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Software Project Complexity and Project Success: Mediating Role of Project Dynamism and Moderating Role of Agility-Based Project Management

Mahram Razzaq[1], Aamer Hanif [2], Nimra Afzal[3]

[1] Tecbrix Cloud, Garhoud, Dubai, UAE
[2] NUST Business School, National University of Sciences & Technology, Islamabad, Pakistan
[3] Faculty of Management Sciences, Riphah International University, Islamabad, Pakistan

*Corresponding author's Email: nimra.afzal@riphah.edu.pk

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Abstract

This article examines the relationship between project complexity and project success while investigating the mediating role of project dynamism, and the moderating role of agility-based project management approach with the application of contingency theory. Quantitative approach has been used for data collection and analysis throughout this study. Data was collected [n = 341] from employees working at different management levels in software project-based firms across Pakistan. For data analysis, SPSS Process Macro was used with simple mediation (model 4) and moderated mediation analysis (model 14). The moderated mediation model 14 depicted that project complexity does not have a significant negative effect on a project's success, whereas project dynamism mediates the relationship between project complexity and project success. Furthermore, the agility-based project management approach plays a vital role being the only moderator between project dynamism and project success. The present study findings suggested to policy or decisions makers that adoption of agility-based project management practices in dynamic environment can significantly enhance the chances of project success. This study has highlighted the concern that projects with greater number of complexities and dynamism should be handled using agility-based project management approach in order to achieve project success. Organizations must learn implementing agility-based project management approach for projects that are both complex and dynamic in nature.

Keywords: Project dynamism, software projects, agile project management, project success, project complexity.

1. Introduction

Rapid technological progress in the software industry has significantly increased the complexity of software-based projects. Coupled with rapid changes that take place in organizations, projects frequently experience alteration in identified scopes, leading to

repeated re-works, recycling of project phases, inclusion of contingencies that involve additional costs, and inherent risk of failure in terms of both application and currency (Cooper & Sommer, 2016; Boehm, 2002). The desire of clients to include intricacies and refinements at different stages of projects has driven the transition from traditional practices to agile practices in recent years (Grepan, 2025; Jabar et al., 2019). As a response to this shift, research on agile practices has been conducted on a global scale with assistance from multiple teams to meet the growing demand of the software industry and to solidify guidelines for the smooth implementation of agile practices, particularly in large and complex projects (Shastri et al., 2021). This background sets the stage for understanding why agility has emerged as a central approach in managing dynamically complex projects.

Several studies have been conducted to understand the negative effects of different elements present in projects (Al-Mohammad et al., 2023; Kukah et al., 2022). These elements directly impact the success of projects, which has been explained as the extent to which a project achieves its established goals, meets schedule requirements, stays within the allocated budget, ensures quality control, and maintains efficiency and overall productivity (Butler et al., 2020; Monserrat et al., 2025). Prior research (Li et al., 2022; TASA et al., 2023) confirmed that two problematic factors—project complexity and project dynamism—have the most profound influence on project outcomes. Scholars such as Ahsan et al. 2022 and Marnewick et al. 2017 emphasized that the intertwined nature of complexity and dynamism makes it nearly impossible to perform reliable forecasting, which is a core necessity for achieving project success. This difficulty strengthens the rationale for exploring adaptive project management approaches capable of managing uncertainty while still enabling project success.

Earlier research in this field has predominantly relied on case studies and scenario-based investigations, most of which were qualitative in nature. While such studies provided valuable insights into the significance of aligning project factors with appropriate project management approaches (Batra et al., 2010; Boehm & Turner, 2005) they left certain gaps unaddressed. Specifically, the moderating role of agility-based project management approach (APMA) in managing the relationship between project dynamism and project success has not been thoroughly investigated. Furthermore, although international literature highlights the benefits of agile methodologies, there is a lack of quantitative, empirical research that investigates how these methodologies actually impact the success of dynamically complex projects in practice. This limitation is even more pronounced when considering the context of Pakistan, where software firms often face challenges in coping with complexity and dynamism due to limited familiarity and lesser experience with APMA. The scarcity of such research in the Pakistani context establishes a clear and significant research gap.

