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Impact of Project Management Strategies and Project Complexity on Project Success

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Abstract: This article aims to investigate how project management affects project fulfillment. Connecting skills to the project environment is key to project management skills. The abilities of project managers to lead successful activities have been examined in numerous studies. The project manager wants to hold on to rigid skills that can be applied to the project's circumstances. The relationship between the project supervisor and the project group, which encourages experimentation and learning, affects how strong their skills are. A thorough literature study reveals the lack of agreement on project complexity as a moderator between project success and project management skills, which also offers a comprehensive overview and critical analysis of the underlying ideas. This investigation's main goal moved to determine project success outcomes by considering project complexity as a moderator between project management skills and project success. To do so, this analysis looks at accumulated data on the complexity of and problem management abilities. The statistics were gathered through online surveys, and the results were examined using logistic regression models. How well project management understanding predicts project fulfillment, the original research question, has been answered. The findings demonstrate that combining project management abilities with problem complexity can help anticipate project success, which was to be expected. There was no statistically significant association between effective project management and unsuccessful projects.

Keywords: project management, project evaluation, project management skills, project complexity, project success

1. Introduction

Project management has gained popularity as a single-control concept and a means of achieving both commercial goals and the economic development of developing nations. Many projects in developing countries, especially those connected to foreign resources from development partners, involve product enhancement, real estate improvement, infrastructure improvement, and event planning. To achieve specific project aims and desires, project management includes planning, organizing, staffing, coordinating, and handling resources [1]. The effectiveness of project managers has been the subject of numerous studies [2]. Project managers must possess various talents that can be applied depending on the project scenario. To fully develop project supervisor

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abilities, the project management and project group must interact in a way that encourages experimentation and learning. Using the project supervisor's encouraging comments and project management skills positively impacts the project's overall performance [3].

Project complexity is becoming more commonplace. The project management network is now conducting research in a related field called project complexity. Complexity obstructs project planning, coordination, control, and long-term performance, claims [4,5]. The project complexity causes hindrances in the project's pathway to success and causes failure despite having strong project management skills. There is no consensus on the definition of project complexity or how complexity affects activities. The factors that contribute to complexity have been examined in advanced research [6].

Many businesses and projects fail because of a lack of understanding and problem-control abilities. It has been stated that project management understanding is not properly implemented in Indonesia, resulting in over-budgeted and behind-scheduled tasks [7]. More than 50% of Malaysian manufacturing jobs experienced value overruns of 0.03% and 72.88% [8] because of bad project planning and execution.

In addition, Ahsan and Gunawan examined 100 projects supported by the Asian Development Bank and hosted by numerous Asian countries (Bangladesh, India, China, and Thailand); the conclusion is nearly all of the projects had been abandoned or postponed due to a lack of project management systems and a clearly described project life cycle [9]. On the other hand, some businesses use programming techniques to achieve their goals, but these techniques present some issues with the modeling process [10,11]. Organizations use a variety of strategies, i.e., investing in various actions, to manage such challenging situations on tasks. These strategies include setting up a PMO (Project Management Office), preparing teams of workers for tasks, and incorporating integrated project management practices to become more mature corporations [12].

The literature makes it clear that project management adulthood fine captures the primary driver of achieving excellence in project management (PMM). For instance, Simangunsong and Da Silva claimed that businesses with a higher level of project management adulthood have a higher propensity to complete their responsibilities successfully [7]. Additionally, a study conducted in Brazil utilizing Berssaneti and Carvalho found a strong association between adult project management and the components of project fulfillment (time, value and quality) [13]. Additionally, hiring project management experts contributes to developing a strategic strategy for expanding project management procedures in the industry [14].

On the other hand, certain empirical research has shown that higher project management adulthood levels no longer always guarantee project completion [15,16]. It is divided into two parts: task completion, which is assessed concerning the task's normal goals, and task control fulfillment, which is assessed concerning the widely used and connected performance metrics of value, time, and quality. Best project management techniques were thought to be crucial for project success. These include:

Project timetable/plans: A thorough breakdown of all the actions that must be completed for the project to succeed.

