoption of procurement methods are required, organisations that have not implemented a structured procurement selection process run stakeholders’ workshops.

  There are also instances when despite the existence of a structured selection process, the stakeholders’ workshop is run for the purpose of identifying and analysing the key criteria. The stakeholders who influence decision-makers are to make an assessment of all the circumstances of the project, all of the risks that the project is likely to face, and the opportunities, across all of the normal areas of risk including technical, environmental, political, safety, stakeholder and all the usual areas. In the workshop, participants share their knowledge and information and then discuss the project constraints, objectives, and the criteria as well as value management and risk aspects [19].

  There might be different opinions amongst the stakeholders which through iterative negotiations, the general consensus is taken in regard to identifying project key criteria required for the selection of a procurement method. In instances when no formalised process is utilised in the organisation a joint decision of the stakeholders ultimately leads to the selection of the delivery system for that project.

5.2.3. Industry Consultation

Industry consultation refers to the situations when the client seeks external advice to bridge their knowledge gap due to either inadequacy of the required knowledge and experience of the in-house resources or the need for expert advice of specialists particularly for a complex and risky project [21]. The client appoints expert consultants to advise on the project criteria, client’s requirements, and special management requirements. Their advice serves as the basis for the selection of procurement. The client then has two options to select the procurement method for the project. The first option is continuing the external consultant services to choose the procurement system and the second option is to rely on their in-house expert’s knowledge and experience to determine the most appropriate procurement system for the project.

6. Discussion

Before the development of a model for selection and ECI for a project, it was important to understand what the main driver for clients was to adopt such a delivery system for their projects. The ECI selection criteria and the ECI selection practices presented in this study help to identify the phenomena that emerged in exploring the ECI selection process.
by clients, however, these findings have yet to address the question as to why clients would choose ECI amongst other procurement alternatives. Although the ECI selection criteria are necessary for selecting an ECI, they, on their own, are not seen as sufficient to fully influence a decision to lead the client to select the ECI, since there is a range of delivery methods that can respond to those criteria as well. Therefore, there should be other drivers for the decision-makers toward the adoption of ECI. Clients normally have a tendency for using the procurement method that they are more familiar with and are satisfied with the outcomes in their previous jobs [14]. However, in selecting an ECI, it is not always the case. For instance, clients with a successful track record in utilising traditional procurement methods or Alliances have decided to adopt an ECI for their project. The described practices clearly influence the selection of ECI, but not in all.

6.1. Control as the Potential Gain in Utilising an ECI

The insights gained within this study indicate that obtaining greater control over the project lifecycle is a main driver for the clients to adopt an ECI for a project.

According to Transaction Cost Economy (TCE), efficient governance of contractual transactions is the key to control the economic performance of an organization, and hence the procurement procedure should be tailored to fit with the transaction characteristics [63]. Eriksson [63] argues that TCE considers the main governance mechanisms of price, authority, and trust that are closely linked to three different control types of output control, process control, and social control.

The client’s decision on the selection of ECI is well supported by the assumptions and conceptual arguments of the governance mechanism, raised by the TCE theory. The decision to adopt an ECI is made in a condition when the project encounters fairly high complexity with the prediction of noticeable alterations. At the beginning of the project, the client is not able to fully measure goal attainment, and the appropriate action to achieve the goal is unknown. In such circumstances, the early collaboration of the contractor in the design development is advocated [64] to obtain the advantages and synergies of cooperative relationships through the early establishment of trust [65]. However, when the project complexity is not too high and the uncertainty associated with the project can be managed and unfolded, clients are more likely to choose a more conventional procurement method. It enables them to gain greater control over the target price and the entire contractual process [66,67]. Gaining control in the entire project process, therefore, is the main factor that moderates an ECI procurement approach amongst the other extreme methods that focus solely on either transfer of risks to one party or sharing between project participants.

When defining the project scope is difficult due to the uncertainty associated with the project and the client lacks the necessary knowledge and skills to utilise appropriate actions to achieve the goal, social control through facilitating trust and commitment, is the most efficient instrument [68]. If the client is able to define the project scope and employ appropriate methods to achieve the goal, the use of a formal contract with more comprehensive contractual specifications and managerial arrangements, is favourable [68]. Greater control over the process is obtained when the transaction is governed by authority [69]. Therefore, clients intend to gain process control when the project and the target price are governed by a standardised or formal contract [70].

