(RESEARCH ARTICLE)

Investigating the Role of Leadership in Project Complexity: An Empirical Assessment Using the MODeST Complexity Model

Winifred Udende *

Department of Business Administration, College of Management Sciences, Joseph Sarwuan Tarka University, Makurdi, Benue State Nigeria.

Abstract

This study investigates the relationship between project complexity and leadership competencies in project management. Using the MODeST model as a framework, the research quantifies project complexity and evaluates its correlation with transactional and transformational leadership styles. Data was collected via structured questionnaires targeting experienced project managers across various industries. A weighted scoring method was used to quantify complexity, followed by a bivariate correlation analysis. Results reveal that although most leadership competencies showed a positive relationship with complexity, no statistically significant correlation was found between leadership styles and project complexity. The findings challenge prevailing assumptions about the direct influence of leadership style on project success, especially in complex project environments. This suggests a need for a more flexible, context driven approach to leadership in project management. The study also highlights the limitations of current complexity guidelines and calls for future research using mixed methodologies.

Keywords: Project Complexity; Leadership Styles; Transformational Leadership; Transactional Leadership; MODeST Framework; Project Management Competencies; Soft Skills

1. Introduction

A project is a temporary and unique endeavour undertaken to deliver a result. The result can be a change in the organisation, its processes, performance, products or services. This transformation/change is as a result of gaps between the start and finish state of the production processes, products or services in the organisation. Projects are used to achieve results, which can be deliverables, improved performance or improved resources in terms of knowledge and skills. Every project is unique because there are always different goals, resources and environments and these elements can contribute in making the projects even more complex to manage (Vidal et al, 2011).

The study of complexity in projects is a growing phenomenon in project management and historically, several research have been carried out over the years in that regard and the findings indicates two scientific approaches in the management of project complexity; descriptive complexity, where project complexity is classified as technological and organisational complexity. Secondly, perceived complexity, where complexity of a project is seen from and observers' perspective (Baccarini, 1996; Schlindwein et al., 2005). The former is regarded as objective and the latter is regarded as subjective.

Organisations use projects to accomplish their business objectives and most works in organisations are being done through projects, for instance, new product development and client projects. Although more work is being done through projects, there is a high rate of project failure (Maylor et al., 2008). A project may fail for many reasons including

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* Corresponding author: Winifred Udende

inaccurate budgeting and estimated time of delivery (Whitty and Maylor 2009). Project complexity could also be a chief reason because underestimating project complexity invariably leads to serious issues in the delivery of the project, including problems in motivating and leading teams (Bosch-Rekveldtet al. 2010). Hence, there is a need to study and quantify project complexity as well as to understand the influence of project complexity on leadership and project success (Maylor et al., 2008). The purpose of this study is to use the MODeST complexity model to investigate the role of project complexity and to determine if there is any relationship between project complexity and leadership.

We live in a world where most things are done as projects for instance, change in the organisation, revenue earning, new product development and many other activities take place through project-based processes. Processes that is vital to these organisations whether it is in private or public sector. The importance of project management is also reflected in the increasing formalisation of projects, which includes the spread of different forms of projects.

Project management practice is widespread, and it is different from other areas of management. One, it is dominated by professional associations and these associations have their Bodies of Knowledge like the (Project Management Institute (PMI), Association of Project Management (APM) that states project management "best practice". These associations give a baseline for organisational practice and individual competence or knowledge assessment. The biggest one is the PMI, which have over half a million certified project management practitioners globally. Their Body of Knowledge is an American National Standard and it is use in the USA. The UK's Office of Government Commerce (OGC) awards Project in Controlled Environment (PRINCE2) and has awarded over 300,000 practitioner-level certifications in the last five years, mainly in Europe. This shows a clear appetite on the part of both individuals and organisations for improved performance; performance that is currently poor for most projects (Geraldi et al, 2011). The professional associations promote their "best practices" as remedies for poor performance. However, performance improvement is elusive.

Project Management has a strong normative element, based on the assumption that good performance will result from the application of best practices. In this case, a high level of dissemination of best practices (as exemplified by certifications to various bodies of knowledge), has not been accompanied by improved performance (e.g. as evidenced by continued performance problems – Standish Group, 2009). This does question the universality of the best practices and indicates that there is an independent contingency variable that impacts on practice and thence performance.

Understanding project complexity will be of significant benefit, both to academics studying projects and to project managers who must deal with the complexities of projects in practice. Complexity can be challenging, and practitioners are looking for guidelines. Current guidelines are often inadequate for dealing with complex projects (Williams, 2005), and it does appear that complexity is neither adequately comprehended nor managed.

One very important area to consider when looking at project complexity is leadership competencies. This is because project managers are the drivers of projects and their ability and styles of leadership invariable determines the fate and direction of the project. Skulmoski and Hartman (2010) indicated that competency as broadly used is a problematic word; it means different things to different people. Competency is an umbrella word for everything that has to do with performance. (Bassellier, Reich, and Benbasat, 2001).There is no universal agreement on the definitions or theories of competency (Seppänen, 2002). The definition of competency is poor, contradictory or restrictive (Robertson et al., 1999; Skulmoski and Hartman, 2010). Leadership competencies include skills, attitudes, knowledge and personal characteristics and these can be bettered through experience and/or training (Spencer and Spencer, 2008; Athey and Orth, 1999).

