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Knowledge requirement theoretical framework for construction procurement management

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Abstract. Procurement management has been a focal point of many studies. This led to several industry stakeholders to produce reports on how best to achieve it. The construction sector comprises of loosely integrated activities and assemblage of various products from other industries. These characteristics make it unique from other industries, and as such, its success is largely dependent on the quantum of knowledge applied in its products design, strategy and implementation. However, clients of the industry and other stakeholders failed to appreciate this salient difference between the construction industry and others, thereby treating the procurement of its product as though is off-the-shelf. This is found in several procurement frameworks reviewed by this study, when the procurement for construction is lumped together with the same consideration as procurement for goods and services. Given the above perspective, this study explores the literature in order to develop a knowledge requirement theoretical framework for construction procurement management. An exploratory design was used as a stand-alone approach through a critical review of the extant literature on construction complexities, general procurement competencies and management. The reviews were applied in the context of systems thinking theory to develop a knowledge requirement theoretical framework for construction procurement management. The framework conceptualized knowledge requirement for construction procurement management as a conglomerate of knowledge (system) that is made up of units of knowledge aligned to accomplish a construction project. Thus, for full attainment of construction procurement management knowledge, a manager needs to possess the various units of knowledge that are appropriate for the execution and coordination of the various activities in construction procurement processes.

Keywords: Construction, Procurement, Procurement management, Competency, Knowledge requirement.

1. Background

Procurement encompasses all processes, systems, operations and activities aimed at the acquisition of goods and services in the most economical manner [1]. Henry Fayol (n.d.) defined management as the art of planning, organizing, directing and controlling the affairs of group, society, business or any other endeavour. Procurement management therefore, is a complete process of planning, organizing, directing and controlling acquisition of goods and services with the aim of achieving value for investment within a pre-determined period. Procurement is always carried out for the purpose of purchase of goods or services to ensure Economy and Efficiency [2-5]. The client of procurement activities, at all time, look



towards achieving value for every money spent in the process of purchase [5]. Procurement management for public expenditure has over the years been gaining momentum, and the increasing needs to ensure probity and economy in spending limited public resources is equally generating more attention globally [2, 6]. However, there are growing concerns in the construction industry whether or not the procurement processes in place are actually giving clients value for money and whether or not procurement strategies and managers are living to the expectations of the construction clients [4] and [7]. Several reports, including Latham [8], Egan [9] and indeed, all the preceding reports on the industry are indicators of these concerns. It seems since the last of the reports, there has been no significant development to address these concerns [10].

2. The issues

In response to the growing concerns on procurement management, several researchers and practitioners explored the area of competency requirements for a procurement manager to meet the expectations of employers, clients and the industry in general. Giunipero [11] used a step-by-step skills-based analysis of competency to examine the skills required for a world-class procurement manager. He concluded that procurement managers should possess the knowledge on cost reduction, total cost analysis, and on the structure and technology of the working environment. The European Union [12], emphasized knowledge development and orientation of business area as a key to profitable procurement management. Similarly, the United Kingdom's (UK's) Ministry of Justice re-echoed the cabinet's office emphasis on education and continuous training of procurement specialists as a tool for competence development and benchmarking [13]. David and Thai [14], reported that the procurement process in the United State (US) consists of four major phases: planning, formulation, administration, and auditing. They acknowledged that each phase composed of various activities that require specific skill and knowledge. In Canada, a review of procurement competency in the British Columbia conducted by Three-E Training Incorporation [15], recommended that effort should be geared towards training and development of procurement managers in the knowledge areas of key public service procurement. In New Zealand, a study on the procurement competency of the public service came up with a framework that emphasizes the need to focus on basic knowledge of public procurement areas as a requirement for progression in the procurement officer cadre of the public service [16]. In Croatia, Knezevic [17] identified robust knowledge in procurement sources, material planning, cost management, among others as the general competencies required of a procurement manager. He emphasized the knowledge of negotiation procedures in procurement, knowledge of efficiencies of various procurement options and ability to recognize and be able to eliminate risks at the early stage of procurement as key specific competencies required of a procurement manager.

