IT Project Characteristics Analysis Results Validation*

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Abstract

Understanding the factors that contribute to project failure is crucial for enhancing project management strategies. This study investigates the relationship between project characteristics such as methodology selection, team composition, and risk management and project outcomes. A structured online questionnaire was created to collect data, offering broad accessibility and facilitating statistical analysis. The survey, currently in progress, has already yielded initial 50 responses, though the dataset continues to evolve. To ensure methodological rigor, the questionnaire adheres to best practices, including clear and concise questions, a mix of closed and open-ended responses, and a logical structure. The ongoing study aims to identify patterns and correlations that can improve project resilience and success rates. This study underscores the importance of a holistic approach to project management, where multiple factors methodology, team dynamics, stakeholder engagement, and proactive risk management must be carefully balanced to improve project outcomes. As data collection continues, further refinements will enhance these insights, providing more precise recommendations for optimizing project management strategies.

Keywords

Project Management; IT; methodological approach; complementary; contradictory; risk forecasting; results validation

1. Introduction

Project management has long been a field of extensive research due to its fundamental role in ensuring successful project delivery across industries. Despite the evolution of methodologies and best practices, a significant proportion of projects still fail either by exceeding budgets and timelines or by not reaching completion. Understanding the underlying factors contributing to project failure is crucial for refining management strategies, optimizing resource allocation, and improving overall project success rates.

One of the key elements influencing project outcomes is the choice of project management methodology. Approaches such as Scrum, Kanban, Waterfall, or Hybrid Methodologies each come with inherent advantages and constraints. While agile methodologies promote adaptability and continuous feedback, traditional methods emphasize detailed upfront planning. However, the misalignment of a methodology with the project's nature and requirements can result in inefficiencies, communication gaps, and an inability to mitigate risks effectively. Equally important is the composition and management of the project team. Project success is highly dependent on having the right mix of skills, experience, and team cohesion. Delays in staffing, mismatched seniority levels, or high turnover rates can disrupt progress and lead to costly inefficiencies. Moreover, stakeholder involvement at different stages of the project plays a critical role in ensuring alignment with business objectives and user expectations. Another major factor affecting project success is risk identification and monitoring. Organizations that implement structured risk assessment strategies where risks are continuously tracked and mitigated tend to have higher success rates. Conversely, insufficient risk monitoring often leads to unexpected issues, such as budget overruns, scope creep, or technical failures, ultimately jeopardizing project outcomes. By examining the correlations between project characteristics and project success, organizations can

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gain valuable insights into improving project resilience. Statistical analysis of past project data allows researchers and practitioners to identify trends, optimize decision-making, and develop frameworks that enhance project delivery success. As industries continue to evolve, leveraging data-driven approaches to understand failure patterns remains imperative for fostering more robust and efficient project management practices.

Most of the articles [1-4] focus on the decision-making aspects necessary for successfully continuing project development. Some studies [5-8] provide specific implementations of different methods to sustain projects. However, there is a lack of research analyzing actual project outcomes through a survey-based approach that can identify patterns for different gaps. Typically, available studies present lessons learned from individual projects rather than offering an overarching view of multiple projects. Additionally, no prior research has been conducted to explore the correlation between using an unsuitable methodology and project failure. Furthermore, there are no studies that quantify risks by examining whether they were mitigated or escalated into issues existing literature only provides general discussions on the importance of risk management. This study is intended to analyze correlations between project failure and different characteristics such as unsuitable methodology, risk assessment and other. Limitation of the article is self-selected bias due to specific of a voluntary online survey for only project managers.

2. Type of IT Project analysis method

To systematically analyze the relationship between project failure and project characteristics, a questionnaire-based approach has been employed. Questionnaires are a widely recognized research tool in project management studies, allowing for structured data collection across diverse project environments. There are several types of questionnaires, including structured, semi-structured, and unstructured forms. Structured questionnaires use predefined questions with fixed response options, facilitating quantitative analysis, while semi-structured and unstructured questionnaires allow for open-ended responses that provide deeper insights.

For this study, an online structured questionnaire was chosen as the primary data collection method. This approach offers several advantages, including broader reach due to time saving answers, ease of participation, and real-time data collection. Online questionnaires reduce geographical limitations, enabling respondents from various industries and regions to contribute, which enhances the diversity and reliability of the dataset. Additionally, digital data collection minimizes manual entry errors and facilitates statistical analysis. To ensure the reliability and validity of the collected data, best practices in questionnaire design have been implemented. These include:

- Clear and easy understandable questions: Questions are formulated to be direct and easy to understand, reducing the risk of misinterpretation by respondents.
- Balanced use of question types: A mix of closed-ended and open-ended questions allows for both statistical analysis and qualitative insights.
- Logical structure of the questions: The questionnaire follows a structured format, guiding respondents from general questions to more specific aspects of project management, ensuring logical progression..
- Limited response options per question: To avoid overwhelming respondents, multiple-choice questions contain a reasonable number of options while ensuring comprehensive coverage of possible answers.
- Pretesting and refinement: The questionnaire was pretested with a sample group before full deployment to identify contradictory and improve clarity.
- Not time consuming: Amount of question limited that allow participant to complete them in 5-10 minutes without obligation of providing long written explanation on any of the questions.