While lots of literature surrounding project management competency are simple, anecdotal or theoretical, there is a vast body of research done on the technical skills of project managers (Lei, Hitt and Bettis, 1996; Brown, 2000). Nevertheless, competency research is shifting as project management is moving away from the technical bias to more emphasis on the behavioural approaches (Cheng et al., 2005; Leybourne, 2007). For instance, Skulmoski and Hartman (2010), studies soft competencies in information system project managers, which include communication, negotiation, leadership, personal attributes etc. Skulmoski and Hartman concluded that different soft competencies are needed at different stages of a project. The project manager's leadership style has also been linked to project type (Müller and Turner, 2007). They found that emotional competence (EQ) has a significant contribution to project success in most of the project situations they studied. For engineering projects, more transactional styles of leadership are appropriate; while, for information systems projects, self-awareness and communication are particularly important. But other competencies also contribute to project success as well.

Dainty et al. (2005) investigated the competencies that construction managers need and concluded that they require team building, leadership, decision making, mutuality and approachability, honesty and integrity, communication, ability to learn, self-efficacy, and an external focus. Another research was carried out on project manager competencies

by El-Sabaa (2001). The results showed that soft skills (e.g. personal characteristics, traits, and skills) of the best project manager have the greatest influence on project management practices; technical skills, on the other hand, had the least influence. El-Sabaa's contribution supports Lechler (1998) and concludes that soft skills contribute greatly to project performance and success, more than technical skills like scheduling. One must conclude that leadership competencies are important in projects; notwithstanding, while we have lists of leadership competencies that contribute to project success; the knowledge of competency is needed in order to manage project complexity.

In summary, complexity is studied in project management so that the right methodology will be used, but there is little literature that tries to quantify project complexity. Also, there is a need to find if there is a correlation between project complexity and leadership styles.

Even though, project management bodies of knowledge provide guidance for managing project complexity, but these guidelines appear to be ineffective. There are researches in this area of project complexity, those studies only defined and characterized project complexity. None of the researchers have tried to quantify project complexity. Also, there is no unified understanding of project complexity in the project management community.

Having the tools to analyse project complexity provides greater understanding and gives a start as to how to manage project complexity. Therefore, this research used Maylor's (MODeST) to quantify project complexity.

The issues highlighted above form the basis for this research. The research problem as well as the aims and objectives are discussed in the following sections.

1.1. Research Problem

As highlighted in the research background section, there has been an increase in recognition of the importance of both project complexity and leadership competencies/styles in project management but there is lack of clarity to what project complexity is about since there is no unified definition of complexity. On the other hand, previous studies have indicated the important of leadership when executing projects but none of these studies have tried to find out if there is a relationship between project complexity and leadership competencies/styles. There is a need to have a better understanding as to what project complexity is about, as well as how leadership competencies/styles can be used to manage project complexity. This research seeks to investigate this problem by examining the perception of project practitioners to gain a better knowledge of project complexity by quantifying project complexity and leadership competencies.

2. Materials and methods

This research aims to investigate the project practitioners' perception of what project complexity is about, using the MODeST framework of complexity to quantify project complexity and investigate the correlation between project complexity and leadership competencies/styles.

2.1. Research Objectives

Evaluate factors affecting project complexity. Determine how MODeST framework of project complexity can be measured. Evaluate project leadership styles. Identify a correlation between project complexity and leadership competencies/style.

2.2. Research Questions

What is the effect of complexity on project management? What are the main factors affecting complexity? What are the main theories describing project complexity? How can MODeST framework of project complexity be measured? What are the main relevant leadership theories for project management? What are the main leadership competencies required by project managers? How do leadership competencies/styles affect project complexity?

2.3. Scope of the research

This research focuses on quantifying Project Complexity using MODeST framework. It also looked at leadership styles and checked for correlation between transactional/ transformational leadership styles in line with project complexity, where leadership styles could be used to manage complexity in projects.

A range of literatures were reviewed with regards to project complexity and leadership styles to understand current practices and other researches done in the area of project complexity and leadership styles. The literature found that project managers' leadership style and their competencies have direct and measurable influence on the performance of the project regardless of the complexity of the project.

To measure project complexity, a mini questionnaire was designed and sent to practicing project managers who have completed a successful project within the past two years. A weighted scoring method was used to analyse the mini questionnaire. The mini questionnaire was sent to a panel which includes project managers from Network Rail, Willmott Dixon and other project practitioners from the University of Bedfordshire. Also, a separate Likert scaled questionnaire was developed and sent to APM members who have completed a successful project within the last two years.

The reasons for the second Likert Scaled questionnaire was to capture and understand the respondents' attitudes, beliefs, and opinions regarding project complexity and transactional/transformational leadership styles. The result included a large volume of rich data, which was textually analysed to measure project complexity and to identify the correlation between project complexity and transactional/transformational leadership styles.

3. Results and discussion

3.1. Respondent Demographic Analysis

The questions under this section were about their gender, job title, and years of experience. Information about academic and professional qualification was also obtained in this section. 109 respondents took part in the questionnaire, male (n=81) and female (n=28).