Kenya's Section 48 (2) of Public Procurement and Assets Disposal Regulations, 2016 provides that "all National Procurement function shall be handled by procurement professionals with recognized qualifications". Moreover, in South Africa, Section 4 (3.3) of Standard for Uniformity of Construction Procurement Regulations 2105 stipulated that "only persons who are fully conversant with the technical aspects of the procurement shall undertake functionality evaluation of tenders" [18]. In Ghana an attempt by Peter et al. [19] to develop capabilities in public sector procurement, revealed that weaknesses in key skills in procurement area results-in loss of value for money and therefore recommended robust basic education and continuous professional development in procurement management. Also, Owusu-Manu, Badu, and Edwards [20] used a three-tier iterative and inductive methodology to propose a new procurement management competency framework (PMCF) for postgraduate training in Ghana. This was a continuation of their findings that lack of technical competencies jettisons the capabilities of procurement professionals. Despite the emphasis on technical competency requirements for sound procurement management, the study like others de-emphasizes the construction aspect of procurement management.

In Nigeria, Ojo, Adeyemi, and Fagbenle [21] reported that traditional construction procurement is still favoured despite its weaknesses in terms of cost and time. Corroborating this, Ojo [22], and Ojo, Adeyemi, and Ikpo [23] confirmed that traditional procurement system is still being used despite having

the tendency of overrunning its cost and time by 53.5% and 160% respectively. This they attributed to the public sector client lack of knowledge of a better procurement system. Supporting this, Bima, Tafida and Baba [24] posits that some African nation's public sector procurement is inefficient and bedevilled by so many challenges due to widespread lack of knowledge of procurement functions by the managers and administrators alike, and recommended that the knowledge gap needs to be looked into by relevant professionals within the industry and advice the public sector appropriately.

Inuwa, Wanyona, and Diang'a [25] studied procurement systems through the perspective of indigenous contractor's project planning attributes and concluded that technical competence, project management capabilities and understanding procurement tasks are the key factors that influence the contractors' project planning irrespective of the procurement system in use. Inuwa et al. [26] stressed the need for contractors to engage competent technical personnel in their construction project procurement planning. Adeyemi and Kashiwagi [27] emphasized that the strength of any procurement system depends largely on the professional ability of the managers to make decisions, directs and control contractors. They further recommend that procuring entities should endeavour to educate procurement workforce on existing and emerging technologies. From the foregoing, there is unanimity in the importance of basic knowledge of construction subject of procurement management. However, none of the authors gave cognizance to the peculiarities and complexities intrinsic to construction procurement. They all consider construction as a one-off product that can be purchased like all other finished products. This study, therefore, sought to develop a knowledge requirements theoretical framework for construction procurement management. This study employs exploratory design as a stand-alone approach through the critical review of extant literature on construction complexities, general procurement competencies and procurement management. According to McNabb [28], the exploratory design is used as a stand-alone approach to provide information either to find answers to a specific organizational question, or to provide information upon which to base a decision.

3. Review of previous studies

3.1. Construction

Construction is the process that provides one of the most important basic needs of man. This encompasses housing, transportation infrastructure, institutions, health care delivery facilities, welfare and entertainment, and host of other infrastructural facilities [29-31]. Seeley [31], and Fellows et al. [32] observed that construction industry embraces a wide range of loosely integrated organizations that collectively construct, repairs, altar, and refurbish a wide range of different infrastructure. Over the years, the building needs of the world over (individual and public) are increasing with the increase in the population [33]; most notably in developing nations [34]. Construction success is dependent on the summation of many factors; one of which is effective management of construction resources through sound procurement. Products of construction are realized through endeavours that start and end within a pre-determined time frame and objectives. These endeavours are called project. Project is defined as a unique process, consisting of a set of coordinated and controlled activities with a start and finish dates, undertaken to achieve an objective conforming to specific requirements, including the constraints of time, resources, cost and product quality (ISO 10006) as enunciated by Chitkara [35-37]. Most at times, projects are started at a definite time but linger beyond the planned time, or without achieving the set objectives due to improper strategy to achieve the desired objectives [38].