To address this research gap, the present study sets out to examine three specific objectives. First, it investigates the impact of project complexity on project success. Second, it

explores whether project dynamism mediates the relationship between project complexity and project success. Third, it examines whether the agility-based project management approach moderates the relationship between project dynamism and project success (Chow & Cao, 2008; Young et al., 2016). The focus on software project-based firms in Pakistan allows this study to provide insights that are both contextually relevant and practically valuable. In doing so, the study not only develops a deeper understanding of the dynamics between complexity, dynamism, and success but also extends the empirical foundation of project management research.

The usefulness of this study lies in its potential contributions to both theory and practice. Theoretically, it builds upon contingency theory by examining how the selection of project management approaches should depend on specific project characteristics. By empirically testing the role of APMA, the study enhances the literature on project complexity, project dynamism, and their combined influence on success. It enriches existing knowledge by going beyond descriptive and case-based accounts and offering a quantitative, evidence-based perspective on how firms can respond effectively to complexity and change. Practically, the study provides guidance to firms that are struggling to achieve success in dynamically complex environments by offering evidence on the benefits of adopting agile practices. For Pakistani software firms, which often lack experience in implementing APMA, these insights can be especially valuable in informing management strategies.

The implications of this research extend to multiple stakeholders. For project managers, the study offers insights into how agility can be leveraged to counter the negative effects of complexity and dynamism, thereby improving the likelihood of achieving project success. For practitioners and employees, the study underscores the importance of training and capacity building in agile concepts, ensuring that skilled manpower is equipped to navigate uncertainty and dynamic change. For policymakers and leaders in the software industry, the findings provide a stimulus to design initiatives that promote the adoption of agile methodologies and support organizational learning. From an academic perspective, this study contributes to the line of inquiry on project complexity and success by filling a context-specific research gap and advancing empirical evidence on APMA.

In summary, the study contributes to project management literature by focusing on a critical and under-researched area: the interplay between project complexity, project dynamism, and project success in the context of Pakistan's software industry. By exploring the moderating role of agility-based project management approaches, it adds depth to the understanding of how adaptive methodologies can safeguard projects against the risks of failure that often accompany complexity and dynamism. The insights derived from this study will enrich academic literature, provide practical tools for managers, and inform broader organizational strategies aimed at improving project performance in rapidly evolving environments. The importance of this study lies not only in its academic contribution but also in its practical implications for organizations striving to remain

competitive and successful in the face of ever-increasing technological and organizational challenges.

The paper is organized as follows: After identifying the study's objectives and implications, the theoretical context and hypotheses development are presented in the second section. The next sections present data collection methods, findings, and discussion. Finally, the study's conclusion is presented together with its limitations and suggested future directions.

2. Literature Review and Hypotheses Development

2.1 Underpinning Theory

The present study research model is based on contingency theory. As this theory is developed by (Fiedler, 1964). In 2001 (Donaldson, 2001) claimed that it can be used for organizational effectiveness. The contingency theory emphasizes that there is no best way to manage, rather it depends on the fit between context. In simple words, there is no universal approach to manage organizational effectiveness, decision making regarding organizations depends on context. In the context of project management, this theory emphasizes that the need of flexible and adaptive strategies for project with high degree of complexity and dynamism. Agility-based project management is iterative and flexible approach that can change in accordance with requirements and context, which is effective for complex and dynamic environment. According to the theoretical lens of contingency theory, the study proposes a model where project complexity cause dynamism that negatively influence the success of a project. However, agility-based project management mitigates the adverse effects of complexity and dynamic environment on the project success in the context of software industry.

2.2 Project Complexity and Project Success

Project complexity based on diverse 'difficulty' factors in particular project prominence, accountability, precision of scope and criticality of a project (Wozniak, 1993). (Morcov et al., 2021) defined project complexity as something which creates difficulty in understanding, anticipating and managing a project's behavior, even when reasonable amount of information is provided regarding the project. A higher degree of project complexity infers to the presence of additional dependencies and difficulties in executing and supervising the project. In case of software-based projects, the degree of complexity is a function of its scope and technical requirements. According to (Jaiswal et al., 2025; Nguyen & Mohamed, 2020), project complexity tends to be a critical factor in managing projects because it adds more trouble in accomplishing the aim of the project. (Elia et al., 2020) stated that complexity affects the projects processes and their outcome. Higher number of requirements equate to more complex projects.