Table 1.0 below presents the job title of these respondents as follows: 41 were project managers, 19 assistant project managers, 18 project engineers, 17 programmer managers, 14 belonged to other categories on the questionnaire.

Table 1 Job Title (Source: Own work)

	Job title	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Project manager	41	35.9	35.8	35.8
	Assistant Project Manager	19	17.4	17.9	53.8
	Project Engineer	18	16.5	17.0	70.8
	Programme Manager	17	15.6	16.0	86.8
	Others	14	12.8	13.2	100.0
	Total	106	97.2	100.0	

As far as experience in project management is concerned, 16 respondents had less than 2 years' experience, 37 had two to five years' experience of working on projects while 26 had six to ten years' experience. 21 respondents also had 11 to 21 years' experience and 9 respondents had more than 25 years of experience in project management (see table 20)

Table 2 Years of Project Management Experience (Source: Own work)

		Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	<2	16	14.7	14.7	14.7
	2-5	37	33.9	33.9	48.6
	6-10	26	23.9	23.9	72.5
	11-25	21	19.3	19.3	91.7
	>25	9	8.3	8.3	100.0
	Total	109	100.0	100.0	

The academic qualifications of the respondents are presented in table 3.0 it shows that 27 of the participants are master's degree holders, 70 had bachelor's degree, 5 had diploma qualifications and 7 possessed other academic qualifications.

Table 3 Academic Qualification (Source: Own work)

	Academic Qualifications	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	Master's degree	27	24.8	24.8	24.8
	Bachelor's degree	70	64.2	64.2	89.0
	Diploma	5	4.6	4.6	93.6
	Others	7	6.4	6.4	100.0
	Total	109	100.0	100.0	

Table 4 shows the professional qualifications of the participants and it can be seen that 38 participants had Prince 2 practitioner qualification, 15 had APMP, 7 are IPMA level C holders, 5 had IPMA Level B, 11 are PMP certified and 11 are PgMPSM holders. 22 of the participants had other professional qualifications not mentioned.

Table 4 Professional Qualifications (Source: Own work)

	Professional Qualifications	Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	Prince 2 Practitioner	38	34.9	34.9	34.9
	APMP	15	13.8	13.8	48.6
	IPMA Level C	7	6.4	6.4	55.0
	IPMA Level B	5	4.6	4.6	59.6
	PMP	11	10.1	10.1	69.7
	PgMPSM	11	10.1	10.1	79.8
	Others	22	20.2	20.2	100.0
	Total	109	100.0	100.0	

The next on the questionnaire was information about the type of projects the respondents worked on which are categorised in their industries in table 5.0. It indicates that 27 of the respondents just finished information technology projects, while 8 completed offshore and petrochemical projects. 7 of the respondents are in advertising and marketing, 13 are in product development. 18 of the respondents are involved in construction projects and another group of 7 respondents completed aerospace project successfully. 12 of the respondents were involved in event management projects, 14 were involved in financial service projects and the remaining 3 carried out other projects which were not listed on the questionnaire.

Table 5 Project Type in terms of Industry (Source: Own work)

		Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	Information Technology	27	24.8	24.8	24.8
	Offshore and petrochemical	8	7.3	7.3	32.1
	Advertising and marketing	7	6.4	6.4	38.5

	Product development	13	11.9	11.9	50.5
	Construction	18	16.5	16.5	67.0
	Aerospace	7	6.4	6.4	73.4
	Event management	12	11.0	11.0	84.4
	Financial services	14	12.8	12.8	97.2
	Others	3	2.8	2.8	100.0
	Total	109	100.0	100.0	

Regarding the budget of the projects which the participants just completed successfully is shown on table 6. It shows that 24 of the respondents completed their projects with a budget below £100,000. 20 respondents finished their projects with a budget between £100,000 - £400,000. 25 respondents around £401,000- £500,000, 26 completed projects worth £501,000 - £5,000,000 and 14 respondents finished projects worth more than £5,000,000.

Table 61 The Budget of the Projects (Source: Own work)

		Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	Budget below £100,000	24	22.0	22.0	22.0
	£100,000-£400,000	20	18.3	18.3	40.4
	£401,000-£500,000	25	22.9	22.9	63.3
	£501,000- £5,000,000	26	23.9	23.9	87.2
	More than £5,000,000	14	12.8	12.8	100.0
	Total	109	100.0	100.0	

Table 7 presents the time which it took the respondents to complete their project. The table shows that 37 of the respondents completed their projects in less than one year while 48 respondents completed their projects between one to two years. 24 of the respondents took more than three years to finish their project.

Table 7 The Duration of the Project (Source: Own work)

		Frequency	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
Valid	< 1 year	37	33.9	33.9	33.9
	1-2	48	44.1	44.1	78.0
	>3 years	24	22.0	22.0	100.0
	Total	109	100.0	100.0	

After the respondents' demographic analysis of the questionnaire, it is important to validate the unit of analysis as was mentioned in the previous chapter. The unit of analysis for study are project practitioners from different sectors such as IT, construction, manufacturing, event management, financial etc. with recent experience of executing projects successful. It is significant to validate the data if the data covers this unit of analysis before proceeding further with data analysis. To do a validation of the targeted unit of analysis, a t-test was conducted. Therefore, a little discussion of what a t-Test is about has been addressed below.

