

Organizational Structure and Software Project Success: Implications of the Mediating Effect of Corporate Culture.

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ABSTRACT

This study firstly examines the current literature concerning software project implementation problems, the instances of culture within an organization and dimensions of organizational structure. A quantitative approach was adopted to understand the association between organizational structure and project success with a possibly mediating effect of culture with data generated using the cross sectional survey design. Different stakeholders, 89 of them including (top management, project manager, project team members) from 10 banks within Port Harcourtaxis were administered the questionnaire, and a bootstrap framework was used to test if the effect of external physical instances of culture have the ability to take on internal psychological significance. The Cronbach alpha test was adopted to ascertain the internal reliability of the instrument. A total of 19 items were examined (complexity = 3; formalization = 3; centralization = 3; software project success = 5; and organizational culture = 5). The study revealed that participants on the average affirm to their experiences of organizational structure within the organization which reflects instances of complexity, formalization and centralization. The result showed a significant association between the variables (complexity, formalization and centralization) which revealed that there is a significant relationship between the dimensions of organizational structure and software project success. The bootstrapping test for the mediating effect of organizational culture on the relationship between organizational structure and software project reveals no significant association. It is hoped that this research will help to bridge the current literature gap and provide practical advice for both academics and practitioners.

Keywords: *Software Projects, Organization Structure, Organization culture, Software Success factors, Mediation effects.*

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I. INTRODUCTION

There is an ongoing challenge for managers involved in the process of software project implementation, successful software development and introduction of projects in the organization (Star et al,2011). The software project implementation process is very intricate, usually requiring instantaneous attention to a wide variety of variables such as human, budgetary, and technical. Increasingly, companies are now using projects in their daily work to attain their goals also the size and intricacy of projects in the software development space are growing very fast (Star et al,2011). Similarly, Hivari. S, (2006), argues that there is a growing need for the management of projects in various business organizations

Disturbingly most projects do not operate in seclusion; they have to operate within a business environment that should be harmonizing to the requirements of good project management. The organizational culture affects strategic planning and implementation, project management, and everything else (Cleland, 1999). According to Skarabot (1994), project organizational culture is best demonstrated by the attitude of employees to the project and the position of the project manager in the company. The project manager's authority should depend on the level of the project; the manager of a project with a high priority should have similar capabilities as line managers and should be paid as a manager. However Cleland, 1999 argues that the informal role of a project manager could be even more vital. Project culture is one of the most persuasive factors of successful project implementation in enterprises and is part of the overall organizational corporate culture (Skarabot, 1998). Project culture is the general outlook to projects within the business. Corporate organizational culture is rooted deep down in people and subconsciously influences their behaviour – it affects their performance and vice versa – the manner of these factors affects the culture. Informally, such culture can be described as follows: “*That’s the way we do it!*” (Lipičnik, 1993) or “*The way things are done around here*” (Lewis, 1995). Culture is the various philosophies and procedures to doing work within an organisation's structure (Moore, 2002).

As opined in Bindress et al. (2014) many scholars have pointed out the importance of organization structure in determining the work attitudes and performance of employees (Burns et al. 1961; Miller, 1986; Mintzberg, 1989). In addition, Ashton, (2004) states that there is a strong relationship between organization structure and dissemination of knowledge and information in workplaces, which reflects on elements such as employment relationships, systems and operational processes and people and groups who aim to realize a common goal (Barney and Griffin, 1992). Organizational structure is seen as a set of ways that divide work to specific responsibilities, and provide coordination among them (Mintzberg, 1979) also showing division of power and parallel effects on organizational processes (Fry and Slocum, 1984). Organizational structure refers to the patterns of relationships within the organization, authority and communication (Frederickson, 1986) showing clear reporting relationships, delegation of responsibility, formal communication channels and decision making (Hodge and Anthony, 1991).

