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What makes the management of a project successful? The case of construction projects in developing countries

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Abstract

Many developing countries (DCs) are currently spending on construction projects due to the high demand resulting from rapid urbanization. However, the results of these projects in terms of time, cost and quality do not tend to meet the expectations of the stakeholders. Despite the relevance and high visibility of this situation in many DCs, this topic has received little research attention. This study examines the combined effect of six factors that are commonly signaled in the project management literature as determinants of successful project management in construction projects. Our ultimate goal is to identify the extent to which traditional factors play a role in project management in DCs, as recent studies have highlighted the uniqueness of project management in these countries, therefore, requiring specific analysis within this context. To empirically address this goal we rely on an ad-hoc survey that collects the responses from 120 project management practitioners in Ghana. First, building upon existing works, we construct and validate a scale that evaluates project management practices in DCs. Next, we use qualitative comparative analysis to scrutinize which combination(s) of the aforementioned six factors lead to successful project management in construction projects. The findings support the initial intuition about the existence of distinct pathways, suggesting that there is no unique formula, but that different situations (i.e., combinations of factors) might require the adoption of diverse project management practices. The primary contribution of this research stems from adding to the project management body of knowledge the understanding of how a combination of factors can assist construction engineers and project managers to plan and implement successful construction projects in DCs.

Keywords: Construction projects, projects management, success factors, qualitative comparative analysis.

Introduction

Construction projects are organized efforts to construct a building or a structure. In the fields of civil engineering and architecture, construction projects involve the process of tangibly assembling an infrastructure or building. These projects tend to involve different contractors with connected agendas and tasks to be completed (Jenkins & Wallace, 2016).

The management of construction projects plays a major role in the economy of many DCs. Due to their relevance to the very existence of society, many countries are spending a lot of resources in ensuring the successful project management of construction projects (Kandelousi, et al., 2011). A successfully managed construction project is the one that meets the project objectives in a safe manner, within agreed time, cost and quality criteria (Radujkovića & Sjekavicab, 2017). The success of construction projects greatly depend on how they are managed and controlled; however the way in which these projects are managed by most project oriented organizations in DCs do not always ensure success (Alias et al., 2014). Common problems found in the project management in construction projects in DCs involve poor planning, project execution and implementation inaccuracies, cost overruns and not meeting project schedule and quality thresholds (Alias et al., 2014).

There is no doubt that the provision of appropriate infrastructures such as hospitals, educational facilities, roads, latrines etc. are important duties of every government in DCs. Not surprisingly, governments in these countries are currently spending on construction projects such as schools, bridges, rail, road etc. due to the high demand resulting from rapid urbanization. However, it is very common to find many of these state resourced projects abandoned in many DCs (Rasul & Rogger, 2016). As Ofori-Kuragu et al. (2016) highlights, in many DCs the results of their construction projects in terms of time, cost and quality do not meet the objectives set by the project team members. Factors that are commonly attributable to this mismatch include culture, partisan politics, the public administration system, low level of project management knowledge, inadequate resources, and corruption (Transparency International, 2015; Amponsah, 2010; Amoako & Lyon, 2014; Asunka, 2016; Damoah & Akwei, 2017).

Although in most DCs, their constitution asks newly elected governments to complete projects started by the previous administration, this seldom happens (Ofori, 2013). News on abandoned construction projects are commonly reported in these countries (Ahadzie & Amoa-Mensah, 2010). Borkor (2011) stated that a number of construction projects are started in many DCs without proper planning. This creates a situation where a lot of projects are uncompleted, many of them left to the mercy of the weather to rot whiles others become white elephants, especially in periods of regime change (Williams, 2016). The construction sector of many DCs still face setbacks such as high utility and material costs, currency fluctuations, high interest rates and land litigations (Damoah & Akwei, 2017; Darko & Löwe, 2016). Despite the relevance and high visibility of this situation in many DCs, this topic has received little research attention.

In this regard, Venter (2005) highlights that previous studies examining the factors shaping project management success have largely concentrated on developed countries, inferring their findings to the context of DCs. While this strategy (i.e. inferring the results) might be suitable under certain conditions, consistent with recent studies (e.g., Bond-Barnarda et al., 2018; Ofori, 2013; Yanwen, 2012), we posit that the factors influencing project management in construction projects in DCs are multi-faceted and interdependent in nature, therefore, requiring alternative analytical methods to able to scrutinize how these factors interact with each other in the specific context of DCs. The method that better suits this research objective is the qualitative comparative analysis (QCA). By assuming complex causality, and based on the principles of set-theoretic methods, QCA focuses on asymmetric relationships that detect configurations (or strategies) that are minimally necessary and/or sufficient for obtaining a specific outcome (Schenider & Wagemann, 2012). In the specific case of project management in DC, these characteristics of QCA are particularly suitable, as previous studies stress the complex and peculiar nature of project management in these countries (Jugdev & Muller, 2005; Yanwen, 2012), calling for the application of alternative analytical tools that are able to capture the multiple determinants that vary among cases.

The contributions of this study are therefore geared towards (1) identifying the factors that capture project management behaviors in construction projects in DCs, (2) employing a qualitative comparative analysis (QCA) approach to unveil which combination(s) of the selected factors influence project management in construction projects in DCs and, based on these, (3) draw policy guidelines with a special focus for DCs.

The remainder of this study provides a summary of the theoretical underpinnings supporting this research. Next, the methodologies used in this study are explained. The results from the analysis of the data collected from respondents are also presented, followed by the discussions and the implications of the findings. The paper ends with the concluding remarks, limitations and suggestions for future research.

Factors shaping the project management in construction projects

According to Sanvido et al. (1992) success factors in project management can be defined as those factors that determine the success or failure of a project management activity. They include components that should be brought together to guarantee a successful project delivery (Alias et al., 2014).