3.2. t-Test

A t-Test is a parametric statistical technique that compares groups. t-Test measures the actual differences between two means in connection to the variation in the data (Pallant, 2011).

There are two types of t-test which includes:

- **Independent Sample t-Test:** This is employed when the researcher needs to compare the mean scores, on some continuous variables, for two different groups of participants.
- **Paired Sample t-Test:** This is also known as a repeated measure and is employed when the researcher has only one group of respondents (companies or machines) and is interested in collecting data from them at two different times or conditions.

An independent sample t-test was used here to validate if the targeted samples for the unit of analysis were obtained. Hence, an industrial description analysis of the respondents was conducted. The results of analysis indicated that the (IT) industry had the highest number of respondents (n=27) out of 109, whereas the rest of the industries where treated as one (see table (25). Thus, the mean value of IT industry and the other industries was compared to see if there are any statistically significant differences between the two (see table 8). The 25 questions under project complexity where used to do the t-test.

Table 8 Comparison Summary of Information Technology and Other Industries Responses (Source: Own work)

		Information Technology		Other Industries		P-value
		Mean	Standard Deviation	Mean	Standard Deviation	
S/N	Mission					
1	The project team had a clear understanding of the goals.	91.78	20.3	88.1	20.98	0.42
2	The project interconnects with other projects.	38.67	16.08	32.78	17.79	0.11
3	The project team used new technologies to carry out the project.	16.67	8.04	13.98	8.64	0.15
4	The project involved legal constraints.	31.11	16.39	39.37	18.01	0.03
5	Health and safety issues caused problems within the project	14.33	4.51	21.29	12.77	5.48
	Organisation					
6	The project team was working in the same geographically located office	10.33	4.58	11.56	3.53	0.21
7	Face-to-face communication was the main channel of communication between team members.	4.44	2.44	5.1	2.72	0.25
8	Successful implementation of the project required changes to the organisation that carried out the project.	5.11	2.24	4.2	2.26	0.07
9	Decisions regarding the project were made in a timely manner.	8.78	3.98	7.9	4.15	0.33
10	The organisational structure was satisfactory	11.85	5.49	11.46	5.36	0.75
	Delivery					
11	The Project team was unable to cope with any changes to the objectives of the project.	10	3.99	10.5	3.78	0.69

12	Information regarding the project reached the people who required it.	11.48	5.69	10.98	5.95	0.57
13	The Project team was clear about its tasks and responsibilities.	23.33	4.8	23.34	5.89	0.99
14	A common project methodology was used throughout the project.	3.7	1.2	3.45	1.13	0.34
15	The budget of the project was flexible.	8.44	4.2	7.46	4.34	0.3
	Stakeholders					
16	Key stakeholders influenced the project negatively.	9.56	5.33	11.41	7.34	0.16
17	The stakeholders responded to the project needs in a timely manner.	24.33	10.24	21.4	10.45	0.21
18	The stakeholders were committed to the project.	22.22	5.96	21.59	6.17	0.04
19	There was good a relationship between the contractual stakeholders and the project team.	36	3.53	33.59	8.72	0.64
20	Project stakeholders had requirements outside of the project objectives.	34.67	16.42	31.46	14.92	0.37
	Teams					
21	The project team was knowledgeable about project management.	57.78	17	60.18	11.9	0.5
22	The project team had a shared vision for the project.	33	7.89	32.38	11.03	0.75
23	The project involved multi-disciplinary teams.	68.67	21.78	63.88	24.36	0.34
24	The project team was competent in the technical aspects of the project.	23.33	7.32	22.83	6.49	0.75
25	Team members were not motivated in carrying out the project.	31.56	16.36	34.24	17.9	0.47

The table above is the result of an independent-sample that was done to compare information technology industry and other industries Mean. There were no significant differences in the Mean for information technology and other industries. The mean, standard deviation and the p-values are shown on the table. The p-values are higher than 0.01. This means that we met the targeted unit of analysis. Therefore, all the industries are treated as one.

After the t-test was conducted, the next step was to calculate the weighted score since there is no significance difference. For each complexity question in the mini questionnaire a weight scores were obtained. This weight score for each question was used to multiply by the same question in the main questionnaire to obtain the weighted score.

3.3. Validation of the Weighted Scores Using (Maylor et al 2008) Example

After the weighted scores were computed, the weight obtained from the mini questionnaire was multiplied with the respondent's response in the main questionnaire. The weighted score was validated to determine if it worked. The example proposed by (Maylor et al 2008) about a book launch project and a scientific research project were used for the validation. Maylor et al (2008) view was that complexity varies from project to project and the managerial challenges related with each project differ as well.

Therefore, in table 9 where the sub-factors of complexity are given, a tick was used to denote complexity, and this is assigned a value of 5. On the other hand, a cross was used to denote reduced complexity and is assigned a value of 1. 5

and 1 are used because in the main questionnaire under the complexity section, respondents were asked to tick from strongly disagree to strongly agree, with the strongly disagree coded 1 and strongly agree coded 5. This was then multiplied by the weight in the mini questionnaire to get the weighted score. The next step was to sum the weighted score together to determine if there is any difference between (Maylor et al, 2008) example and the weighted score from the questionnaire.