Project goals: The first readability of aspirations and well-known course.

Top Management assistance: The readiness of pinnacle control to provide the designated resources and power.

Others: The act of "selling" the finished product to its very last intended users; Implementation; customer session; conversation; session and energetic being attentive to all events affected; personnel; recruitment, selection, and education of the specified project group participants; technical tasks; availability of the critical era and understanding to carry out the specific technical motion steps; patron acceptance; tracking and feedback; active transport of feedback [1].

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Over the years, many professors have concurred that these tactics ensure effective and environmentally friendly problem management. Critical fulfillment factors are a grouping of project variables or attributes that can be carefully tied to project fulfillment and whose maximization or minimization, depending on whether they are positive or unfavorable, will contribute to project fulfillment. The crucial fulfillment criteria are the few areas where strong, aggressive performance will ensure a successful aggressive performance for the person, department, or firm. They are the selected few crucial areas where the organization places a premium on fulfillment. The organization's efforts over the term will fall short of expectations if results in those areas are unsatisfactory. The study concluded that effective planning, clearly defined roles and duties, time management, project management, governance, and communications are essential components of successful activities. It demonstrates that a clear project strategy, a plan for threat control, and the commitment and assistance of stakeholders are the essential fulfillment components for project management.

Our research has considered Project complexity as a moderator variable between Project management skills and Project success. The research focuses on these three variables, i.e., Project management skills, Project complexity, and Project Success. The influence of Project complexity is measured statistically on the relationship between Project success and Project Management skills.

2. Literature Review

Three essential indicators—project fulfillment, project complexity, and project management competency—founded this research's methodology. An analysis of the current literature revealed that globalization and technological advancements had significantly changed how certain research topics were seen. Evidence showed that conventional wisdom regarding project management proficiency, project complexity, and task completion had been called into question [17]. To complete the task, a group of behaviors and skill sets was called project management skills. In the past, it has been believed that intermediate project management abilities are the knowledge of and application of project management procedures and related equipment [18].

An important positive association between leadership skills and project success was discovered via data analysis. Additionally, it discovered that while the association between governance and internal success is moderated by project complexity, the connection to outward success is high across all complexity regimes. The data analysis also validated two different (internal and external) components for project success in addition to a unified framework for leadership [19].

The findings from [20,5] demonstrate that project complexity was strongly correlated with planned progress (constructive correlation) but not substantially with cost inflation, distribution of resources was strongly associated with scheduled progress (negative correlation) but not significantly with cost inflation, and resource distribution had a significant influence, simultaneously increasing resource allocation significantly reduces the impact of complexity of project on planned progress. The results of this research add to the body of knowledge on complexity of project by experimentally demonstrating that the degree of allocating resources affects how well a schedule performs concerning project complexity. With this understanding of resource allocation functions, project managers and engineers can better manage and manage their complex transportation projects..

As technology advanced, so did the demand for project managers with strong people skills in communication and management. Stakeholder management, team building, communication, and management were critical project management skills [21,5]. According to project managers, project management expertise is the most effective tool for achieving project goals [22]. However, having the necessary skills to manage a task has become insufficient. Instead, think of project management in terms of the project's events. Instead, project managers should modify their talents to fit the

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nature and circumstances of each problem. The mission evolved into a social organization [23]. There is, however, limited research on the connection between mental components and project performance. By adopting people-focused project management techniques, including discussion, empowerment, and empathy, the project supervisor can motivate the overall performance of the project group participants. Project managers who treated their contributors fairly were likelier to maintain their participants' enthusiasm and drive to complete the task [24]. Businesses must be resourceful and innovative to keep up with changing customer demands. Innovation is, first and foremost, about creativity. Given that projects were the primary vehicle for pursuing organizational goals, according to Lavalle's argument, project managers were well-equipped to innovate within the company [25]. Their analysis suggested that project managers who excel in flexibility and adaptability can promote a revolutionary and innovative environment.