Various authors have suggested a list of relevant factors—most of them being obtained either from experience or research—for construction projects (Fortune & White, 2006). Notwithstanding, coming out with these factors has always been an ongoing challenge for scholars, mainly due to the fact that the factors change from country to country and from situation to situation (Frefer et al., 2018).

The study of De Wit (1988) is one of the earliest works that researched on this topic and found that planning, competence of the project manager, commitment to project objectives, motivation of the project team, definition of the scope of the project and project monitoring and control are important in achieving project success. His study further revealed other success criteria such as budget performance, schedule performance, client satisfaction, functionality, contractor satisfaction, and project manager/team satisfaction. This later list of factors is somewhat related to the "iron triangle", that is, cost, quality and schedule, which are commonly used as the benchmark for measuring how a project has been successfully managed (Walker & Shen, 2002; Lapinski et al., 2006; Chau et al., 2012).

In the specific context of DCs, Odeh and Battaineh (2002) identified obstruction from project owners, financial management, competence of contractors, payments methods, planning, effectiveness of team members and management decision making, management of contractors and materials accessibility as crucial elements for project management success. Building on this study, Fugar and Agyakwah-Baah (2010) investigated the factors associated with project management success in Ghana, listing a total of thirty-two possible causes that were further categorized into nine major groups: materials, personnel, equipment, funds, environmental changes, government interventions, contracts, scheduling and control techniques. Recent works include those of Amoatey et al. (2015) and Damoah and Kumi (2018) who focused more on economic, management/administrative factors.

As discussed in the previous lines, there is no agreement on what these success factors are and how they should be classified. For the purpose of this study, we draw upon the recent work of Alashwal et al. (2017), which results from a study of construction projects of a developing country. Accordingly, we distinguish among six categories, which are discussed in the sections that follow.

Human-Related/Project Team Factors (HR/PTF)

Human related factors (HRF) in project management can be defined as a set of human characteristics impacting on the results of a project. Ciccotti (2014) defines HRF as the actions of various groups of people, with different orientations and experience, from different functional areas, sometimes with different objectives, who have come together to ensure the successful management of a project.

According to Rodney et al. (2009), current studies have been paying attention to the contribution of human resources in the achievement of construction project's objectives. Nguyen et al. (2004) found that in all construction projects, human resources are the backbone of almost all its activities. In this regard, various are the authors who include, as key factors influencing construction projects, aspects that relate with having a competent project team (Shokri-Ghasabeh & Kavousi-Chabok, 2009). Additionally, commitment among project participants is a highly desirable quality that plays a role in successful management of a construction project (Belout & Gauvreau, 2004). A coordinated effort by all factions in a contract—owner, architect, construction manager, contractor, and subcontractors—is also deemed as a vital component for the successful implementation of a construction project (Hassan, 1995).

When investigating the dimensions or sub-factors that can be used to operationalize HRF we found that Chan et al. (2004) consider the nature of customers, project managers' competence and skills, project managers' commitment on schedule, budget and quality, project manager's adaptability, working relationship and the competence of the project team members. The work of Ahmed and Mohamad (2016) adds to this list of relevant sub-factors: clients' commitment, competency and commitment of construction project team, and the effectiveness of the construction project manager. Other sub-factors commonly used in the literature on construction projects include commitment, communication, competency, coordination, trust, sub-contractors' competency (Alashwal et al., 2017; Liu et al., 2010), project team coordination and the project manager's power (Ofori, 2013).

Project-Related Factors (PRF)

Within the context of construction project management, PRF can be defined as those aspects related with the very nature and other characteristics of a project to be undertaken, including the type, size and scope of the project, its level of complexity and the risks associated with the project (Chan et al., 2004).

According to Belassi and Tukel (1996) project characteristics such as the magnitude and the merit of a project, the distinctiveness of its activities (vs. standard ones), the depth of the project network, its life cycle and the seriousness of the outcome have a significant impact on how a project is managed. In construction projects—especially in large ones—having a well-defined objective, scope and planning, together with a thorough understanding of the project complexity provides a clear direction towards the successful management of the project (Songer & Molenaar, 1997). In addition, an accurate definition of the project budget helps to achieve a well-managed project devoid of cost overruns (Molenaar & Songer, 1998). Projects that tend to exceed their deadlines, result in monetary penalties and "loss of credibility". If the duration of the project is used as a benchmark to assess the performance of the management of the project, the size of the project should be taken into consideration. Tukel and Rom (1995) argue that the density of a project—defined as the ratio of the total number of precedence relationships to the total number of activities—influences how a project is managed, mainly due to resource allocation and man hours. Complex projects—projects that involve many teams and stakeholders, numerous moving parts, unclear project timeline and budget—might require the use of overtime—which jeopardizes budget performance and the overall management of the project (Pinto & Slevin, 1989).

From the above, it can be concluded that PRF have been operationalized in different ways. Most common approaches include accounting for project size and value, project objectives and scope, project type and project complexity (Chan et al., 2004; Khang & Moe, 2008). Notwithstanding, there is another strand of authors that use other measures that are more oriented towards capturing the rationale behind the project (project mission) and its urgency (Beleiu et al., 2015; Jelodar et al., 2016).

Project Procedures (PP)

Dissanayaka and Kumaraswamy (1999) defined PP as the method used to bring about, acquire or obtain a construction project. This definition entails considering the specific practices and methods that will be followed over the entire lifecycle of the project—in a logical sequence—in order to produce the final the result (or expected outcome). Said differently, and using a more contemporary definition, PP can be defined as series of steps that are to be taken over the course of a project (PMI, 2017).

Project procedures are expected to provide a standard and repeatable method. If properly designed, they can help to reduce project cost overruns and ease the execution of the construction project; thus, impacting on the management of the project (Dissanayaka & Kumaraswamy 1999). According to Shokri-Ghasabeh and Kavousi-Chabok (2009), examples of critical procedures in construction projects include the procurement method (which involves how the company to design and construct the project is selected), the tendering method (which involves the strategy used to select the team and the substantive contractor for the project) and the processes used to award procurement contracts. For instance, a project procurement contract which is awarded using a justifiable procedure that encourage coordination among project participants has been found to be critical for project management success (Lester, 2007; Phua, 2004).