(Ominde et al., 2025; Zolin et al., 2009) views a complex project as one which involves inconsistencies in various fields of PM at different stages of currency of a project, thereby

affecting the project in terms of controls and smooth management with lowest level of predictions for its success. Consequently, (Damasiotis et al., 2018) outlines that software-based projects are complex by nature and in most cases their outcome is uncertain. Similarly, project success has always been controversially discussed in the literature. (Butler et al., 2020; Rehman, 2020) defines project success as the degree to which a project achieves its recognized goals, such as its schedule, obligatory requirements, costs to be incurred, allocated budget, quality control, efficiency, and overall productivity. (Hoxha & Mcmahan, 2019; Luo et al., 2020) states that project success is regarded as the vital goal which is pursued by the project team members and all stakeholders in project management. Attributing factors identified by (Iriarte & Bayona, 2020) for success of a project include trust, keenness and seamless & uninterrupted communication between all stakeholders which are instrumental in effective and efficient progression during each phase of development of the project. According to (Tam et al., 2020) time, cost, and quality are recognized as the iron triangle of project management and these measures are used to evaluate project success whereas, (Radhakrishnan et al., 2022) argued that actual measure of the success of a project is found in client's satisfaction. Moreover, an undesirable influence on the success triggers by adding more to scope and requirements of the project. An increased number of requirements means more complexity involved which results in delays in completion of the project (Clark, 1989). Existing literature indicates that project complexity has a negative effect on project success. Projects also fail due to prevailing complexities in a project which are able to cause cost overruns (Kaming et al., 2010). The presence of complexities in a project tends to enhance risks associated to the success of the project. Considering the aforementioned information, the following hypothesis has been proposed:

- H1: Project complexity will have a significant effect on project success.

2.3 Project Complexity, Project Dynamism and Project Success

Project dynamism refers to the "Rapid Changes" made or encountered in a project (Collyer & Warren, 2009). (Maylor et al., 2008) defines project dynamism in terms of inconsistency and variability whereas, (Geraldi & Adlbrecht, 2007) suggest that project dynamism relates to the sum of variations in scope and the negative effects it induces upon the success of the project. Projects that go through constant changes in scope are considered as highly dynamic projects. These highly dynamic projects are prone to greater postponements in schedule and unexpected incurred costs (Reichelt & Lyneis, 1999), which are presumed as a threat to the success of a project (Collyer et al., 2013). However, in certain projects, it has been experienced that dynamism due to supportive technological advancements and downward revision of scope by the end users have simplified the scope of project thereby facilitating the project's success both in terms of costs and duration of the project.

Furthermore, in some cases a ripple effect of reworks is produced in projects where continuous and frequent changes in scope and requirements is observed (Chritamara et al., 2001; Mookerjee & Chiang, 2002). (Wang et al., 2017) stated that unforeseen events are

always present while working on projects. These unforeseen events can only be conceived or examined once the project starts to progress, thus from this perspective it is quite evident that project dynamism has a significant negative effect on project success. (Maylor et al., 2008) suggested that project dynamism refers to the number of changes and their effect on scope and client's requirements. Frequent changes in the project scope also causes negative impact on team morale which subsequently effects the success of the project (Thamhain, 2004). Project complexity is not the only challenge software-based firms face while executing projects but dynamism is also a formidable barrier to project's success (Butler et al., 2020).

It was abstracted in many researches that the term project dynamism is one dimension of project complexity. Dynamic characteristics if present in a project, result into uncontrollable large changes (Jabar et al., 2019). (Tam et al., 2020) suggested that dynamism can be handled by establishing a cooperative working connection between the client and project manager, with both perceiving the project as a partnership. (Wu et al., 2021) pointed out that the complex nature of the project (i.e., project complexity) and consecutive changes (i.e., project dynamism) make it nearly impossible to perform reliable forecasting in order to achieve success for the project. Therefore, following hypothesis has been proposed:

- H2: Project dynamism will mediate the relationship between project complexity and project success.