According to the research, there has been a recent increase in general and project-specific project management skills. Because of changing customer preferences and the current day, project managers want a satisfactory manner to cooperate and share understanding, according to Moradi [21]. The project manager's ability allowed for anticipating a project's success. Their online survey invites project managers who have previously benefited from developing collaborative skills. The forty results were used to corroborate the literature, which claims that when collaboration declines, belief, building relationships, and management affect project success.

Xue et al. examined project managers' abilities assuming their primary duty was promoting innovation. Task control skills refer to the knowledge, abilities, and behaviors necessary to complete a project, together with persona, attitude, and behavior components [26]. A quantitative correlation analysis was used to support the ability of project management to enhance project events and provide innovative and long-lasting project outcomes. The literature argues that creativity is necessary for complexity control [27]. Instead of focusing on specific project management skills connected to this, a “self-administered questionnaire” was utilized to determine the techniques needed to improve project management skills related to fostering creativity. Developing project management understanding enhances the knowledge of the profession's human components [28]. Research confirmed that problem-based learning (PBL) increased awareness of team interdependence. Well-known green project managers focus on technical project management skills related to triple constraint control. Project completion demonstrates that project management skills have a marginally beneficial impact on project completion [29].

According to a 2009 study employing Whitty and Maylor, project managers can manage complex projects with the help of their interpersonal and project management skills. The complexity of the project made it tough to succeed [30]. Conflicts have been inevitable because project entities depend on connections and information sharing among project players. Complex jobs might result in tensions that need to be managed by project managers who can defuse conflict and promote teamwork. In a global poll, project managers that were able to implement war control noted that their jobs positively impacted the morality and beliefs of their coworkers. Interest in the complexity of the task has been sparked by globalization and constantly shifting illogical customer needs.

According to [31], each obstacle varies in complexity. The literature now refers to item complexity as a crucial forty-two studies thread. Recent years have seen a shift in the focus of studies from defining and categorizing complexity to providing project managers with management advice [32]. The assumptions that project complexity issues should have an impact on agile activities were put to the test [33]. The focus on customer demands developed into a conflict between the requirements for fun projects and the encouraged organizational project control model. Project completion decreased because of the growing tension between flexibility and the usage of

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prescriptive technologies. A qualitative research method revealed that the conflict between workplace ethics and unethical task behavior led to tensions that added forty-three complexities.

According to [34], threat and uncertainty caused projects to become more complicated. Project managers who should take advantage of disagreements can complete complex projects. A study of complex tasks across the United States [35] proved that project complexity decreased project fulfillment because haziness and uncertainty affected the process of project management. Decision-making was impacted by the hidden dependencies of complex tasks, in line with [21].

Complexity was introduced in a diverse way that was motivated by organizational, financial, technological, and social factors. Different financial and technological endeavors should cause uncertainty, making decision-related projects more challenging [36]. The study of [37] confirmed the possibility that a choppy and diverse interchange of statistics would bring on complicated issues arising from organizational and technical conflicts.

According to [38], the task required a sophisticated social structure and a widely used project management technique. The analysis shows that the complexity of the project can damage the relationship between the project manager and the project team. As the complexity of the project increases, the specificity of the compromise of beliefs arises. In response to the intricacy of the project findings, it was advised to promote teamwork and select group members who might have a common belief.

3. Methodology

Project complexity was shown in the research to be a significant reason for the project's failure. A statistical, theoretical correlational analysis was conducted to confront the absence of evidence on project management skills and complexity to forecast project success. This study examined how much project planning expertise and complexity influence project success using the ESM (Extended Standard Model) of PM as a relational framework. Because the study used two continuous predictor variables and one standard constant variable, the method we used to accomplish these tasks was Multiple Linear Regression.

Based on the above discussion, the following Research Questions and Hypotheses were concluded:

RQ1: How much does project complexity influence a project's success probability?

H10: The relationship between project success and project complexity is not statistically significant.

H1A: The relationship between project success and project complexity is statistically significant.

RQ2: How much do project management skills influence a project's success probability?