Lastly, in projects in which the scope is able to be specified and the target goal can be defined but the client has limited knowledge to monitor the transformation process, measuring and monitoring the results or outcomes produced by the contractor can ensure the attainment of the client goals [65]. In this situation, Eriksson [63] points out that clients are more likely to utilise a strategy that gives them greater control over the price which is closely related to the output control.

This is evident that the tenet of ECI that focuses on the three governance mechanisms of price, contract formality, and trust together in different stages of the project lifecycle, enables the client to achieve all three forms of control. Social control is facilitated at the front end of the project by establishing a collaborative relationship based upon trust and
commitment between client and contractor. Process and output control are enabled during the detailed design and delivery stage by the adoption of a traditional standardised contract (i.e., D&C or Construct only) where the project is governed by a formal contract and a lump sum fixed price is determined. The higher control on all stages of the project process reduces the extent of uncertainty and risks, which makes the ECI more attractive to the clients as a more moderate option compared to the other procurement alternatives.

6.2. Development of Conceptual Selection Model

While the individual relationships between categories have been explored in detail, they are now presented as an integrated, consolidated whole. The graphical presentation helps the model become more clear and vivid. Figure 2 shows the conceptual model for the selection of ECI.

[Diagram: Conceptual model for selection of ECI (client perspective)]

The essential features of the model are as follows:

- The decision to select an ECI for a project is predominantly guided by the identified selection criteria. Four main elements namely ‘project characteristics’, ‘client’s objectives’, ‘internal environment’, and ‘external environment’ are set in a vertical block with the thick boundary lines representing the major influence of section criteria on the decision to adopt an ECI and linked to the ECI selection block.
The identified practices for selecting ECI include ‘systematic process’, ‘intuitive decision’, or ‘industry consultation’ and shown in a horizontal block with the think boundary lines and linked to ECI selection approaches. There is a constant interaction between selection criteria and selection practices. The described practices are used for formulating the procurement selection criteria, comparing the identified criteria against the ECI characteristics leading to selecting the ECI method. For example, a client may seek ‘industry consultation’ to formulate the procurement selection criteria. Once the criteria are formulated, based on the availability of the in-house resources and whether a selection process approach should be established in the organisation, the choice is to source the selection process entirely internally through a systematic process or individual judgment, or to outsource the process to obtain industry advice again to develop the selection process. The links between the ECI selection criteria and the selection practices are shown in double arrows representing the use of these practices for the purpose of identification of selection criteria and the selection of procurement method.

7. Conclusions

In this paper, a conceptual model for selecting the ECI procurement method has been developed. While there are several procurement selection models exist to assist the client in choosing the best delivery system for their project, no systemic and integrated model focus on the selection of ECI as a relatively new delivery system in construction projects. The model developed in this paper integrates the procurement selection criteria specifically related to the project characteristics, client’s objectives, and internal and external project environments with alternative selection approaches and practices. The proposed conceptual model could assist the client to assess the suitability of ECI for a project by considering all surrounding influencing factors governing the choice of a delivery system. The model drew on a number of theoretical foundations that collectively helped to define the dimensions of the ECI selection criteria, ECI selection approaches, and attainment of different types of control as potential gains for the client under the notion of Transactional Cost Economy (TCE) theoretical framework. In particular, the model was shaped by an understanding of the procurement selection process parameters governing the procurement choice and procurement selection methods and techniques. The model has provided a set of conceptual tools for client organisations to evaluate the effectiveness of an ECI delivery system for their project by formulating their needs and requirements as well as utilising an approach to assess whether the use of ECI can fulfill those needs properly. The conceptual model presented in the study is consciously designed to support the development of theories and the development of this selection conceptual model merely relied on the theoretical grounds. While the model can be useful to propose effective practices abstractly, the industry would need more tangible and pragmatic tools to implement within their organisations. This conceptual model can be the basis for the development of more practical tools.

Furthermore, this paper only focused on the client organisations and explored the dimensions of selection of ECI only within that context. Consequently, the development of the model was based on the client representatives’ points of views. Since the contractors and designers are also the main components of a construction project’s delivery team, there is a need for future research concentrating on contractor and designer organisations in order to refine, improve and extend the ECI selection models. This paper can be the basis for further research from different dimensions focusing on the ECI procurement method.

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