2.4 Moderating Effect of APMA on the Relationship Between Project Dynamism and Project Success

The agility-based project management approach (APMA) is also known to be a change-driven approach (Serrador & Pinto, 2015). According to (Baskerville & Pries-Heje, 2004) this approach focuses on life cycles of projects which have a tendency of being adaptive in nature as projects tend to face fluctuations in assumptions, incremental increase in requirements, and quite a few limitations and constraints. APMA is viewed to be more about swiftly managing the variation in requirements linked with the uncertainty present in a project, while becoming a positive force for both the project and the project team (Jugdev & Müller, 2005; Sandstø & Reme-Ness, 2021)

According to (Morcov et al., 2020) in today's dynamic environment, projects experience more issues relating to complexity and dynamism, which are observed through numerous methods used for acquiring tools and technologies during the development process. In APMA, elementary outcomes are defined, initial targets are established, and the project outcomes are consistently revisited & further refined using an adaptive process (Gemino et al., 2020). (Trippensee & Remané, 2021) emphasized upon the need for organizing meetings for the entire organization, wherein the project management team, developers and agile trainers can collectively share ideas and define core agile values. As APMA is more

about managing and dealing with the negative effects of complexity and uncertainty (i.e., dynamism), present in a project (Dybå et al., 2014). Henceforth, in order to adjust to technological advancements, projects' changing scope and clients' requirements, agile practices must be adopted. (Collyer et al., 2010) stated that project complexity is solely managed by project teams using the conventional project management approaches although implementing agility-based project management approach will facilitate project teams in managing dynamically complex projects with greater efficiency. Therefore, it has been agreed by many researchers that agility-based project management approach helps overcome dynamism through adaptation, improvisation and incremental and iterative processes (Cao et al., 2009; Harris et al., 2009). In this regard, contingency theory supports the phenomenon that there is no single practice or method to handle the complexities and their impact on project success due to various characteristics or a project and its dynamic atmosphere. However, agility-based project management is considered as effective and vital approach for managing complexities and dynamic environment of projects, as it provides framework and enables firms to quickly adapt changes and flexibility in their processes in accordance with the situation and characteristics of a project (Ahimbisibwe et al., 2015; Conforto et al., 2016). Hence, the following hypothesis has been proposed:

- H3: Agility-based project Management approach will moderate the relationship between project dynamism and project success in such a way that this relationship will be weak when agility-based project management approach is high.

Based on the above literature of existing studies, the conceptual model developed for this study is shown in Fig 1.

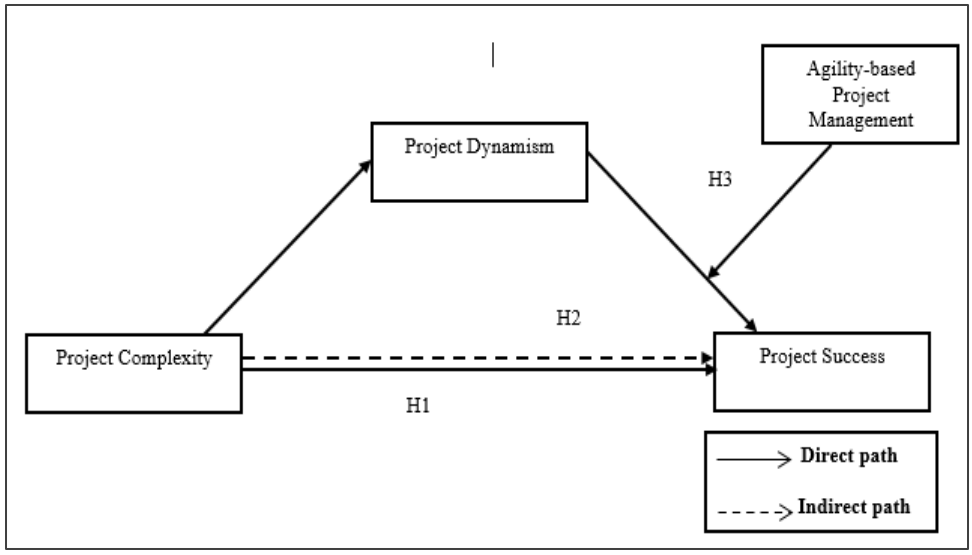

Figure 1: Proposed Research Framework

3. Research Methodology

3.1 Data Collection and Sample Size

The data was gathered through a self-administered questionnaire using purposive sampling technique since the researchers wanted to use their best judgment in selecting participants for the survey (Black, 2010). The questionnaire was forwarded to suitably experienced employees working in the field of software all across Pakistan. Some participants received it by email and some received a direct link to the created questionnaire on google form. Six hundred fifty questionnaires were distributed out of which 390 were received back however only 341 were usable after removing outliers. Hence, the final sample size of the study was 341 constituting a response rate of 52%.