When assessing the management of construction projects, PP factors that are typically taken into account include procurement procedures, the tendering method and the contracting method (Chan et al., 2004). A different approach is that proposed by Dang et al. (2012). These authors suggest measuring PP using market exploration research/market survey prior to funding or taking part in the project, comprehensive pre-tender site investigation, reasonable tendering system and comprehensive contract documentation, while Cserháti and Szabó (2014) added sub-factors such as project contract initiation and planning, project contract administration and the procurement method to the previous list.

Project Management Factors (PMF)

PMF include those factors that relate to the use of knowledge, skills, tools, and techniques to manage project activities to meet the project specification (PMI, 2017). The use of management tools by project managers to address challenges associated with the cost, scope, schedule, quality, complexity etc. of a construction project—as highlighted in the PMI definition—is what PMF actually have in common.

PMF have been found to be relevant for the successful management of construction projects because they provide the tools project managers will use in the planning, execution and monitoring of their construction projects in an attempt to increase the success rate of their projects (Doloi & Lim, 2007). In this regard, project management tools such as Gantt charts, S-curves, precedence diagram method, earned value management, work breakdown structures, cash flow analysis, project chart, quality function deployment, and other project management techniques are inherently value-oriented instruments and, if correctly used, can positively influence the successful management of the intended project (Besner & Hobbs, 2006). Nevertheless, it must be emphasized that the use of these tools require that project managers possess the relevant knowledge, competences and skills for the specific purpose of the project (Radujković & Sjekavica, 2017).

When investigating the factors that influence project management success, it is possible to observe that PMF have been operationalized covering three main areas: the knowledge required to use project management tools, the skills needed to apply these tools effectively, and the use of the tools per se. For instance, Besner and Hobbs (2006) focus on the tools, while Ling et al. (2008) and Cleland and Gareis (2006) looked at both the tools and the knowledge requirements. A more comprehensive approach is observed in Radujković and Sjekavica (2017), where the authors consider indicators that cover all three dimensions. The use of this combined (or holistic) approach is also found in the works of Chan et al. (2004), Khang and Moe (2008), Nguyen et al. (2004) and Ihuah et al. (2014).

Project Support Factors (PSF)

PSF are those factors that are related to the extent to which opinion leaders, top management and senior executives interpret how vital a construction project is and are willing to provide the necessary resources to carry it out and to meet the project objectives (Kandelousi et al., 2011; White & Fortune, 2002).

Project support is particularly critical during the early stages of the lifecycle of a project. At this stage the access to resources—mainly in the form of finance, human capital as well as materials or equipment—are paramount to ensure project completion (Kandelousi et al., 2011; Ofer, 2007). Other areas in which support from top management is needed include collating project documentation and keeping all stakeholders informed, so they are all aware of how the project is developing. If top management participate in these tasks, it is easier to have all parties committed to it. In this regard, project support activities are aimed at building and sustaining an effective working relationship with a network of internal and external stakeholders to help deliver effective project management services.

In terms of operationalizing this construct, Alashwal et al. (2017) and Khang and Moe (2008) measured PSF by looking at support from top management, client and government, the existence of sufficient project funding, and the effectiveness of consultation. Other authors have considered the different types of resources from which support is needed. In this regard, Nguyen et al. (2004) looked at the availability of labor, materials, machinery and equipment to measure PSF, while other author's also paid attention to the availability of funding (Cserháti & Szabó, 2014). A mix of both approaches is that used in the work of Ofori (2013), who considered stakeholder involvement, executive commitment, top management support, and financial resources.

External Environmental Factors (EEF)

EEF refers to all external influences on a construction project process, which are mostly beyond the control of the project manager or the management team (Gudiené et al., 2013). These might include not only the political, economic, and social situation of the territory, but also the level of technological advancement or even factors related to the climate (Belassi & Tukel, 1996). Several are the studies that support their impact on the management of construction projects (Hwang & Lim, 2013).

The external environment influences how construction projects are managed at all stages of its life-cycle. In some cases, EEF are so powerful that they can even cause the termination of a project at its implementation stage (Belassi & Tukel, 1996). For the specific case of DCs, the issue of culture is very important. Current research on multi-cultural management postulates that understanding the culture and its impact on project management is crucial for a successful project execution in DCs (Ojiako et al., 2014; Owusu-Ansah & Louw, 2019). Likewise, political factors play a critical role. As highlighted by Chen et al. (2012) and Pugh (2001), political stability and government intervention can boost or inhibit the establishment of an enabling environment which can eventually influence the overall management of a construction project. Equally important are economic factors, which shape access to funding and the flow of funds. If the macroeconomic environment is strong, interest rates are low, credit facilities are accessible and repayment periods are extended, project management success will be achieved (Gudiené et al., 2013). In many DCs, where the majority of the contractors rely on loans, it will be very difficult for contractors to successfully manage a project if the economic environment is unfavorable. Although not desirable, this is a common situation. Finally, the state of the art of the technology—being updated with current technological advancements—has also been considered as a relevant factor that influences how a project is managed (Hwang & Lim, 2013).

Consistent with the previous paragraph, recurrent dimensions to be examined when studying the impact of EEF on project management success in construction projects include the four dimensions in the PEST analysis, namely the political, economic, social and the technological environments surrounding the project (Ofori, 2013). Additional elements from the external environment that have also been examined relate to cultural aspects, the physical environment and the industrial fabric (Chan et al., 2004).