Maylor believed there is a higher correlation between level of complexity of a project and the number of resources needed to manage it. Therefore, he assessed the project complexity in the table below:

Table 9 Validation of the Weighted Scores Using Maylor's Book Launch Project and Scientific Project (Source: Own work)

Element of complexity	Examples of issues that make management complex	Book launch project	Scientific project
Mission	Lack of clarity of requirements.	×	×
	Large scale, high value, high importance, high urgency.	×	✓
	Large number of constraints- legal, health and safety, security.	×	✓
	High level of interaction and interdependency with other projects.	×	✓
	High level of uncertainty- novelty, implications and side effects.	×	✓
Organisation	Multiple time zones project team members operating in.	×	✓
	Lack of collocation of project team.	×	✓
	Linguistic differences between team members.	×	✓
	Lack of appropriate organisational structure used in the project.	×	✓
	High level of change that the project produces in the organisation.	×	×
Delivery	Lack of common or appropriate project management method.	×	×
	Inappropriate human, financial or other resources.	×	✓
	Problematic communications in the project team.	×	✓
	Lack of clear or timely decision-making	×	✓
	Lack of flexibility for the project manager to respond to changes.	×	✓
Stakeholders	Large number of stakeholders with differing requirements.	×	✓
	Lack of commitment to the project by key stakeholders.	×	×
	Interference in the project by key stakeholders.	×	×
	Lack of relationships with key stakeholders.	×	×
	Problematic inter-relations between stakeholders.	×	✓
Team	Lack of leadership shown by project manager.	×	×

	Cultural and other differences between team members.	×	✓
	Low level of motivation of team.	×	×
	Lack of project, technical and business experience in the team.	×	✓
	Lack of appropriate training for team members	×	✓

Table 10 Validation of the Weighted Scores in the Main Questionnaire Using Maylor's Example

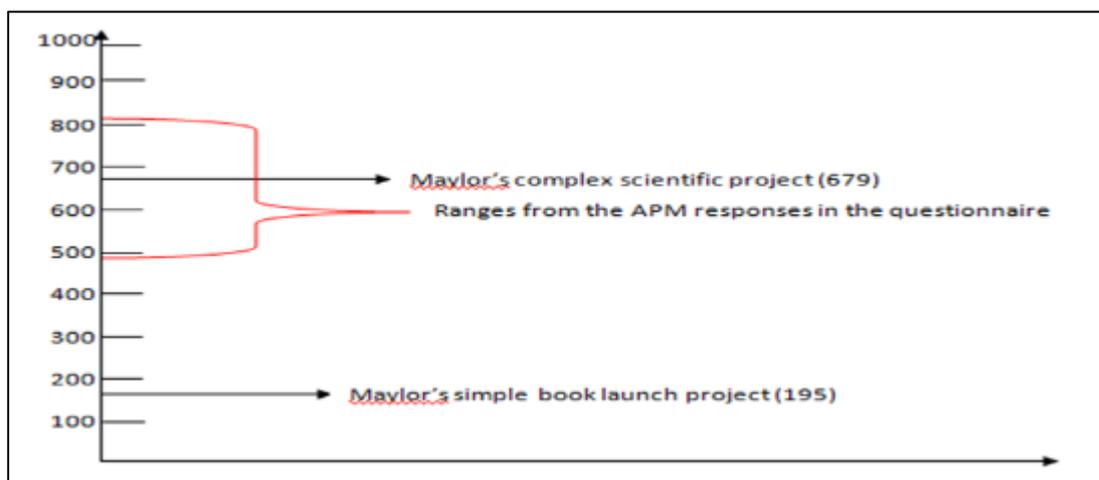|	Weighted score from questionnaire	Weighted scores from Maylor
Maximum	806	679
Minimum	486	195

Figure 1 Validation of the Weighted Scores in the Main Questionnaire Using (Maylor 2010) Example

The above graph shows the validation result of the weighted scoring method using Maylor's simple book launch project as well as a complex scientific project. The graph shows that (Maylor et al, 2008) simple project 'book launch' had a value of 195 whereas the complex project 'scientific project' had a value of 679. The projects investigated in this research can be deemed as complex because of the qualifications of the project management personnel involved. Hence, it is reasonable that the value obtained from the study lie in the periphery of (Maylor et al, 2008) complex scientific project (679) - from 486 to 806. The results indicate that the projects executed by members of the APM were of higher complexity compared to the Book Launch Project illustrated by (Maylor et al, 2008). This means that the weighted scores obtained by the APM project practitioners are sensible and reasonable for this study.

The next section answered the research question: What leadership competencies are needed by project managers to manage different levels of project complexity in other to achieve successful projects? In other words, correlation between leadership competencies and project complexity will be addressed.

3.4. Correlation of Project Complexity and Leadership Competencies

According to (Pallant, 2011) Correlation is one of the statistical techniques that explore relationships among variables. Under correlation we have the following:

A bivariate correlation is employed when the relationship between two variables is to be explored. The level of relationship could either be positive or negative. The maximum number could be either + 1 (positive) or -1 (negative) this number is the correlation coefficient. A zero correlation denotes no relationship.

Partial correlation can be used when the researcher wants to explore the relationship between two variables while statistically controlling for a third variable.