The authors took into account each respondent's autonomy when conducting this study, and everyone's response to the survey was optional. Participants' anonymity was expressly guaranteed. Everyone was made aware that their answers and identities would be kept strictly confidential and used solely for this study.

In the questionnaire, there were two main sections. The first section comprised of all the demographic information such as gender, level of management, and total job experience. 75% of the participants were male and 25% were female. 53% of participants were in a middle-level management position, 27% of participants were in a top-level management position whereas, 20% of participants were in a lower-level management position. 50% of participants had a total job experience between zero to five years, 20% of participants had a total job experience between six to ten years, 28% of participants had a total job experience between eleven to fifteen years and lastly 2% of participants had a total job experience between sixteen to twenty years.

3.2 Measures

The second section of the questionnaire covered items from each variable i.e., project complexity, project dynamism, APMA and project success. The items from each variable were to contribute towards acquiring data relevant to the subject of the study. For all study variables, a five-point response scale for measurement was used, where 1 represents “strongly disagree” and 5 represents “strongly agree”. Project complexity was measured via a 3 items scale, developed by (Butler et al., 2020). A sample item is “Project complexity was high”. Project dynamism was developed by (Butler et al., 2020) using a 3 items scale for measurement. The items for Project Dynamism were reverse coded. A sample item is “Scope was clearly defined”. Agility-based project management approach (APMA) was measured via a 10 items scale, derived from (Butler et al., 2020). A sample item was “The project team anticipated and adapted to changing assumptions, constraints, and requirements”. Project success was measured using a 10 items scale, derived from (Shenhar & Dvir, 2007; White & Fortune, 2002). A sample item was “The project met reliability goals.”

4. Data Analysis

During data pre-processing for analysis, Mahalanobis Distance test was performed in order to identify multivariate outliers in the collected dataset (Penny, 1996). After removing outliers, the final sample size for this study was (n=341). A multicollinearity test was then performed, and VIF values greater than or equal to 10 (VIF ≥ 10) were checked against each independent variable. All variables had values less than the threshold, confirming that multi-collinearity was not a serious issue for this study. Table 2 illustrates VIF values for each of the independent predictors against Project success, along with the Cronbach alpha values on diagonals. The values of Cronbach alpha against each variable were at an acceptable level indicating reliability of scale (Keyworth et al., 2020). Furthermore, descriptive statistics including mean and standard deviation along with correlations between variables are also displayed in Table 1.

Furthermore, the study selected Hayes Process Marco model 4 and model 14. These models suit the current study context. This study proposed moderated mediation hypothesis. Process macro was selected because it provides direct statistical testing for moderated mediation models with smaller sample size.

Table 1: Descriptive Statistics, Correlations, Multi-collinearity and Cronbach Alpha

Variable	Mean	SD	1	2	3	4	VIF
Project Complexity	4.07	.86	(.715)				1.358
Project Dynamism	2.33	1.30	-.45**	(.954)			3.686
APMA	3.86	1.03	.51**	-.85**	(.937)		4.002
Project Success	3.95	.89	.43**	-.80**	.85**	(.915)	

Note: p< .05*, p< .01**, n-341, Cronbach alpha on diagonals within brackets

4.1 Simple Mediation

Model 4 of Hayes Process Macro was applied to the data to generate results for mediation. Table 2 shows total effect (B = 0.447, p= 0.000) and direct effect (B = 0.091, p= 0.017) of project complexity on project success. Both were found to be significant as p-value is less than 0.05. Moreover, bootstrapping was used, in order to confirm the significance of an indirect effect of project dynamism on the relationship between project complexity and project success. 95% confidence intervals (LLCI, ULCI) were calculated using 5000 data samples from the raw data samples (N = 341). **Error! Reference source not found.** d emonstrates the indirect effect of project complexity on project success through project dynamism to be significant (B = 0.356, SE = 0.025, 95% CI = [0.306, 0.404]), as the 95% CI does not include zero. Thus, this confirmed that project dynamism mediates the relationship between project complexity and project success. This result supports H2.