At this stage it is important to point out that the factors discussed above have been extracted from existing works that review practical examples of either developed and developing countries. In fact, as discussed in the introduction, previous studies in DCs have basically relied in the findings of developed countries, therefore, it is not surprising that the factors described above can also be applied to territories with a wealthier economic development. In this regard, our work contributes to the existing body of knowledge in two main ways: first, the six aforementioned factors have been operationalized taking into account the particularities of DCs; second, given the limited resources of DCs and the specificities that each construction project might entail, we expect to identify different combinations of factors—all of them equally valid—that explain project management success in construction projects in these countries. Meaning, different situations might require different actions.

The Ghanaian context

Ghana is a country that is currently investing in schools, roads, housing and other construction projects due to the increased demand for these infrastructures resulting from urbanization (Oxfordbusinessgroup, 2019). This phenomenon can be observed from the increased expenditure for capital infrastructure in the 2019 budget of Ghana. Even though there has been some growth in the construction industry of the country for the past few years, there are still several setbacks such as currency instability, land litigations, unfavorable interest rates and an increase in the prices of utilities and building materials among others (Darko & Löwe, 2016).

Both Ahadzie et al. (2012) and Amponsah (2010) observed that many construction projects in Ghana are financed by either grants or credits. Currently, the country is accessing $547 million under the Millennium Challenge Account (MCA). The problem is that after these funds are received, the country finds it difficult to use them efficiently to implement the intended construction projects. Ahadzie and Amoa-Mensah (2010) stated that inefficient management has, in most instances, been a major setback in the Ghanaian building, and by extension, the construction industry. Studies on the construction industry in this country report a lot of incomplete and unsatisfactory projects that have not yielded any benefits to the citizenry (Konadu-Agyemang, 2001; Kissi et al., 2015). Improper application of generally accepted project management principles have led to the desertion of construction projects (Ahadzie & Amoa-Mensah, 2010).

Developmental projects which are part of the construction sector of the economy of Ghana have been highlighted as a priority in most of the budgets statements of the country (Damoah & Akwei, 2017; Republic Ghana Budget, 2019). Notwithstanding, in most of the cases, the outcome obtained from the implementation of these projects has not met the goals set by clients and the project team members themselves in terms of time, cost and quality (Ofori-Kuragu et al., 2016). As Damoah and Kumi (2018) observed, many construction projects in Ghana fail to achieve their anticipated objectives and in some cases, they are totally abandoned. Researchers have often attributed these failures to culture, partisan politics, the public administration system, low level of project management knowledge, inadequate resources, corruption, obstruction by politicians, late settlement, long protocols, improper monitoring, improper planning, initiating more than necessary projects and regime changes (Transparency International, 2015; Amponsah, 2010; Borkor, 2011; Damoah & Akwei, 2017).

It is worth noting that the aforementioned problems are not specific to Ghana but are commonly shared by many DCs (Owusu-Ansah & Louw, 2019). Despite the existence of a few studies highlighting project management success in construction projects in DCs, there are still many issues to be addressed (Ofori, 2013) in order to provide useful guidelines that policymakers can refer to and use proactively to create the environmental conditions that enable an optimized use of resources (including financial, manpower, time, etc.) required for successful project completion.

Data and Methodology

Sample and data collection

To capture project manager’s perceptions about the relevance of the factors—described in the literature review section—that might shape the success of project management in construction projects, an ad-hoc questionnaire was designed. The questionnaire was targeted at government officials, heads of public and private institutions and civil servants who give project contracts, contractors and managers, managers of non-governmental organizations and employees of project oriented organizations, and other individuals who are certified project management practitioners in Ghana. The survey was administered to the executives of the project management institute (PMI) in Ghana for onward distribution to their members in January 2020. This was done after a letter of request explaining the objective of the study and asking for their acceptance to take part in the survey was issued. 120 questionnaires were distributed and were all returned after a month's period. From them, 110 were dully completed without errors and, as a result, were valid for analysis in this study.

Measures

The survey that was distributed to project management experts was designed using English language and was divided into two parts. Part one—including five items—requested respondents to provide demographic information. Part two was made up of 6 factors (i.e. those discussed in the literature review section) that were operationalized through 24 items. 4 additional items were included to capture information about the outcome (i.e., project management success), making a total of 28 items.

A 5-point Likert scale format—with 1 denoting "strongly disagree" to 5 denoting "strongly agree"—was used when asking respondents to express their level of agreement to each of the 28 statements included in the questionnaire. At this stage we relied on both the existing literature on project management in DCs as well as on already validated, scales adapting the items proposed by Chan et al. (2004) and Alashwal et al. (2017) to the context of this study. Table 1 shows the six factors and their respective items.

Insert Table 1 about here

Method

Because the items included in the survey were adapted from different previous works, as a first step it was necessary to validate whether the grouping of the items was appropriate. This implies testing how suitable our data were for factor analysis. To this end, the Kaiser–Meyer–Olkin test and the Bartlett's test of

Sphericity were carried out. Next, a principal component analysis was used as an exploratory tool to assist us in the grouping of the items included in the survey into factors. These analyses were performed using SPSS for Windows v25. To ensure an overall consistency of our measures, the reliability analysis of the factors obtained was vouched using Cronbach alpha and composite reliability. By assessing if the inter-factor correlations were less than the square root of the average variance extracted (AVE), the discriminant validity analysis among these factors was conducted using standardized covariances between factors to help ascertain the overall accuracy of our measures.

Once factors were established, we explored which combination(s) of factors lead to project management success in construction projects. Qualitative comparative analysis (QCA) is the preferred method for addressing this type of research question (Schneider & Wagemann, 2012). QCA is a hybrid method that combines the advantages of both qualitative analysis (case-oriented research) and quantitative analysis (variable-oriented research). QCA helps to explore equifinality, that is, the existence of different amalgamations of factors leading to the same outcome (Ragin, 2008). As a result, QCA highlights how multiple causal paths underline a management phenomenon (Salam et al., 2017). One of the distinctive features of this method is that it uses Boolean logic instead of the traditional correlation methods to set causal conditions strongly related to a particular outcome (Ragin, 2008). The technique relies on the analysis of sufficient and necessary conditions to produce an outcome, and has strengths from small to medium-level case studies. A condition is deemed as necessary if it is present in all instances of the outcome, while a condition will be considered as sufficient if a particular outcome emerges whenever the condition is present (Schneider & Wagemann, 2012).