Distances calculate different variety of statistics measuring similarities or differences (distance), between pairs of variables. This can be used with procedures like factor analysis, cluster analysis or multidimensional scaling, to assist analyse complex data sets.

Bivariate correlation was employed to investigate the relationship between project complexity and leadership competencies. Under Bivariate Correlation Analysis, we have the r-value and p-value.

The r-value determines the strength and direction of the relationship. This ranges from -1.00 to 1.00 (correlation coefficient). As earlier mentioned, 0 indicate no relationship, 1.0 means a perfect positive relationship, and -1 means perfect negative relationship. Nevertheless, (Cohen, 1988) gave the following guidelines:

Small   r=10 to 0.29

Mediumr= 0.30 to 0.49

Larger= 0.50 to 1

The P-value is the probability that you would have found the current result if the correlation coefficient were in fact zero (null hypothesis). If this probability is lower than the conventional 5% (P<0.05) the correlation coefficient is called 'statistically significant'.

Table 11 Results of the Correlation (Source: Own work)

Leadership Competencies Questions	Correlation Coefficient (r)	P-value	Correlation Status
Factors of Transactional Leadership Style			
The project manager relied on punishment to control the project team	-0.15	0.105	Negative Correlation
Sanctions were given to team members who did not meet targets	-0.08	0.377	Negative Correlation
The project manager engaged in one-way communication	0	0.993	No Correlation
The project manager intervened only were tasks were not completed on time	0.04	0.675	Positive Correlation
There was no shared decision making about how aspects of the project were to be achieved	0.05	0.568	Positive Correlation
The project team was motivated by rewards	0.09	0.314	Positive Correlation
The project manager was responsive	0.15	0.1	Positive Correlation
The project manager dealt with current issues	0.16	0.096	Positive Correlation
Factors of Transformational Leadership Style			
The project manager allowed shared decision-making about aspects of how tasks were to be accomplished	-0.01	0.913	Negative Correlation

The project manager allowed the project team to be creative and listened to new ideas	0.02	0.838	Positive Correlation
The project manager was proactive	0.03	0.689	Positive Correlation
The project manager motivated the team to work for goals beyond self-interest	0.05	0.594	Positive Correlation
The project manager directly encouraged the team to complete tasks	0.05	0.607	Positive Correlation
The project manager could convey his/her vision for the project	0.07	0.451	Positive Correlation
The project team developed strong emotional bonds	0.1	0.292	Positive Correlation
The project manager created learning opportunities for team members	0.11	0.236	Positive Correlation

The table above shows the results of the correlation calculated for the different sections of leadership competencies against project complexity. Although correlation coefficient was calculated for all the leadership competencies, the p-value computed reveals that the correlation were not statistically significant, since all the p-values were above the level of significance ($\alpha= 0.05$). The results show that three factors of leadership competencies showed a negative correlation. One of the factors didn't show any correlation and the remaining twelve showed a positive correlation with project complexity. It is interesting to note that the negative correlation is only observed for certain styles of leadership, such as those relying on being harsh and leaving decisions on the hands of the subordinates otherwise known as transitional leadership. The greater part of the leadership competencies showed a positive correlation with project complexity indicating that as the complexity of a project increases its requirement on strong leadership competencies increases as well.

4. Analysis and Interpretation of Findings

The results of this study showed that the data gathered did not support the research hypotheses. The correlation result represents the MODeST model of project complexity and transactional/transformational styles of leadership. Survey was used to gather data from project practitioners. Both the mini and main questionnaires were sent for assessing these practitioners' perception on different areas. Firstly, the data was analysed using the weighted scoring method to get a measure for project complexity. Secondly, a Bivariate Correlation was later used to correlate MODeST project complexity and transactional and transformational leadership styles.

From the results, the first aim of quantifying project complexity was achieved. But the result from the second analysis showed that there was no correlation between project complexity and transactional/transformational leadership styles because there is no statistically significant since all the p-values were above the level of significance ($\alpha= 0.05$). But the correlation result rejected the following hypothesis:

4.1. H1: Transactional leadership style of project managers positively influences project performance

Transactional leadership style: There is significant evidence from the data collected that transactional leadership styled does not influence project performance positively. Instead, some of the characteristics of this style of leadership have a negative correlation.

4.2. H2: Transformational leadership style of project managers positively influences project performance

Transformational leadership style: The correlation coefficient calculated using the characteristics of transformational leadership style, indicates that the p-value computed were not statistically significant, since all the p-values were above the level of significance ($\alpha= 0.05$). This means also that transformational leadership style does not influence project performance positively.

Regardless of the efforts at the conceptual improvement of project complexity and transactional and transformational styles of leadership, the correlation results remain surprising as there is no evidence that supports the hypotheses. Even though, researches in project management regarding transactional and transformational leadership indicated that that these styles of leaderships influence project performance positively. Although there is limited literature in the context of project complexity with regards to leadership styles.

Transformational leadership styles are of special interest in project-based environments because of the significant emotional and motivational duties required of project managers. This fact requires project managers to develop faith in and commitment to projects which are often temporary. Project managers lead teams that are made up of different individuals and the managers have little or no direct control over most of them (Turner and Müller, 2003).