H20: The relationship between project success and project management skills is not statistically significant.

H2A: The relationship between project success and project management skills is statistically significant.

RQ3: How much does project complexity influence the relationship between project management skills and Project success?

H30: Project complexity does not influence the relationship between project success and project management skills.

H3A: The relationship between project success and project management skills is influenced by project complexity.

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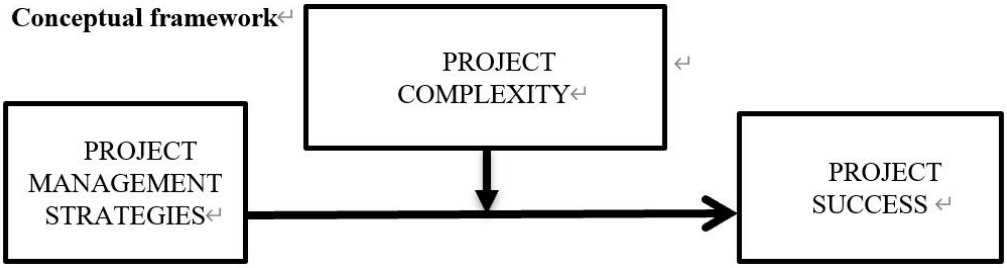

Figure 1: Conceptual framework.

3.1 Data Collection

An online survey was performed to gather data, and participants received a link to the survey via email and LinkedIn.. A total of 345 individuals with project management backgrounds responded to our questions.

Respondents were led to the survey instrument once they confirmed their informed permission. Respondents were asked 40 questions on project management skills, 32 questions about the complexity evaluation framework, and 16 questions about the project's success. The entire survey was completed in 25 minutes by participants. Each question in the survey requires a response. Participants completed the survey using a laptop, hand held devices, like tablet, or smartphone.

Hypotheses testing

To assess the influence of independent variables on dependent variables, using the statistical method of multiple linear regression, the regression coefficient R2 was calculated for each relationship between the prognostic variable and the standard variable. To establish the relevance of the association in hypothesis testing, a standard alpha threshold of 0.05 was used [39]. Stepwise multiple regression analysis was used to investigate three models of multiple regression. Empirical data supported the association between predictors and standard variables. Project management skills and project success are the only components of Model 1. Model 2 simply incorporated project success and complexity. Model 3 incorporated project complexity, project success, and PM skills.

The R-value was calculated in SPSS to assess the degree of correlation between the predictor and the standard variables [40]. The model's ability to generalize to the community was evaluated using the modified R2. The F statistic was utilized to gauge how much better the model was at making predictions compared to the inaccuracy of the model. For testing the hypotheses, t-testing was used; if the b-value was equal to 0, the alternative hypothesis was rejected. The analysis of the computed p-value revealed a straight best model fit line. "b" was substantially different from 0 if p = 0.05. Suggesting that the IV was a significant predictor of the DV.

Table 1. Data analysis.

RQ (Research Question)	Type of Analysis	Hypothesis Testing
1	MLR (Multiple Linear Regression)	H0i: βi = 0 Hai: βi ≠ 0 For i = 1,2,3 R2 variance
2	MLR (Multiple Linear Regression)	H0i: βi = 0 Hai: βi ≠ 0 For i = 1,2,3 R2 variance
3	MLR (Multiple Linear Regression)	H0i: βi = 0, Hai: βi ≠ 0 For i = 1,2,3 R2 variance

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Table 2. Variables Summary.

Research question	Variables	IV/DV/MV
1	Project Success	DV
	Project Complexity	IV
2	Project Success	DV
	Project Management Skills	IV
3	Project Success	DV
	Project Complexity	MV
	Project Management Skills	IV

The research questions and related hypotheses are shown in Table 1.3. Data was collected through Survey Monkey, Qualtrics, Emails, and LinkedIn.