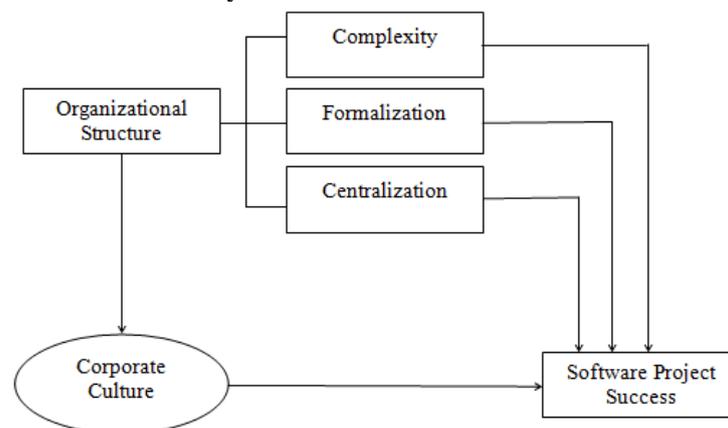
Despite the amount of research on organizational structures and patterns, the challenge which managers are facing is the ability to comprehend the organizational structures, dimensions and patterns and so be able to (successfully) reach the company's goals (Kermani, 2013). To this end, this study is geared towards the following objectives:

1. To ascertain the degree of association between organizational structure and software project success;
2. To investigate the mediation effects of corporate culture on the relationship between organizational structure and software project success.

1.1 Scope of Research

This study limits the organizational culture impacts to **corporate culture as an indirect influence** on project success this is premised on the fact that there exist a lot of studies already on project organizational culture impact and the subculture of the project team impact available in the public domain. As a point of departure from similar research, this study would focus on the mediating effect of corporate culture on the association between organizational structure and software project success bearing in mind the three principal dimensions of organizational structure (Centralization, formalization and Complexity)

1.2 Operational Framework For The Study



Therefore the **Research Questions** based on the framework is as follows:

1. To what extent is organizational structure associated with software project success?
2. Does corporate culture mediate the relationship between organizational structure and software project success?

The **Research Hypotheses** are as follows:

HO₁ There is no significant relationship between complexity and software project success

HO₂ There is no significant relationship between the formalization and software project success

HO₃ There is no significant relationship between centralization and software project success

HO₄ Corporate culture does not significantly mediate the relationship between organizational structure and software project success

II. Review of Existing Literature

It is widely renowned that organizational culture has an impact on project performance (Brown, 2008; Andersen et al., 2009). Many studies have been carried out and several dimensions of organizational culture have been examined, e.g. the organizational strategy, structure, culture, systems, behavioral patterns and processes of an organization, thereby shaping the internal environment required for project management to be successful. A study of the literature reveals there are three types of organizational culture impacts:

1. **Corporate culture with an indirect influence**– several authors have looked at different aspects of corporate culture having an indirect influence on project success, such as: how decision-makers respond to vagueness, difficulty, and uncertainty (Shore, 2008); employees’ participation, consistency (a strong inner culture, a concern with shared values), positive work atmosphere, management leadership, results-oriented, commercial success, technical success, customer satisfaction (Belassi et al., 2007); mission and long-term directions, adaptability to the atmosphere (Kuo&Kuo, 2010); organizational direction, keenness orientation, decision-making rationale, cross-functional integration, communication philosophy, locus of decision-making, people management style, tractability, philosophy about people, personal capability, process and systems support, performance management (Morrison et al., 2008; Brown, 2008; Aronson & Lechler, 2009); strong command and control competences or a more empowered work style (Moore, 2002); hierarchy, market, clan and adhocracy culture (Fong & Kwok, 2009); very lax “we are all friends here” or very formal “buttoned down” cultures (Snedaker, 2006);
2. **Project organizational culture (a direct influence)** – various authors have researched the direct influence of project organizational culture on project success such as; organizational policies, processes, rules, formal and informal roles (Cleland, 1999); top and line management supporting/attitude, observing, ranking and project staffing (Kerzner, 2009, Andersen et al., 2009, Young & Jordan, 2008; Kearns, 2007; Tinnirello 2001; Doll, 1985); support of departments in the pursuit of project goals, employee commitment to the project goals in the context of harmonizing them with other, potentially competing goals, project planning – how managers evaluate it and how they view the outcomes of projects -the way work is estimated or how resources are assigned to projects, performance of project teams (Pinto, 2010);
3. **The “subculture” of the project team**(a direct influence) – a few authors have studied the direct influence of the sub-culture of the project teams on project success such as: effective communications, co-operation, trust and teamwork (Kerzner, 2001), social activities of the team, preparedness to share ideas and problems among team members, calling team members by their first names or nicknames, level of formality within the team (Cleland, 1999).