QCA is particularly relevant to the context of this study because the factors explaining project management in construction projects are multifaceted and complex in nature. This is due to the inherent complexity a project entails and the presence of distinct participants in the construction process. Thus, studying the effects of these factors independently will not be enough to provide a clear understanding of the problem (Yanwen, 2012; Ofori, 2013). Instead of assessing the influence of each condition on the outcome, we evaluate cases as configurations of conditions (Ragin, 2008). Another reason supporting the use of QCA is that this technique is better suited for conducting an assessment in a specific context, showing how multiple causal recipes relate to a particular outcome and to help answer certain questions that could not be addressed via conventional variable-oriented analyses (Ragin, 2008).

QCA has two main variants: csQCA and fsQCA. For the purpose of this study we used fsQCA, with the aid of the fsQCA 3.0 software. The greatest difference between csQCA and fsQCA is that the former utilizes the traditional aggregation concept using 0 (out of the set) and 1 (inside the set), while fsQCA accounts for a varying degrees of membership between 0 (fully out of the set) and 1 (fully in), therefore, minimizing the loss of information. Because of the nuanced nature of the conditions influencing our outcome, fsQCA was selected over csQCA (Choi, 2009).

Results

The analysis started with an exploration of the demographic features (Table 2) of the survey participants. Next, the Kaiser–Meyer–Olkin test and the Bartlett's Test of Sphericity (Table 3) were performed to validate the suitability of our data for factor analysis. Results from the analysis provided a Kaiser–Meyer–Olkin test value of 0.846, greater than the threshold value of 0.60, thus, indicating a good sampling adequacy and the suitability of the data for factor analysis. The Bartlett's Test of Sphericity was also positive and significant at 0.05 (i.e., χ^2 = 1605.480, df = 276, p = 0.000 < 0.05). This result authenticates a linear dependence among the variables and confirms that the database as good for further analysis (Pallant, 2010).

Insert Table 2 about here

Insert Table 3 about here

To validate the factor structure, factor analysis was conducted using principal components analysis and varimax rotation. The 24 items included in the survey were used at this step (the in-depth description of the items is presented in Table 1). To retain an item we imposed the following criteria: the item (a) loaded at 0.6 or more on a factor, (b) did not load at greater than 0.5 on two factors, (c) had an item-to-total correlation of greater than 0.5 and (d) had an eigenvalue greater than 1 (Ladhari, 2012; Wolfinbarger & Gilly, 2003). In total, five factors emerged from our analyses with eigenvalues greater than 1 (Kaiser, 1960) explaining 68.258% of the variance in the sample as shown in Table 4.

Insert Table 4 about here

New labels were proposed after the groupings from the factor analysis, given the relatively few overlaps with original dimensions: external environmental factors (factor 1), project management factors (factor 2), project support factors (factor 3), project procedure (factor 4), and human related factors (factor 5).

To examine the uni-dimensionality of the newly obtained factors, five new independent factor analysis using an orthogonal rotation method (varimax) were carried out. The independent analysis used only the newly obtained items in Table 4 for each factor. The results extracted only one factor each, validating our approach. Table 5 shows the results for the new independent factor analysis including only the loadings of those items that significantly contribute to explain each of the factors (loadings > 0.6). The values for reliability and convergent validity for the newly discovered factors are also provided in Table 5. The high loads of the respective items confirm their reliability. With the exception of HRF whose Cronbach's alpha was slightly below 0.7 (i.e., 0.651), the Cronbach's alpha and the composite reliability of all the factors exceeded the benchmark of 0.7 for internal consistency (Nunnally & Bernstein, 1994).

Insert Table 5 about here

The AVE for each of the individual factors was above 0.5, satisfying the cut-off for the proposed threshold (Fornell & Larcker, 1981). With the exception of HRF, the Cronbach's alpha did not suggest a removal of any item from each factor's scale, while the overall corrected scales and the correlation figures for the relationship between the items were greater than 0.5. Note that in the case of HRF, we did not remove an item because, on the one hand the difference in the new Cronbach's alpha did not change significantly and on the other hand, important information about the construct (if deleting the item) was lost. The loads for all the items were significant (t > 2.58), testifying the convergent validity for all the factors (Malhorta, 1999).

Results for the test for discriminant validity are shown in Table 6. Using the standardized covariances between latent factors, we assessed the inter-factor correlations to determine whether they were below the square root of the AVE (Fornell & Larcker, 1981). From Table 6, the off-diagonal elements show values below the square roots of each AVE. Thus, discriminant validity was also verified (Hair et al., 2010).

Insert Table 6 about here

Next, QCA was performed. The five factors that emerged from the factor analysis (Table 4) were treated as the antecedent conditions, while project management in construction projects (PMCP) was used as the outcome. Data were transformed (i.e. calibrated) into fuzzy-set terms, expressing the values of each observation according to their degree of membership from 0 (full non-membership) to 1 (full membership), with 0.5 being the crossover point (Ragin, 2008). The selection of the anchors was made based on theoretical knowledge and empirical evidence. Specifically, we started by plotting the distribution of each of the factors. Based on these graphs we defined the qualitative anchor for the cross over point. Given that we are using factors that emerge from a principal component analysis, the median was found to be a good proxy for the point of maximum ambiguity (neither in nor out of the set). The full membership and non-membership scores were computed using percentiles. Following a common approach in QCA studies (Ragin, 2008; Alrik & Dușa, 2013), the 90th percentile was used to represent the threshold of 0.95 (full membership), while the 10th percentile was used as the 0.05 cut of point (full non-membership). Table 7 displays the thresholds used for each factor.