4. Results

Descriptive statistics were performed on the IVs and DVs. The results are shown in Table 1.2. Observed project management ability, μ = 142.67, CI [94, 166], S = - 0.824, K = 1.057; for project complexity, μ = 124.05, CI [57, 156], S = -1.334, K = 1.961; for project success, μ = 57.28, CI [18, 71], S = -1.489, K = 3.491.

Table 3. Frequency Distribution .

Statistics	Project Management Skills	Project Complexity	Project Success
Mean	142.67	124.05	57.28
Median	145.30	127.9	59.40
Mode	146.2	140.0	63.00
Standard Deviation	13.51	20.74	8.85
Skewness	-8.14	-1.334	-1.488
Kurtosis	1.07	1.952	3.489
Minimum	94	57	18
Maximum	166	156.0	71
Range	73	97.00	52.0
Percentiles 25	133.00	116.00	54.00
50	145.00	128.00	59.00
75	153.00	140.00	63.00

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Table 4. Analysis of Variance Results.

Model	**Sum of Squares**	***Df***	**Mean Square**	***F***	**Significance**
Regression	715.777	1	715.787	17.638	0.000***
Residual	4262.513	104	40.605	18.432	0.000***
Total	4980.290	106	756.392	36.07	0.000***
Regression	2879.281	2	1438.146	71.248	0.000***
Residual	2102.009	104	20.202	16.981	0.124**
Total	4978.290	106	1458.38	90.219	0.145**
Model 1 : Project Complexity and Project Success					
Model 2 : Project Management Skills and Project Success					
Model 3 : Project Management Skills, Project Complexity, and Project Success					

Three multiple linear regression models were considered. The first model includes the ability to manipulate elements as predictors. The second model includes project management skills and project complexity. Linear regression was used to compare the variance of means between groups. These calculations are included in analysis of variance (ANOVA). Because ANOVA includes linear regression, the F statistic measures the importance of the between-group and within-group means [39]. The F statistic is used to explain model fit by dividing the amount of systematic variance in the measurement by the amount of unsystematic variance in the model. This value represents the improvement in model predictions over model inaccuracy. An F-statistic greater than 1 indicates a good model. Also, the F statistic has an appropriate probability distribution, so $p < 0.05$ is significant and the null hypothesis is rejected. The sum of the regression models shows that the second model is good as $F(2, 104) = 71.248$, $p < 0.001$.

Table 5. Results of Regression Coefficients.

Model	**B**	**Standard Error**	Q	*t*	**Significance**	**Tolerance**	**VIF**
(Constant)	27.00	7.555		3.574	0.001		
Project Management Skills	0.220	0.052	0.379	4.199	0.000***	1.000	1.000
(Constant)	8.96	5.607		1.597	0.113		
Project Management Skills	0.083	0.039	0.143	2.111	0.037**	0.886	1.129
Project Complexity	0.295	0.028	0.700	10.346	0.165**	0.886	1.129

Using a linear equation, b0 and b1 are the regression coefficients representing the ratio of the intercept to the slope. A regression coefficient of zero means that there is no relationship between the outcome variable and the predictor variable. Therefore, the value of b is not equal to zero. Using the t statistic, a hypothesis test is such that if b has a value of 0, then the hypothesis has been rejected. Therefore, if $p < 0.05$, b is significantly different from zero, indicating that the predictor is positive for the predicted outcome [39]. -value indicates strength and direction. Relationship

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Between Dependent and Independent Variables. With H01, we found no statistically significant correlation between project management competence and project success. The first null hypothesis was rejected because $F(1, 105) = 17.638$, $p < 0.001$. Accept the first alternative hypothesis. Recall from H02 that there is no statistically significant correlation between project complexity and project success. The score for the second null hypothesis is uncertain because SPSS software did not generate the F82 statistic. Additionally, the second reported project management competence ($b = 0.083$, $= 0.143$, $t = 2.111$, $p < 0.05$) and project complexity models. ($b = 0.295$, $= 0.700$, $t = 10.346$, $p < 0.05$); 0.001). In a good model, as project management capabilities increase and complexity increases, so does the probability of project success. The results of the regression coefficients are shown in Table 6.