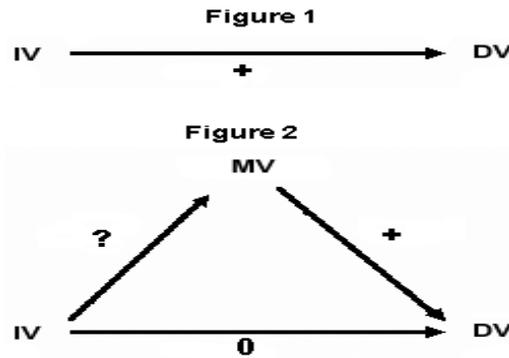
Blackburn (1982), regarding the dimensions of organizational structure in defining the structural aspects, suggests that there are a lot of factors which vary according to the vision and attitude of researchers. Among these factors there are the managerial components, formalization, integration, independence, field of supervision, centralization, complexity, delegation of authority, segregation, professional orientation, standardization, specialization and the number of erect hierarchy levels (Robbins, 1987). However most of organizational theorists agree on Centralization, formalization and complexity (Fry and Slocum, 1984) as dimensions of organizational structure. These dimensions have been defined as follows:

1. **Degree of Complexity:** according to kermani (2013) refers to the levels of departmentalization, that demonstrates horizontal complexity of the structure
2. **Degree of centralization:** kermani (2013) stipulates the chain of command and span of control belong, displaying vertical complexity (hierarchical levels and linkages between them)
3. **Degree of formalization** reflects standardization: reliance on formal rules and procedures (kermani, 2013)

2.2 The mediating effect of organizational culture

In this study we argue that culture *mediates* the relationship between the three dimensions of organizational structure and software project success. That is, the attributes of software project success *through* the development of culture. When culture has not been developed (that is, when an organization has not developed the simultaneous capacities for an aligned corporate culture), the different organizational structure dimensions, in and of themselves, may or may not influence software project success. The reason for hypothesizing a mediating effect is that contextual organizational culture is seen as a meta-capability that is developed gradually over time through the interaction of the various dimensions of an organization context. As both Ghoshal and Bartlett (1994) and Adler and coauthors (1999) showed, the development of this sort of ability takes many years. Stated slightly differently, it would be wrong to suggest that a company could simply institute the three dimensions of organization structure and expect them to deliver successful software projects. Rather, the three dimensions of organizational structure outlines individual and collective culture that in turn shape success of software project, and it is the development of the organizational culture that leads to software project success. The general thinking of the mediation effect provides for a specific variable to function as a mediator to the extent that it accounts for the relation between the predictor and the criterion. Mediators explain how external somatic events have the ability to take on internal psychological significance.

Consider the path diagrams below:



IV -> independent variable; DV -> dependent (response) variable; MV -> mediator variable

The path diagrams are used by researchers to clarify the implication of mediation, these diagrams are used as a model for portraying a causal chain. The simple causal chain involved in mediation is displayed in the Figures 1 & 2 above. These models assume a three-variable system that depicts two paths feeding into the outcome variable: the direct impact of the IV on the DV and the indirect path from the IV to the DV via the MV. There is also a relationship between the MV and the DV. A variable can only function as a **mediator** when it meets the following conditions: (a) variations in levels of the IV significantly account for the variations in the presumed mediator as in (Fig. 1), (b) variations in the MV significantly account for variations in the DV, and (c) when both IV and MV appear in the model, a previously significant relation between the IV and DV is no longer significant, with the strongest demonstration of mediation occurring when the direct IV to DV path is zero as in (Figure 2).

III. RESEARCH METHODOLOGY

Design

This study descriptively and inferentially examines the relationship between organizational structure and the success of software projects within the mediating implications of organizational culture with data generated using the cross sectional survey design. The study is quantitative as it draws upon the numerical and quantitative characteristic of observations and the scaling of measurements.