Insert Table 7 about here

Another important step in QCA is to test whether antecedent conditions are necessary in the prediction of the desired outcome (Meyer et al., 1993). Consistency scores higher than 0.9 indicate necessity (Ragin, 2008). From Table 8 it can be concluded that there is no antecedent condition that can predict the outcome alone, thus, giving preliminary support to our initial intuition that the outcome results from a conjunction of different factors.

Insert Table 8 about here

Next step consists of the creation of the truth table, which contains every logically plausible combination of conditions. The table is made up of 2k rows, with k being total causal conditions. For all combinations with case membership scores above 0.5, those cases are assigned to that combination. Finally, a reduced statement is produced logically. In this process, rows are simplified using two parameters: coverage (represents how vital a solution is empirically) and consistency (quantifies the degree to which cases sharing comparable conditions have the same outcome). Both measures range from 0 to 1. Recommended values for acceptable consistency and coverage are of 0.75 and 0.45 respectively (Ragin, 2008).

From Fig. 1, seven different recipes that lead to the desired outcome are shown, verifying our initial hypothesis for the existence of different successful combinations of factors. It is notable that although all seven configuration are equally valid, the first three (1a, 1b and 1c) have the highest raw coverage values (0.422, 0.668 and 0.387, respectively), and therefore, cover a greater proportion of cases in the sample. The distinction between core and peripheral conditions is used to systematize the comparison of the solutions (Fiss, 2011; Ragin, 2008). Core conditions represent the important causes that have a strong causal relation with the outcome of interest, while peripheral conditions are those that are more expendable as they are contingent on specific segments. The solution coverage is 0.835 while the solution consistency is 0.847. All the seven configurations also show acceptable consistency scores greater or equal to 0.871. Raw coverage figures are notably high, depicting that the degree at which each recipe explains the outcome is sound. However, unique coverage figures are rather low, implying that the proportion of cases that can be exclusively explained by the configuration is low. In other words, cases in the sample emerge from a combination of different recipes.

Insert Fig. 1 about here

Fig. 1 further shows that PSF is one of the major factors accounting for project management in construction projects in DCs. This factor appears in configurations 1a, 1b and 1c. Although it needs to be combined either with the absence of PP (1a), the presence of PMF (1b), or the presence of EEF and absence of HRF (1c), PSF stands as a core condition. This implies that with a favorable external environment—even when strict project procedures are missing or there is a limited skilled workforce (as in the case of many DCs)—construction projects in DCs can still be managed successfully if people in authority provide the necessary support to project managers to perform their functions efficiently.

PP appear as a core condition in configurations 4a and 4b. This factor merges with the presence of HRF and the absence of PMF. Additional conditions shape these solutions. In the case of configuration 4a the above factors are put together with the absence of PSF, while in configuration 4b with the absence of EEF. These results suggest that despite project management factors being poorly developed, when project management procedures are adhered to and these are coupled with a good and determined project team, it is likely that the management of the construction project will be a success even if the external environment is not that favorable or the support for the project is limited. The rationale behind these solutions lies in a motivated project team, who is able to overcome obstacles. With a well laid down project procedure, too much effort would not be required of the project managers if they would follow the already laid down procedures.

Lastly, configurations 2 and 3 reveal two additional patterns. Configuration 2 suggests the combination of EEF and HRF (both appearing as core conditions) with the absence of PP. This solution can be interpreted by saying that with a favorable environment and the presence of a good project team, construction projects in DCs can be managed even if the procedures to be used to manage the project are unclear. On the contrary, the duty of the project manager in a construction project is deemed as crucial (i.e. core condition) in configuration 3, compensating for a hostile external environment, a lack of human capital and the existence of limited project procedures.

Discussion

The goal of this research is to assess the factors (and their combinations) that shape project management in construction projects in DCs; and based on the results, recommend policy guidelines that help project managers to successfully manage construction projects in these countries.

The findings from this study suggest that the backbone of a successful project management in construction projects in DCs lies in the ability of opinion leaders and stakeholders such as governments, senior managers and clients to provide the relevant assistance in the form of systems and structures, finance, materials, manpower and other physical resources for project managers to operate effectively, while creating an enabling environment. It is notable that when implementing a construction project, the management of the cost, communication, quality, schedule and risk associated with the project should be carried out effectively to ensure a successful execution of the project activities and to meet the objectives of the construction project even if strict project procedures are missing. This finding supports those of Kandelousi (2011), Ofer (2007) and Chan et al. (2004) who found empirical support that senior management are vital in ensuring a successful project management in construction projects.

The findings also reveal that the processes and the procedure used to initiate, acquire or obtain a construction project significantly affect the outcome of the project. The procurement and the tendering methods used before and during the execution and implementation phases of a construction project significantly influence the successful management of the project. It is remarkable that, in combination with the use of prescribed project procedures and practices, the competence of the people who are in charge of the tendering, procurement, selecting and giving the contract also influence the outcome of the construction project. This combination still holds true even when there is inadequate project support, project management factors are poorly developed and the external environment factors are unfavorable, as is the case of the management of construction projects in many DCs. This finding is aligned with the work of Dissanayaka and Kumaraswamy (1999) in which project procedure is found—using a different analytical approach—to be a significant predictor of project management in construction projects.

Another relevant finding arising from this study is that with the right competences, commitment and communication among project managers and other stakeholders (e.g., clients, contractors, consultants, subcontractors, suppliers, and manufacturers), coupled with a favorable external environmental conditions, a construction project could be successfully managed, even in the mist of the absence of strict project procedures. It is however notable that in a situation where the external environment is hostile, the competence of the human resource is inadequate and the project procedures are unclear, how the project manager performs his duties (e.g., cost and quality control, schedule management and feedback management, project communication management, project planning, safety and risk management, project policy and strategization and client consultation) is deemed as crucial for a successful project management in construction projects in DCs. These findings add to those of Chan et al. (2004) who found external environmental factors, human related factors and project management factors as relevant predictors of construction projects' success in DCs.