Table 6. Regression Model Summary.

Model	***R***	***R* Square**	**Adj R^2**	**Std. Error**	**R^2 Change**	**F Change**	***df*1**	***df*2**	**Sig. F Change**
1	0.376	0.145	0.136	6.372	0.144	17.638	1	105	0.000
2	0.765	0.579	0.570	4.495	0.434	107.044	1	104	0.000
Model 1 - Project Complexity and Project Success									
Model 2 - Project Management Skills and Project Success									
Model 3 - Project Management Skills, Project Complexity, and Project Success									

The R value measures the correlation between predictor and outcome variables [39,41]. Adjusted R2 measures how well the model generalizes to the population. It turns out that project management capability is 13.6% of the variance in the first model. The second model added elemental complexity, explaining 57.0% of the variance. The results of the linear regression model are shown in Table 7.

Table 7. The third model Moderation.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.610	1	50.610	31.617	.000[b]
	Residual	316.945	198	1.601		
	Total	367.555	199			
2	Regression	83.067	2	41.533	28.761	.000[c]
	Residual	284.488	197	1.444		
	Total	367.555	199			
a. Dependent Variable: Project Success						
b. Predictors: (Constant), Project Complexity						
c. Predictors: (Constant), Project complexity, Project management skills						

The table above describes the moderation effect of project complexity on project management skills and success. The research revealed that project complexity significantly affected project management skills and project success with a significance of 0.00 with the F-value of 31.617 and

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28.761, respectively. The increase in the project complexity decreases the success ratio of the project.

5. Discussion

Answers the first research question: to what limit project management capabilities predict project success. As expected, the results indicate that the integration of project management competence and project complexity predicts project success. The null hypothesis of no statistically significant correlation between project management competence and project success was rejected as $F(1, 106) = 17.638$, $p < 0.001$ [42]. The second predictive model, including project management skills and project success, was appropriate as $F(2, 104) = 71.238$, $p < 0.001$. A third predictive model including project management skills, complexity, and success was appropriate because "$F = 60.38$, $p < 0.001$".

6. Limitations

This research examines the predictive impact of project management skill and project complexity on project success. The statistical method used was multiple linear regression. The research included two continuous independent variables, project management skills and project complexity, and one continuous dependent variable, project success. Although the study was conducted according to the research design, it has limitations. In particular, limitations regarding the statistical methods used and the studied predictor variables were identified. This section continues the description of specified limits.

7. Implications

The Standard Project Management Model shows how project complexity affects the relationship between project management skills and links to project success, The Standard Project Management Model shows how project managers acquire project management skills, knowledge, and skills through experience and mentorship. The results of this study demonstrate the project's success in improving project management capabilities. All research shows that successful project management practices are directly related to project success. The complexity of the project is an important factor in determining the success or failure of the project. Project complexity acts as a deterrent in determining the impact of the project management team's skills on the project's likelihood of success. Before starting any project, managers must pay great attention to the complexity of the project and the skills of the team.

8. Recommendations

It offers suggestions on how to get more information on project management skills, project complexity, and project success. With using a moderator variable, a categorical variable, sheds light on how the other two variables interact.

The complexity evaluation method must be modified to consider project complexity as a moderator variable. A categorized scale with low, medium and high project complexity levels can be used to quantify project complexity. The study will look into variations in item complexity across different categories. Project management skills can be further categorized into fields since different fields require varying management skills.

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9. Conclusion

As stated in [43], the aim of this study was to fill gaps in the body of knowledge regarding project management skills, project complexity, and project success. As the first research topic, how do project management skills predict project success? The second research topic How does project complexity predict project success? The findings support the ability of project management to predict project success.

Results are not conclusive as to whether project complexity predicts project success. A good model analyzes project management skills, complexity, and success. The predictive model of this study is applicable to project managers as they can successfully manage complex projects by using their imagination and ingenuity through project management skills. Our findings clearly show that project complexity has an adverse effect on the relationship between project success and project management team skills. The more complex a project is, the less impact project management skills will have on its success.

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