Population and sampling

The study accessible population comprises the head branches of ten (10) banks located geographically in Port Harcourt with respondents purposively selected given the nature of the study and the unique data required for the study which assessed the viability and success of previous software projects ranging from network and database connections to online banking systems and back-end development; hence the units of measurements comprised of eighty nine (89) senior software engineers, top project officers and technical experts.

Instrumentation

The structured questionnaire was used to elicit responses and data for the study. It is composed to three sections namely: the demographic: which assessed the sample characteristics; the bivariate section: which assessed the manifestations of the predictor which is organizational structure and the criterion which is software success; and the contextual: which assessed manifestations of the contextual variable which is organizational culture. Measures for organizational structure (complexity, formalization and centralization) are adapted from Nahma et al (2003); and Mullins (2007). The measures for the criterion variable, software project success is adapted from the literature of Ibrahim et al (2013) and Rowlinson (1999); while the measures for the contextual variable, organizational culture is adapted from Pittorino's (2009) adaptation of Harrison's 1972 structure scale.

Reliability

The Cronbach alpha is adopted in ascertaining the internal reliability of the instrument. A total of 19 items are examined (complexity = 3; formalization = 3; centralization = 3; software project success = 5; and organizational culture = 5). Table 1 below is used to illustrate the reliability results for the study.

Table 1: Reliability of instruments

Variables	Dimensions	No. of Items	Alpha Coefficients
Organizational Structure	Complexity	3	0.951
	Formalization	3	0.883
	Centralization	3	0.900
Software Project Success		5	0.937
Organizational Culture		5	0.878

Source: Research survey, 2016

IV. RESULTS OF THE ANALYSIS

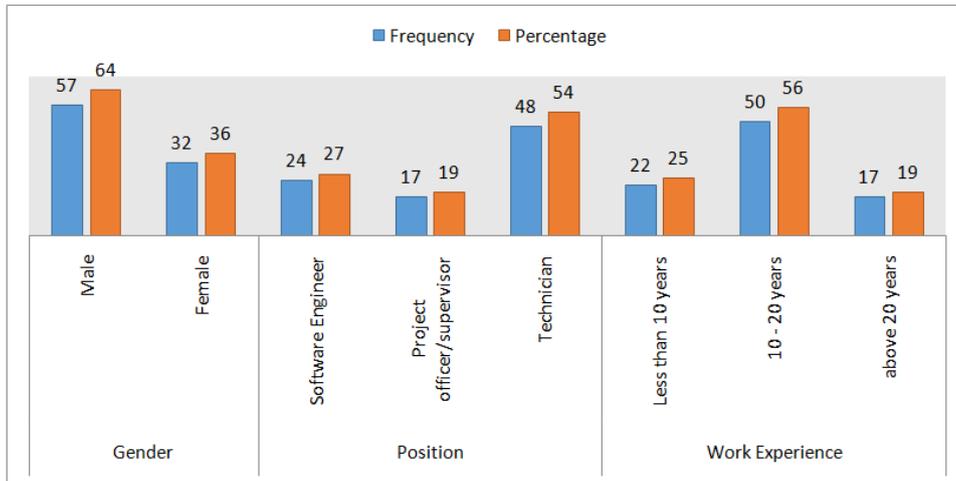


Figure 3: Distribution according to demographic characteristics

The data as illustrated in figure 3 shows the distribution of the participants based on their demographic attributes. Based on the result of the descriptive analysis, data reveals that a majority of the participants are male (64%) and a majority are technicians in their respective organizations (54%) with most having a work experience ranging between 10 – 20 years (56%).