Transformational leadership has also been stressed as an important factor that has significant influence on project performance (Kissi, et al., 2012). Project managers who executed projects using the transformational style motivated their project team to pursue the project goals better; making the team committed to the project as well as increasing the performance of the team (Jung et al., 2008). Tyssen et al. (2014) and (Hwang and Ng, 2013) indicated in their researches that the transformational style of leadership changes the project team by causing them to look beyond self-interest in favour of the organisation's objectives which resulted in an improvement of the morale, ideals and values of the project team. Additionally, project managers who employed transformational leadership in executing their projects were shown to have teams that are more committed, satisfied, motivated as well as put more effort towards achieving the project goals (Müller and Turner, 2010).

On the other hand, transactional leadership is commonly used to contrast transformational leadership. Transactional leadership style is established on the leader's exchanges with the followers. The followers obtains some valued outcome such as wages and prestige when they achieve the desired performance and punishment or sanction when the goals are not met (Yang et al., 2012).

Although research reveals that transformational leadership is a preferred style of leadership for projects, like (Kissi et al, 2013) and (Keegan and Den Hartog, 2004) who established a link between transformational leadership with motivation and commitment of the project team. They went further to stress that the transformational style of leadership is an important factor that influences innovation and performance on project. In addition to this, Tyssen et al. (2014) also pointed that transformational leadership are most effective during the period of change in project.

Nevertheless, there are situations where it is more productive for project managers to "switch" their leadership styles in a given project. The motivation for project managers to switch has been attributed to responses from the progress status of projects. Hence Project managers can decide to switch their leadership approaches in response to the projects either progressing too slowly or not at all, veering away from the goal, or progressing backwards. It is no doubt that a project manager who is more flexible in the leadership approach employed is a lot more successful than a strict one.

To achieve the basic aim of the research and answer the questions and also meet the objectives, the research developed a conceptual framework using the MODeST project complexity model and transactional/transformational leadership styles to test whether there is a correlation of these variables on project. Also, a weighted scoring method was employed to quantify MODeST complexity; the validation of this measurement was done using (Maylor, 2010) example of a simple book launch project and a complex scientific project. While the overall finding of the correlation showed that there is insignificant influence of transactional and transformational leadership with regards to project performance. This is in contrast to what is indicated by other researchers like (Kissi et al, 2013; Yang et al, 2012) which claims that leadership styles can positively impact on project success. In addition, the effect of project managers is vital to project success since their leadership influences the project success through teamwork (Yang et al 2011).

Based on the analysis of the findings, the point of departure for this research was the quantification of MODeST model of project complexity. Though, the two hypotheses were rejected as there was no support from the data collected. We live in the world where most things are done as projects. For instance, change in the organisation, revenue earning, new product development and many other activities take place through project-based processes. These processes are core to most organisations whether it is public sector or private sector. Maylor et al. (2008) pointed out that more than 50% of Siemens value-adding activities are done as projects. Schwalbe (2013) stated the importance of projects by indicating that one-fourth of the world's domestic products are attributed to projects. The project management bodies of knowledge have developed well-established methodologies for carrying out projects. These methodologies are poor when handling project complexity (Geraldi et al, 2008). The definition of project complexity was identified to be inconsistently used in its discussion as with the reality which is described by practitioners (Maylor et al. 2008; Geraldi

et al 2008). Some project management companies have their own methods for evaluating project complexity alongside with (Maylor 2003) but these methods are ineffective due to the nature of complexity.

As a result of these issues, MODeST model of project complexity was used to quantify project complexity which is more comprehensively contrast to previous methods described by other research. A weighted scoring method was used to measure project Complexity. Therefore, by quantifying complexity, it will help provide project management organisations in the following way:

- Help match the experiences of the project manager and the team against the project to be executed.
- Help the organisation with the tools and the right project governance to use
- Help the organisation to save cost.
- It can also be used by project management organisation in developing countries as a scale to assess project complexity since project managers from developing countries always adopt methods from the developed countries.

5. Conclusion

This research set out to explore the relationship between project complexity, quantified through the MODeST model and leadership styles, particularly transformational and transactional approaches, within diverse project environments. While the study achieved its first objective of measuring project complexity using a weighted scoring method, the findings revealed no statistically significant correlation between project complexity and either leadership style. These results challenge the prevailing assumptions in project management literature, which often suggest a direct link between leadership style and project outcomes, particularly in complex environments. One of the key insights from this study is the recognition that traditional leadership models may be insufficient when applied rigidly to dynamic, complex project scenarios. The lack of a statistically significant relationship suggests the potential for more context-sensitive or hybrid leadership approaches that can adapt based on the project's demands, organizational environment, or stakeholder configurations.

Despite these valuable findings, the study is not without limitations. The use of a purely quantitative method restricted the depth of insight, particularly in understanding the subjective perceptions and nuanced experiences of project managers dealing with complexity. Respondents were confined to selecting from predefined options, which may have led to overly generalized results and a lack of contextual richness. In addition, the difference in structure between the mini and main questionnaires limited the scope of complexity factors evaluated, potentially affecting the comprehensiveness of the complexity assessment. These limitations suggest several avenues for future research. Studies incorporating mixed methods both quantitative and qualitative approaches could yield a deeper understanding of how leadership styles interact with project complexity. Moreover, expanding the sample to include a broader and more diverse group of project practitioners could enhance the generalizability of the results. Finally, exploring alternative or blended leadership frameworks, such as situational or contingency theories, may offer new perspectives on effective leadership in complex project contexts.