Implications of findings

Managerial and policy implications as well as several recommendations can be drawn from the above findings. First, governments and top management need to provide the necessary support that will help to successfully manage and implement construction projects in DCs. They need to make sure that before the initiation of these projects in DCs, project funds, material and all other relevant resources are provided. In addition, the bureaucratic processes involved in obtaining this support should be reduced and simplified. The adoption of electronic systems can help in this direction, since these systems help to eliminate corruption, the difficulty in obtaining necessary documents for a project and promote monitoring and transparency.

Second, project procurement contracts must be awarded by merit and through a justifiable system such as 'open tender' to attract competent contractors and agencies who qualify. Legislations which will force contractors to complete construction projects on time should also be enacted and enforced to serve as deterrent to contractors.

Third, project team members need to embark on periodic training to boost their competence levels. Project managers need to handle the emotions of their team, motivate them when they get disappointed and ensure coordination among team members during difficult times. Also, project managers need to have the required know-how that will help them to execute and implement their project plans, which includes how to obtain the relevant funding that will help to accomplish the project within the stipulated time.

Fourth, it might be useful for governments to have specific units within its ministries responsible for monitoring the progress of awarded construction projects. These units should be empowered to receive feedback from contractors and project managers and develop the necessary strategies to deal with implementation challenges emanating from their monitoring activities.

Finally, political leadership and other opinion leaders who have the capacity to obstruct construction project management success in DCs are expected to create an enabling external project environment. Specifically, parliament of various DCs needs to enact legislations that will empower technocrats carrying out government construction projects, to avert political interference. In addition, specific banks should be established by legislation for construction project purposes. This will help contractors to get access to credit in times of liquidity difficulties and avoid unnecessary delays.

Concluding remarks

In recent years, various scholars have come out with different lists of factors affecting project management in construction projects, with many of these being applicable to both developed and DCs. However, in accordance with the works of Jugdev and Muller (2005), Lova (2009) and Yanwen (2012), we posit in this study that (1) project management success factors operationalize differently in construction projects in DCs, thus, requiring the readjustment of the existing scales to measure them; and (2) these factors might combine differently—depending on the specificities of the cases—making it possible to observe a set of equally valid configurations (or patterns) leading to project management success. Consequently, a cautious identification and study of these factors and their combined effects on the management of several aspects of construction projects in DCs is necessary for guaranteeing their success and a sustainable use of the resources invested.

Within this context, the original contribution of this study stems from the use of a novel configurational approach to examine the factors that affect project management in construction projects in DCs. In doing so, the paper contributes to the existing body of knowledge on project management. Specifically, it adds to the existing literature, new insights on how a combination of factors can assist construction engineers and project managers in implementing successful projects in DCs.

Results presented in this study are expected to help project managers, top managers, policy-makers and other relevant stakeholders to appreciate the causal complexities of the factors shaping project management in construction projects in DCs and the challenges and the risks associated with them. The technique used in this study—QCA—provides a context-specific assessment, suggesting ways in which multiple causal factors should be combined to explain a phenomenon (i.e., project management in construction projects). This approach complements existing works that only provided a partial view (i.e., looking at these factors independently). In addition, by putting a spotlight on these factors and their combined effects on the management of construction projects, the complexities arising from project delivery in DCs could be better understood and addressed.

The results obtained suggest that different pathways are envisioned, signaling that there is no unique strategy but different routes that can be followed; all of them equally valid for ensuring project management success. Based on the resources and the capabilities of each project, project managers should select the route that best fit with the specificities of each of their projects. These findings are of great importance as construction projects in DCs, although having a similar structure and pattern, tend to be heterogeneous in nature and respond to different interests and needs.

Limitations and suggestions for future research

The results of this study cannot be generalized and are constrained by some limitations. The empirical application of this study considered the case of only one country, Ghana. Future research might consider testing the scale in other DCs for better inference as well as comparing the results among different countries or regions. Other research lines such as the sustainability of construction project management in DCs, and the moderating role of key performance indicators on the relationship between the factors discussed in this paper and construction management in DCs are recommended.

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Data Availability Statement

All the data, models, or code that support the findings of this study are available from the corresponding author upon reasonable request.

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List of Tables

Table 1. List of dimensions and items.

Dimensions	Item	Description
Human-Related Factors (HRF)	HRF1	Project managers have the technical competence
	HRF2	Project team members have the necessary competence
	HRF3	Project participants are commitment
	HRF4	There is project team coordination
Project-Related Factors (PRF)	PRF1	Cost of our projects are always reasonable
	PRF2	Project quality levels are always acceptable
	PRF3	Projects are always within schedule
	PRF4	All our projects have clear cut mission
Project Procedures (PP)	PP1	Proper procurement methods are followed
	PP2	Contract administration is transparent
	PP3	PM techniques are applied
Project Management Factors (PMF)	PMF1	Projects are properly planned
	PMF2	There is adequate project communication
	PMF3	There is periodic project monitoring and control
	PMF4	Feedbacks are properly managed
Project Support Factors (PSF)	PSF1	There is top management support
	PSF2	Government support is always available
	PSF3	Project funding is always available
	PSF4	Suppliers and contractors are credible
	PSF5	There is always enough consultations during project execution
External Environmental Factors (EEF)	EEF1	Socio-cultural factors affects the execution of our project
	EEF2	The economic environment affects the execution of our projects
	EEF3	The Political environment affects our project execution
	EEF4	Technological factors affects the management of our projects
Project Management in Construction Projects (PMCP)	PMCP1	Completed construction projects generally meet the acceptable quality standards
	PMCP2	Completed construction projects are generally within budget
	PMCP3	Construction projects generally meet customer's specifications
	PMCP4	Construction projects are normally completed before deadline