Table 2: Regression Results for Simple Mediation

Total Effect		Direct Effect		Indirect Effect			
B	**p**	**B**	**p**	**B**	**SE**	**LLCI**	**ULCI**
0.447	0.000	0.091	0.017	0.356	0.025	0.306	0.404

4.2 Moderated Mediation Analysis

From the conceptual model shown in Error! Reference source not found.**,** it can be observed t hat this model represents second stage moderated mediation. In order to test the moderated mediation effects, Hayes Process Macro Model 14 (Hayes, 2018) has been applied. From Table 3, it can be observed that the direct effect of project complexity on project success was insignificant (B = 0.073, SE = 0.039, 95% CI = [-0.003, 0.149]), which indicates that H1 was not supported. Table 3 also demonstrates conditional indirect effects at different levels of the moderator. As APMA was mean centered, hence, the three different levels of APMA were (mean=0.000, +1SD=1.025 and -1SD=-1.025).

APMA was found to moderate the effect of project dynamism and project success as the interaction term is significant (B= 0.102, SE= 0.024, P= 0.000). The overall moderated mediation model was supported with the index of moderated mediation. The index of moderated mediation is negatively significant (B = -0.070, SE = 0.017, 95% CI = [(-0.101, -0.034]), and zero does not fall between the upper and lower bound, as shown in **Error! R eference source not found.**. A negative index indicates that the mediation by project dynamism only gets stronger when the level of APMA gets weak. Hence, H3 was supported.

The mediation effect of project dynamism was found to be significant for low level of APMA (B =0 .172, SE = 0.032, 95% CI = [0.111,0.234]) as the 95% CI does not include zero. Similarly, at mean level of APMA, the mediation effect of project dynamism (B =0.100, SE = 0.030, 95% CI = [0.044, 0.161]) was, again, significant as the 95% CI does not include zero. Lasty, for high level of APMA, the mediation effect of project dynamism was insignificant because (B =0.029, SE =0.038, 95% CI = [-0.042, 0.108]), as the 95% CI does include zero. Hence, this implies that at higher levels of APMA, mediation effect of project dynamism reduces but results still show evidence.

Table 3: Regression Results for Moderated Mediation

	B	SE	T	P
Project Dynamism				
Constant	2.769	0.307	9.018	0.000
Project Complexity	-0.681	0.074	-9.215	0.000
Project Success				
Constant	3.767	0.146	25.730	0.000
Project Complexity	0.073	0.039	1.891	0.060
Project Dynamism	-0.147	0.038	-3.891	0.000
APMA	0.0467	0.049	9.480	0.000
Int_1	0.102	0.024	4.296	0.000
APMA	Boot Indirect Effect	Boot SE	BootLLCI	BootULCI
Conditional indirect Effects at Levels of APMA= M± 1 SD				
-1SD (-1.025)	0.172	0.032	0.109	0.235
M (0.000)	0.100	0.030	0.043	0.164
+1SD (1.025)	0.029	0.038	-0.040	0.107
Moderator	Index	Boot SE	BootLLCI	BootULCI
Index of Moderated Mediation				
APMA	-0.070	0.017	-0.102	-0.033
Effect	SE	P	LLCI	ULCI
Direct Effect of Project Complexity on Project Success				
0.073	0.039	0.060	-0.003	0.149

To visualize the three simple slopes of regression, **Error! Reference source not found.** d emonstrates a graph in which project dynamism values are plotted on the X-axis and values of project success are plotted on Y-axis. The three slopes indicate three different levels of the APMA. From the graph, slope where APMA is (+ISD) =1.025), the mediating effect of project dynamism on project success becomes very low and insignificant. This means APMA moderates the relationship between project dynamism and project success in such a way that this relationship becomes weak when APMA is high, or one standard deviation

above the mean. This is because even with a high (+SD) value of project dynamism ((+ISD) =1.30), the project success mean value is (Mean=4.50). The graph also represents two other slopes at different levels of APMA. The slope at the mean level of APMA shows a significant mediation effect. Similarly, the slope of APMA (-1SD) also shows a significant mediation effect of project dynamism on project success. Hence, it is now evident that the relationship between project dynamism and project success depends on the different levels of APMA. However, it is also substantial to understand that the mediating effect of project dynamism is significant for two levels of APMA.