This study contributes to both academic knowledge and practical project management by providing empirical evidence that challenges widely held beliefs about leadership effectiveness in complex projects. By highlighting the limitations of current complexity guidelines and the ambiguity in leadership influence, it calls for a more adaptive and reflective approach to project leadership. These insights can assist project-based organizations in more accurately assessing project demands and aligning leadership strategies accordingly ultimately leading to better project governance, performance, and success.

Compliance with ethical standards

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Appendix "C" Main Questionnaire

Survey of Soft Skills Competencies in Project management

Main Questionnaire

This questionnaire was distributed to gather information regarding the role of soft skills competencies in project management. This questionnaire will help in identifying factors that contribute to project complexity in project management. This questionnaire should take less than ten minutes of your time and remains anonymous in other to ensure confidentiality of the information provided. The information provided will be used solely for academic purposes.

Section 1 – Personal Information

Please provide the following information about yourself

Your gender is...
- Male
- Female

Your job title is...
- Project Manager
- Assistant Project Manager
- Project Engineer
- Programme Manager
- Others...

Years of project management experience

- <2
- 2-5
- 6-10
- 11-25
- >25

Your academic qualifications include (tick all that apply)
- Master's degree
- Bachelor's degree
- Diploma
- Others ...

Your professional qualifications include (tick all that apply)
- Prince 2 Practitioner

- APMP
- IPMA Level C
- IPMA Level B

- PMP
- PgMPSM
- Others ...

Section 2 – PROJECT INFORMATION

The project was in the following area:
- Information Technology
- Financial services
- Offshore and petrochemical
- Advertising and marketing
- Product development
- Construction
- Aerospace
- Event management
- Other...

The budget of the project was...
- Budget below £100,000
- £100,000-£400,000
- £401,000-£500,000
- £501,000- £5,000,000
- More than £5,000,000

The duration of the project was...
- < 1 year
- 1-2
- >3 years

Did the project involve new technology?
- Yes
- No
- Not applicable

Were the team members operating in multiple time zones?
- Yes
- No
- Not applicable

How many nationalities were you involved with in the project?
- < 2
- 2-5
- 6-10
- 11-25
- >25

Factors contributing to Project Complexity

The next section considers the project mission, the organisation that carried out the project, delivery, the project team and internal and external stakeholders.

Section 3 –Mission

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.1	The project team had a clear understanding of the goals.					
3.2	The project interconnects with other projects.					

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
3.3	The project team used new technologies to carry out the project.					
3.4	The project involved legal constraints.					
3.5	Health and safety issues caused problems within the project					

Section 4-Organisation

Definition

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
4.1	The project team was working in the same geographically located office.					
4.2	Face-to-face communication was the main channel of communication between team members.					
4.3	Successful implementation of the project required changes to the organisation that carried out the project.					
4.4	Decisions regarding the project were made in a timely manner.					
4.5	The organisational structure was satisfactory.					

Section 5 – Delivery

Definition: Project methodology gives a standard method and guidelines to ensure that projects are conducted in a disciplined, well managed and consistent manner that promotes the delivery of quality products and results in projects that are completed on time and within budget.

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
5.1	The Project manager was unable to cope with any changes to the objectives of the project.					
5.2	Information regarding the project reached the people who required it.					
5.3	The Project team was clear about its tasks and responsibilities.					
5.4	A common project methodology was used throughout the project.					
5.5	The budget of the project was flexible.					

Section 6- Stakeholders

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6.1	Key stakeholders influenced the project negatively.					
6.2	The stakeholders responded to the project needs in a timely manner.					
6.3	The stakeholders were committed to the project.					
6.4	There was good a relationship between the contractual stakeholders and the project team.					
6.5	Project stakeholders had requirements outside of the project objectives.					

Section 7 – Team

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
7.1	The project team was knowledgeable about project management.					
7.2	The project team had a shared vision for the project.					
7.3	The project manager led the team successfully.					
7.4	The project team was competent in the technical aspects of the project.					
7.5	Team members were not motivated in carrying out the project.					

Section 8 – Transformational, transactional and contingency leadership

	Statements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8.1.1	The project manager was responsive					
8.1.2	The project manager dealt with current issues					
8.1.3	Sanctions were given to team members who did not meet targets					
8.1.4	The project manager relied on punishment to control the project team					
8.1.5	The project team was motivated by rewards					
8.1.6	The project manager intervened only were tasks were not completed on time					

8.1.7	The project manager engaged in one-way communication					
8.1.8	There was no shared decision making about how aspects of the project were to be achieved					
8.1.9	The project manager allowed the project team to be creative and listened to new ideas					
8.2	The project manager created learning opportunities for team members					
8.2.1	The project manager motivated the team to work for goals beyond self-interest					
8.2.2	The project manager could convey his/her vision for the project					
t8.2.3	The project team developed strong emotional bonds					
8.2.4	The project manager was proactive					
8.2.5	The project manager used two-way communication					
8.2.6	The project manager directly encouraged the team to complete tasks					
8.2.7	The project manager allowed shared decision-making about aspects of how tasks were to be accomplished					