3.2. Procurement systems and strategies

Procurement is all about the acquisition of a constructed facility [36]. The construction procurement system is broadly divided into two: traditional and non-traditional [37]. Hence, procurement manager's task is to map out a strategy that will guide the selection of a specific procurement type in accordance to the prevailing situation that will ensure effective delivery of client's needs [37]. This is however not a one-off task. It requires consideration of several factors that might affect the goals of the client. The client's input, for instance, is shaped by the experience of the procurement manager; because without

that, a clear procurement strategy might not be achievable [37]. In addition to this, the nature of the project, its complexity, the budget/resources available, time constraints; etc all determines the type and nature of procurement systems and strategy to be adopted. The knowledge, skills and experience of the procurement manager about these factors will greatly influence their choice, as well as their success [37]. Construction clients are desirous of achieving their construction objectives, therefore, they have various expectations from the construction procurement process. Newcombe (1994) as cited in Benham & Birchall [2] listed those expectations as follows:

- Unbiased and informed advice on the appropriate procurement strategy
- Accurate information regarding how to proceed in achieving the goal vis-à-vis the chosen contract strategy (merits and demerits)
- A clear understanding of the legal framework that will give value for money
- Procurement process that will bring about performance in achieving their objectives
- Identify the risks involved and mitigation strategies within their capabilities
- Flexibility in the procurement process and its cost, and other implications

3.3. *Knowledge requirement theoretical framework for construction procurement management*

This study founded its knowledge requirement theoretical construct for construction procurement management on the concept of systems thinking theory. The literature revealed that the advocacy for the need to explore the understanding of systems started since the 1950s. Although, the term systems thinking was first coined in 1987 by Barry Richmond [39], and to fully grasp what systems thinking is, one needs to understand what a system is. A system is a set of things working together as parts of a mechanism or interconnecting network; a complex whole [39]. Arnold and Wade [39] defines systems thinking as a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviours, and devising modifications to them in order to produce desired effects. Systems thinking is made of three basic things: elements (the various subsystems that coexist to form a system), interconnections (a network of elements that coexist in a system), and a function or purpose (system goal or objective) (Meadows, 2008 cited in Arnold & Wade [39]).

According to Seeley [31], the accomplishment of any task requires good management, which in itself is based on effective training, knowledge, skills and hard work. Knowledge is construed as the facts, information, and skills acquired through experience, or education; the theoretical or practical understanding of a subject [35]. Knowledge is basically the absence of uncertainty of a realm [36]. It is the state of being aware of reality and a fact of the existence of a phenomenon. This follows, therefore, that the absence of knowledge is the presence of uncertainty, ignorance of/about a reality of a fact of the existence of a phenomenon. Just as Seeley [31] theorized, managing any process is a function of the amount of skills at the disposal of the manager, which in itself stems from the amount of knowledge he possesses, which is a function of how effectively he is trained [3]. Thus, construction procurement knowledge requirement can be viewed as a mechanism of knowledge that guides the realization of a construction project. Its elements are the proficiencies that are aligned to execute the various tasks in procurement processes. These proficiencies are interconnected within the confine of the various stages of the procurement process (stages of the procurement process: pre-bid process, bid process, and post-bid process) for the realization of a construction project.

3.4. *Construction procurement management knowledge requirement*

Rathod [40] describes construction procurement as a process that generally encompasses a series of inter-dependent activities (tasks) aimed at achieving value for public resources. Rathod [40] further argued that getting these series of activities right is the basic responsibility of procurement managers. Bureau for Public Procurement [41], Knezevic [17], Hughes et al. [4], and Masterman [5] identified the series of inter-dependent chronological processes and their activities for construction procurement as follows: Pre-bid process (needs/requirement assessment & evaluation, market surveys, feasibility &

viability studies, estimates, sourcing funds/cash flow analysis, selecting procurement routes/options, and preparation of bid documents), Bids process (advertisement/request for proposals, collection & submission of bid document, bids evaluation/report, approval for award), and Post-bid process (award & executing contract, construction administration/management, and project/facility commissioning). The execution of each of the activity captured in the construction procurement processes can best be aligned to appropriate expertise (skill; proficiency) for their accomplishment. Thus, this study identifies proficiencies as construed from the review of existing literature, and aligned them according to the interrelated tasks executed in the construction procurement process (see table 1). In addition to the skills identified in table 1 are the sustainable construction proficiency and ICT proficiency. Sustainable construction proficiency is a skill used in achieving sustainability in construction. This skill is necessary for procurement activities for better sustainability performance, and it is supposed to be applied throughout the construction procurement process [39]. Likewise, ICT proficiency, it is no longer a business resource, it is the business environment [42].

Table 1. Construction procurement management knowledge requirement.