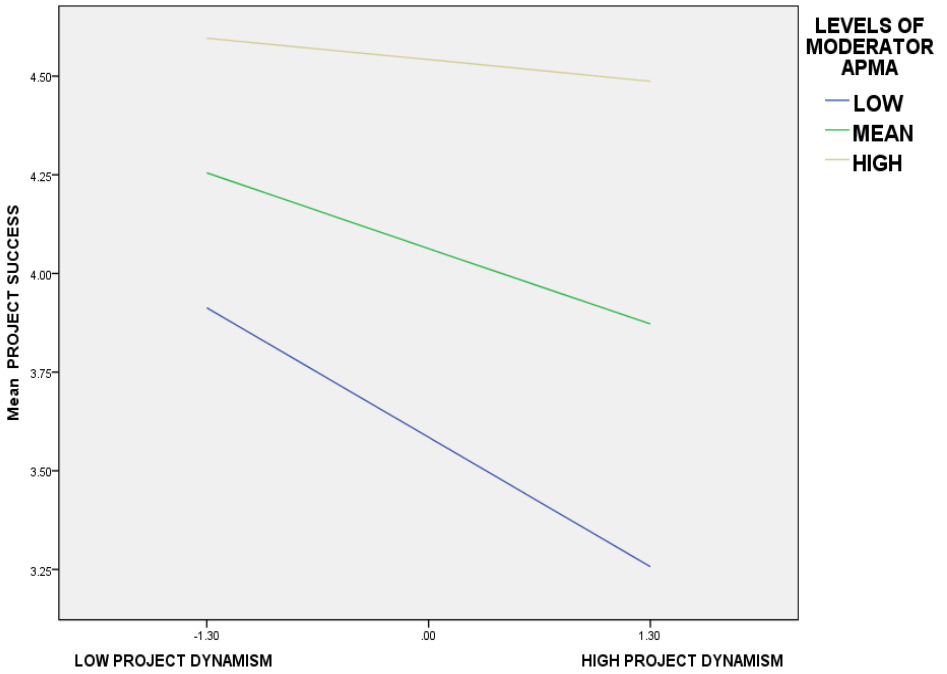

Figure 2: Moderated Mediation Graph

5. Discussion on Findings

As evident from the empirical analysis, two of the hypotheses of this study were supported. H1 was not supported. Prime factor contributing towards neutralization of this hypothesis is the critical path analysis undertaken at both planning and execution phases by project management teams to ensure project's success. Therefore, it can be assumed that structural complexity tends not to affect the overall success of the project but instead has an impact on the performance only. Whereas, the complexity that involves dynamism may affect project's success (Shafique et al., 2023). The results depict that project complexity is

neither solely and nor significantly affecting project success. Findings of (Elia et al., 2020) suggest that traditional approaches can be ineffective when dealing with higher levels of complexity, therefore more integrative, systemic & universal approaches are required. However, findings of this study align with prior research conducted by (Butler et al., 2020). Whereas, a few previous researches (Barry & Lang, 2003; Boonstra & Reezigt, 2023; Luo et al., 2017; Ma & Fu, 2020) have shown the relationship among project complexity and project success to be negatively significant. Even so, it is quite logical to assume that success of the project is not mainly affected by factors contributing towards increasing complexities. Instead, these complex challenges lead towards more vigilant planning and improved strategy selection by the project team, with a positive effect on some aspects of the project.

Moreover, H2 was supported, claiming the mediation effect of project dynamism to be significant. These findings were in line with the previous research findings of (Butler et al., 2020), where it was highlighted that project dynamism negatively affects the success of the project. Moreover, it has been emphasized in many previous researches that the term project dynamism is one dimension of project complexity. But (Floricel et al., 2018; Wang et al., 2017) stated that both project complexity and project dynamism make it nearly impossible to perform reliable forecasting in order to achieve success for the project. Dynamic characteristics, if present in a project, result into uncontrollable large changes (Jabar et al., 2019). (Tam et al., 2020) suggested that dynamism can be handled by establishing a cooperative working connection between the client and project manager, with both perceiving the project as a partnership. However, project dynamism surely affects the smooth progression of projects. The factors like ignorance of End user and changing demands necessitates changes and adjustments to the project's scope. The rapid technological advancements invalidate the existing scope or at least require variations which warrants re-works and re-allocation of resources. All the above-mentioned factors negatively affect the project's success. According to the findings of (Gemino et al., 2020), comprehensive & realistic scope eliminating the complexity through active and un-interrupted communication & involvement of stakeholders guarantees project success. Project success can be achieved by creating clear scope requirements, reduction of complexity, and upholding a high level of stakeholder involvement.