Table 2. Demographic information

	Number	%
Gender		
Male	86	78.2
Female	24	21.8
Total	110	100.0
Age		
18-20	2	1.8
21-31	39	35.5
31-40	47	42.7
41-50	18	16.4
> 50	4	3.6
Total	110	100.0
PM Certification		
PMP	72	65.5
CAPM	2	1.8
PMI-RMP	1	0.9
PMI-PBA	1	0.9
OTHER	34	30.9
Total	112	100.0

Table 3. Kaiser-Meyer-Olkin (KMO) Test and Bartlett's Test of Sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.846
Bartlett's Test of Sphericity	1605.480	1605.480
	276	276
	.000	.000

Table 4. Matrixes of the components extracted from the FA

FA (24 ITEMS)					
	1 EEF	**2 PMF**	**3 PSF**	**4 PP**	**5 HRF**
EEF3	.913	-.075	-.003	.008	-.130
EEF2	.896	-.012	-.028	.019	-.081
PRF2	.889	.033	-.009	.035	-.062
EEF1	.886	.069	.019	.058	-.115
EEF4	.878	.051	-.012	-.041	.025
PRF4	.840	-.006	.034	.089	-.198
PMF1	-.090	.830	.083	.215	.065
PMF2	.119	.819	.201	.108	.055
PMF4	-.039	.745	.339	-.058	.075
PMF3	.108	.719	.077	.383	.044
PSF3	-.048	.354	.734	.104	-.046
PSF2	.125	.107	.713	.395	.095
PSF1	-.035	.032	.695	.239	-.089
PSF4	-.076	.392	.689	.253	-.019
PRF3	.009	.540	.619	.129	-.134
PP2	.136	.115	.255	.784	.129
PP3	.091	.014	.451	.641	.020
PP1	.014	.319	.179	.626	-.168
HRF3	-.119	.431	.235	.555	-.167
PSF5	-.016	.472	.434	.511	-.190
HRF4	-.348	.186	-.075	-.118	.776
HRF1	.060	.064	.092	-.250	.774
HRF2	-.183	-.016	-.069	.207	.623
PRF1	.194	.243	.225	-.051	-.334
% of variance	**20.77**	**15.21**	**13.21**	**10.98**	**8.09**

Table 5. Factor loads and their reliability statistics.

	1		2		3		4		5	
	EEF		**PMF**		**PSF**		**PP**		**HRF**	
	EEF1	.899	PMF1	.867	PSF1	.669	PP1	.766	HRF1	.773
	EEF2	.906	PMF2	.856	PSF2	.792	PP2	.814	HRF2	.677
	EEF3	.923	PMF3	.812	PSF3	.824	PP3	.838	HRF4	.852
	EEF4	.866	PMF4	.796	PSF4	.841				
	PRF2	.890			PRF3	.812				
	PRF4	.865								
Alpha Cronbach	.948		.853		.847		.726		.651	
Cronbach's alpha if an item is deleted	.933 - .942		.791 - .834		.796 - .848		.585 - .697		.395 – .679	
Total corrected scale and correlations	.805 - .885		.642 - .745		.521 - .724		.504 - .601		.371 – .575	
Composite Reliability	.959		.901		.892		.848		.813	
AVE	.795		.694		.624		.651		.594	

* Loads are significant at p-value = 0.01

Table 6. Correlation matrix of factors

EEF	*.892*				
PMF	.033	*.833*			
PSF	.017	.576**	*.790*		
PP	.119	.420**	.603**	*.807*	
HRF	-.307**	.118	-.053	-.086	*.771*

* Correlation significant at 0.05
** Correlation significant at 0.01
In the main diagonal are the square root of the AVE of each construct.

Table 7. Calibration of the outcome and the antecedent conditions

Condition	Membership threshold values		
	Full non-membership	**Crossover point**	**Full Membership**
External environmental factors (EEF)	-1.00	-.50	1.50
Project management factors (PMF)	-1.30	.00	1.30
Project support factors (PSF)	-1.20	.00	1.50
Project procedures (PP)	-1.20	.20	1.50
Human related factors (HRF)	-1.00	-.20	1.50
Outcome: Project Management in construction projects (PMCP)	-1.60	-.10	1.40

Table 8. Necessary conditions analysis

Antecedent conditions	Consistency	Coverage
EEF	.5939	.6668
~ EEF	.5901	.6528
PMF	.7434	.8185
~ PMF	.5495	.6198
PSF	.8047	.8898
~ PSF	.5143	.5776
PP	.7616	.9173
~ PP	.5481	.5683
HRF	.5756	.6792
~ HRF	.6161	.6504

* The symbol (~) represents the negation of the characteristic.

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Fig. 1: Sufficient configurations of antecedent conditions for project management of construction projects.

Antecedent conditions	Configurations						
	1a	1b	1c	2	3	4a	4b
External environmental factors (EEF)			•	●	⊗		⊗
Project management factors (PMF)		•			●	⊗	⊗
Project support factors (PSF)	●	●	●			⊗	
Human related factors (HRF)			⊗	●	⨂	•	•
Project procedures (PP)	⊗			⊗	⊗	●	●
Raw coverage	.4216	.6678	.3837	.2544	.1963	.2537	.2354
Unique coverage	.0113	.1839	.0113	.0173	.0095	.0062	.0121
Consistency	.8712	.9223	.8974	.8293	.8826	.9163	.9358
Solution coverage	.8352						
Solution consistency	.8471						
Frequency threshold	1.0000						
Consistency threshold	.8460						

Black circles (●) indicate the presence of a condition, and circles with (⊗) indicate its absence. Large circles indicate core conditions; small ones, peripheral conditions. Blank spaces indicate “don’t care”.