SN	Construction procurement processes	Knowledge requirement	Source(s)
<i>Pre-Bid Process</i>			
1	Needs/requirement assessment & evaluation	<ul style="list-style-type: none"> • Business needs proficiency • brief developing proficiency • Construction contract administration proficiency 	Knezevic [17]; Achilike <i>et al.</i> [43]. Adeyemi <i>et al.</i> [27]; Rowlinson [10].
2	Market surveys, feasibility & viability studies, & estimates	<ul style="list-style-type: none"> • Construction economics proficiency • Design management proficiency • Project management proficiency • Construction estimation proficiency 	Knezevic [17]; Callahan [29]; BPP [41]; Achilike <i>et al.</i> [43]. Giunipero [11]; Ojo <i>et al.</i> [21]; Hughes <i>et al.</i> [44].
3	Sourcing funds/cash flow analysis	<ul style="list-style-type: none"> • Financial management proficiency • Construction cost planning & control proficiency • Construction estimation proficiency 	Liebowitz <i>et al.</i> [7]; Giunipero [11]; Knezevic [17]; Hughes [44].
4	Selecting procurement routes	<ul style="list-style-type: none"> • Construction procurement strategy proficiency 	Masterman [5]; Knezevic [17]; Mcdermott [45].
5	Preparation of bid documents	<ul style="list-style-type: none"> • Construction bidding procedure proficiency • Construction contract proficiency • Design management proficiency • Construction technology proficiency 	Hughes <i>et al.</i> [4]; Cabinet Office [13]; BPP [41]; Inuwa <i>et al.</i> [25]. Kiyanki [3]; Knezevic [17]; Peter <i>et al.</i> [19]; Owusu-Manu <i>et al.</i> [20].
<i>Bids Process</i>			
1	Advertisement & request for proposals	<ul style="list-style-type: none"> • Construction bidding procedure proficiency • Construction contract proficiency 	Cabinet Office [13]; Knezevic [17]; BPP [41]; Green <i>et al.</i> [46]. Hughes [44].

SN	Construction procurement processes	Knowledge requirement	Source(s)
2	Collection & submission of bid documents	Construction bidding procedure proficiency	Cabinet Office [13]; Ojo <i>et al.</i> [21]; BPP [41].
3	Bids evaluation/report	• Construction bidding procedure proficiency	Cabinet Office [13]; Knezevic [17]; Ojo <i>et al.</i> [21]; BPP [41].
4	Approval & award	• Construction contract proficiency	BPP [41]; Hughes [44]; Mason [47].
<i>Post-Bid Process</i>			
1	Award & executing contract	• Project management proficiency	Knezevic [17]; Inuwa <i>et al.</i> [26]; Hughes [44]; Harris & McCaffer [48].
2	Construction administration/management	• Construction contract proficiency • Construction contract administration proficiency	Rowlinson [10]; Knezevic [17]; Mason [47]; Harris & McCaffer [48].
3	Project/facility commission	• Project management proficiency	Hughes <i>et al.</i> [4]; Rowlinson [10]; Inuwa <i>et al.</i> [25]; Harris & McCaffer [48].

The knowledge requirement for construction procurement management captured in table 1 confirms that construction procurement is a complex process that requires professionals with requisite expertise [24, 41]. Yet, many public clients failed to comply with the requirement it deserved. Hence, many failed in achieving projects objectives [10]. This has been the case even in the UK, which resulted in the government to investigate how to improve the performance of the construction industry (see Latham Report, 1994; Egan Report, 1998). Thus, Inuwa *et al.* [49], Hughes [44], Achilike & Akuwudike [43], McDermort [45], Mason [47], Harris & McCaffer [48] and Green & Lenard [46] all argues that if clients would acknowledge the complexity of construction procurement processes by applying appropriate knowledge in managing it, most failures will be avoided.

4. Conclusion

This study was necessitated by the absence of detailed and comprehensive literature on knowledge requirement for construction procurement management. A detailed review of existing literature on construction procurement management and, its application in the context of systems thinking theory was used to develop a knowledge requirement theoretical framework for construction procurement management. The framework conceptualized construction procurement management knowledge requirement as a conglomerate of knowledge (system) that is made up of units of knowledge aligned to accomplish a construction project. These units of knowledge are networked within the procurement stages of construction procurement processes. Thus, for full attainment of construction procurement management knowledge, a manager needs to possess the various units of knowledge that are appropriate for the execution and coordination of the various activities in construction procurement processes.

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