Table 2: Analysis on the variables of the study

Dimension	Indicators	Mean	Standard Deviation
Complexity: X = 4.1723 SD = 1.08957	Complex1	4.2022	1.15974
	Complex2	4.1798	1.18285
	Complex3	4.1348	1.07863
Formalization: X = 4.1161 SD = .81974	Formal1	4.1573	1.02135
	Formal2	4.1236	.83693
	Formal3	4.0674	.86337
Centrality: X = 4.1049 SD = .80339	Central1	4.0449	.83815
	Central2	4.1124	.78968
	Central3	4.1573	.99885
Software Project Success: X = 4.0764 SD = .78015	Software1	4.2247	.91394
	Software2	4.0787	.86897
	Software3	4.1573	.92808
	Software4	4.1124	.87176
	Software5	3.8090	1.14690
Organizational Culture: X = 4.1191 SD = .81893	Culture1	4.2022	.95560
	Culture2	4.1461	.92381
	Culture3	4.0337	.81811
	Culture4	4.1236	.95132
	Culture5	4.0899	.92491

Source: Research survey, 2016;

The data (table 1) reveals high mean values for the variables of the study relative to a corresponding low degree of dispersion where $x > 3.0$ and $SD < 2.0$ given the characteristic of the scale (5 – point Likert). This implies that participants of the study on the average affirm to their experiences of structure and working frameworks within the organization which reflects instances of complexity, formalization and centralization. Furthermore, participants also affirm to various software project successes and completion within the organization as well as their experiences of various cultural beliefs, values and artefacts.

Table 2: Tests for Hypothetical Assumptions

			Software	Complex	Formal	Central
Spearman's rho	Software	Correlation Coefficient	1.000	.567**	.647**	.535**
		Sig. (2-tailed)	.	.000	.000	.000
		N	89	89	89	89
	Complex	Correlation Coefficient	.567**	1.000	.398**	.471**
		Sig. (2-tailed)	.000	.	.000	.000
		N	89	89	89	89
	Formal	Correlation Coefficient	.647**	.398**	1.000	.568**
		Sig. (2-tailed)	.000	.000	.	.000
		N	89	89	89	89
	Central	Correlation Coefficient	.535**	.471**	.568**	1.000
		Sig. (2-tailed)	.000	.000	.000	.
		N	89	89	89	89

** . Correlation is significant at the 0.01 level (2-tailed); **Source:** Research survey, 2016; where Structure = organizational structure, culture = organizational culture; software = software project success; Complex = complexity; formal = formalization, Central = centralization

The result for the tests for the null hypothetical assumptions of no significant associations between the variables reveals that there is however a significant relationship between the dimensions of organizational structure and software project success. This is as the data reveals that complexity and software project success are significantly associated at a rho = 0.567, where p = 0.000 (P < 0.05); hence an indication that complexity as a dimension or feature or organizational structure significantly affects the success or completion of software projects in the selected organizations. The data also indicates that formalization and software project success at a rho = 0.647 where p = 0.000 (P < 0.05) are significantly associated implying that organizational structure through its attributes and manifestations of formalization, significantly affects the success or completion of software projects in the selected organizations. Furthermore, the data also reveals a significant relationship between centralization and software project success where rho = 0.535 and p = 0.000 (P < 0.05) implying that the success of software projects as well as their completion depends considerably on organizational structural characteristics such as the level of centralization as observed in the selected organizations. This analysis hence reveals that organizational structure is significantly associated with software project success, therefore the previously null hypothesized assumptions and statements of no significant associations between the variables are rejected.

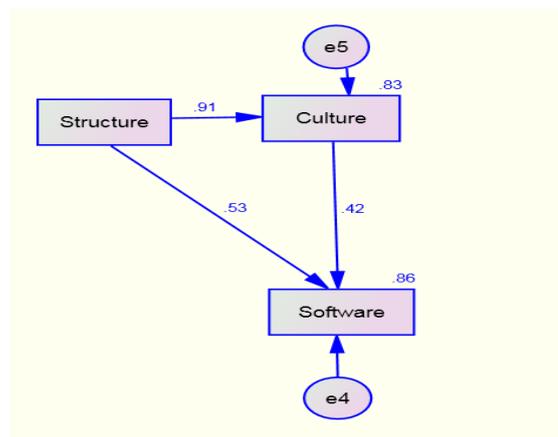


Figure 4: Bootstrapping tests for mediating effect of Organizational Culture

Where structure = organizational structure; culture = organizational culture and software = software project success.