The moderated mediation index was significant, hence H3 was supported. This depicts that APMA is most suited for projects with higher level of dynamism. This is mainly because APMA works best where projects exhibit high inconsistency in tasks, in the abilities of individuals working as a team, and in the technology being used. (Chakko et al., 2021) stated that agile practices focus on shorter project's life-cycles that continually adapt and align with evolving client needs. The literature presented by (Bergmann & Karwowski, 2019), confirms the limitations and constraints of traditional project management approaches in order to manage dynamically complex projects. Hence, APMA is able to fill in the gaps created by today's dynamically complex projects and this approach is able to ensure project success. According to the findings of (Ciric et al., 2021), APMA's

application in software industry has been particularly witnessed as the most powerful tool for the success of the project in comparison to other fields which fetch their own advantages through this application. (Serrador & Pinto, 2015) findings also proved that APMA has a statistically significant relationship with project success and that agility appears to work well irrespective of the perceived complexity of the project. Comparable results were obtained by a more recent study (Butler et al., 2020) in which the relationship between project dynamism and project success was moderated by APMA; the results confirmed significance of APMA and how this approach helps cater for projects which are dynamically complex by nature.

6. Conclusion

The study highlighted the importance of the agility-based PM concept and examined the character of project complexity and project dynamism in the overall project life cycle. The core objective of this study was to determine the presence of agile PM in the complex and dynamic nature of the project and analyze its effect on project success with the application of contingency theory. The findings of this study showed project complexity does not have a significant impact on the success of a project, but there is a little inverse relationship between project dynamism and project success and most important the presence of agility PM approach mitigates unexpected events due to project dynamic and complex nature. Moreover, complexity is an integral component of a project which cannot be circumvented completely but may be meticulously structured in a manner to become an additive in best project management practices. This study aids in understanding project complexity and project dynamism in depth and the negative effects they induce upon a project's success. This study shows evidence of the need to adopt APMA in order to ensure greater success for the project. APMA is an effective tool both in terms of organizational readiness and technical eagerness to accept, innovate and deliver to changes at all tiers and all phases of project without risk of failures and delays within most economical costs. Consequently, proactive involvement by the project team is required to handle projects of both complex and dynamic nature.

The study proposed framework determines the practical implication of agility-based project management approach for complex and dynamic projects. As this research has been done for the software-based firms, therefore, the study provides guidelines to decision makers and highlights the concern that projects with greater number of complexities and dynamism should be handled using APMA in order to achieve success. Project teams working on dynamically complex projects, may benefit from the insights identified in this study. To sum up, APMA's application in software industry has been particularly witnessed as the most powerful tool for the success of the project in comparison to other fields which fetch their own advantages through this application.

Moreover, study also enriches the literature on contingency theory integration with project management. Project complexity cannot negatively affect success of a project however, in

the dynamic environment project complexities significantly and negatively influence success of a project. This finding significantly contributes to the contingency theory and highlights dynamic environment can create hurdles for projects. In case of agility-based project management it can undermine the effects of complexity and dynamism. This outcome emphasizes adaptability, flexibility and agility as vital contingencies for project success.

Similar to every other research, this study also inherits a few limitations. The respondents for this study were based in Pakistan, and the study was conducted only for project-based software firms. As this study only focused on one industry, the results obtained only specify the projects which are software technology-related projects. Future studies could be replication of study in various contexts or countries like developed and underdeveloped to strengthen and validate the findings generalizability. This research can also be conducted to validate results from other industries such as construction, and telecom. Furthermore, future research could also focus specifically on examining the influence of agile project management on project performance with the application of resource-based view. This could produce some interesting differences in project management approaches and project outcomes. Lastly, future studies can statistically determine the moderating role of organizational support.

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