Table 3: Test for mediating effect of organizational culture

Effects (X → Y)	Estimates	Significance
Direct Effect		
Organizational structure → software project success	0.53 (βY1.2)	P < 0.05
Organizational structure → Organizational culture	0.91 (β21)	P < 0.05
Organizational Culture → Software project success	0.42 (βY2.1)	P < 0.05
Indirect Effect		
Organizational structure → Organizational Culture → Software project success	0.38	P < 0.05

Source: Research survey, 2016.

Data (figure 4 and table 3) illustrate the output for the bootstrapping test for the mediating effect of organizational culture on the relationship between organizational structure and software project success. Where the indirect effect ($\beta_{21} * \beta_{Y2.1} = 0.38$) is less than the direct effect ($\beta_{Y1.2} = 0.53$). The results imply that the culture of the organization does not significantly mediate the relationship between organizational structure and software project success; therefore the previous null hypothetical assumption of no significant moderating effect is accepted.

V. DISCUSSION

This study reveals that the interrelationships of the different dimensions of organizational structure (Centralization, formalization and Complexity) plays an important role in order for organizations to attain successful software projects implementation. These findings is in line with other authors like (Brown, 2008; Andersen et al., 2009) who have argued that organizational structure has an effect on project performance. The structure of an organization that allows for positive communication amongst software project stakeholders has been credited for the success level in software projects (Petersen and Wohlin, 2010). This communication is usually swayed by many factors such as the type of software, users and organizational structures involved (Sommerville, 2011). Organizational structure which refers to “the formal aspect of an organization’s functioning: Division of labor; hierarchical authority; job descriptions” (Beynon-Davies, 2002) shapes the relationships between employees, process and management. According to result of the analysis, there is an interrelationship between the different dimensions ; centralization, formalization and Complexity , hence the success of a software project not only depends on an individual component but also depends on the relationship between centralization and formalization, formalization and Complexity and Complexity and centralization.

Therefore, it is imperative to ensure that the structure of the organization is designed to support software implementation as the design of the organizational structure would affect the software design and equally the software outcomes can change the structure of the organization (Al-Halak et al., 2010; Baxter and Sommerville, 2011). It is Unavoidable that differences and disagreements occur in any fast-paced organization, but unsettled conflicts between team members is seen to be the most influential factor in terminating the effectiveness of that team more quickly or more completely (Humphrey, 1996). In this light, software project managers should aim to reduce the structural conflicts by clarifying or altering line of authority and responsibility as well as harmonizing reporting relationships processes (Robinson et al., 1974).

Furthermore, the bootstrapping test for the mediating effect of organizational culture on the relationship between organizational structure and software project success shows that the culture of the organization does not significantly mediate the relationship between organizational structure and software project success; therefore the organizational culture, the project culture and sub-culture of the teams which is usually referred to as “*That’s the way we do it!*” (Lipičnik, 1993) or “*The way things are done around here*” (Lewis, 1995) does not significantly mediate the relationship between the various dimensions of organizational structure and the success of a software project. Although the organizational culture significantly associated with project success, it doesn’t mediate the relationship between structure and project success.

VI. IMPLICATIONS FOR FUTURE RESEARCH

The application of a quantitative analysis method is useful for generalization of findings to other socio-economic and socio-cultural frameworks. This further explains “what” the dimensions of organizational structure are and “how” they contribute to software implementation success. The consultants, top management, project team members and project managers involved in this study, were willing to assess the viability and success of previous software projects ranging from network and database connections to online banking systems and back-end development; and made conclusions about what they considered reflects instances of complexity, formalization and centralization. It would be beneficial in future research on mediation effects to consider how certain instances of organizational culture affect each other in a reinforcing manner.

VII. CONCLUSION

This study makes use of a bootstrapping research method and follows the correlation analysis to identify the mediating effects of culture on project success. More importantly, it examines and discusses dimensions of structure and their contribution to successful software project implementation. The results of this research result suggests that three dimensions of organizational structure though they shape individual and collective culture , culture does not shape success of software project, and the development of the organizational culture alone does not lead to software project success. The participants have agreed that the instances of organizational structure (Centralization, formalization and Complexity) directly impact the success of a software project. It is also hoped that this study will serve as a guideline for researchers wishing to investigate software project success factors or problems associated with organizational cultures and project management.

Author's Contributions

All authors equally contributed in this work.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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