- Confidentiality: Respondents' privacy is maintained to encourage honest and accurate responses. Questionnaire does not store or ask for sex, position, country of origin and even doesn't store mail address.

Main and core auditory for this survey are project managers. The survey is currently active, and initial 50 responses have been gathered. However, data collection remains ongoing, and the dataset is expected to evolve as more responses are recorded. Composed questions from survey [15] can be seen in separated tables below.

Table 1
General questions of Project Management survey with numeric values

Question	Answer	Answer options	Numeric Value
Past project duration	Select	Less than Year; Year; 2+ Years	1; 2; 3
Past project size	Select	Small (up to 10 people); Medium (11-50); Large (50+)	1; 2; 3
Past project nature	Checkbox	KTLO/Support; Integration; Development; Infrastructure; Other	1; 2; 3; 4; 5
Past project complexity	Select	Simple; Moderate; Complex	1; 2; 3
Past project industry	Select	Tech; Healthcare; Retail; Finance; Transportation; Food and beverages; Logistics; E-Commerce; Edtech; Government; Oil&Gas; Manufacturing; Other	1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 11; 12; 13
Stakeholder involvement	Select	Monthly; Bi-weekly; Weekly; Twice per week; Daily	1; 2; 3; 4; 5

Table 2
Team questions of Project Management survey with numeric values

Question	Answer	Answer options	Numeric Value
Team was fully staffed on time and budget	Select	Yes; No	1;0
There were cases of team member retention	Select	Yes; No	1;0

What caused retention	Checkbox	(if previous answer was "Yes") Client; Performance; Person related; Budget related; Other	1;0;0;1;1
All team members where expected seniority	Select	Yes; No	1; 0

Table 3
Methodology questions of Project Management survey with numeric values

Question	Answer	Answer options	Numeric Value
Which PM methodology was used	Checkbox	Scrum; Kanban; Waterfall; Hybrid; No methodology; Other	1; 2; 3; 4; 5; 6
Why was this methodology chosen	Checkbox	Client insist; Applicability to the project; Familiarity with methodology; Other	1; 2; 3; 4
Methodology was changed during project	Select	Yes; No	1; 0
Why methodology was changed	Checkbox	(If previous answer was "Yes") Mitigate risks; Client insist; Methodology not suitable; Other	1; 1; 1; 1
Which PM methodology was used after the change	Select	(if previous answer was "Yes") Scrum; Kanban; Waterfall; Hybrid; No methodology; Other	1; 2; 3; 4; 5; 6

Table 4
Outcomes questions of Project Management survey with numeric values

Question	Answer	Answer options	Numeric Value

What was the final project outcome	Select	Delivered on time and within budget; Delivered but exceeded budget or timeline; Not delivered or failed	0; 1; 2
Challenges on the past project were because	Checkbox	Client related; Budget related; Project team related; Methodology related; Infrastructure related; Other	1; 2; 3; 4; 5; 6; 7
To what extent did the PM methodology contribute to the past project deliverables	Scale	Very much contribute; Not contributed	1; 0

Table 5
Risks questions of Project Management survey with numeric values

Question	Answer	Answer options	Numeric Value
Did risks stated in the start or before start of the past project	Select	Yes; No	1; 0
there were some risks that were converted into issues	Select	(If previous answer was "Yes") Yes; No	1; 0
Most common risks that were converted into issues	Checkbox	Scope creep; Budget overrun; Team retention; Unclear requirements; Other	1; 2; 3; 4; 5; 6
Most common risks that was mitigated	Checkbox	Scope creep; Budget overrun; Team retention; Unclear requirements; Other	1; 2; 3; 4; 5; 6

Did risks stated for the past project	Select	Yes; No	1; 0
How frequently were those risks monitored	Select	Monthly; Bi-weekly; Weekly; Twice per week; Daily	1; 2; 3; 4; 5

With information from this survey, after normalization, different parameters can be gathered. Formulas and calculation for parameters such as overall success ratio, percentage of failed project due to methodology, the most remediated and not remediated risk and many more different characteristics are listed below.

Project failure rate has the following formula:

$$P_f = \frac{N_f}{N} \times 100 \quad (1)$$

where P_f is Project failure rate, N_f is number of failed and $N_{\square}$is number of Projects. By "failed" meant projects that have answer "Delivered but exceeded budget or timeline" and "Not delivered or failed" for question "What was the final project outcome".

With given set of data we have failure rate 66%

Project success rate has similar formula:

$$P_s = \frac{(N - N_f)}{N} \times 100 \quad (2)$$

Expected that success rate will be around 60-70% of overall quantity of the projects. But with given set of the data our success rate is only 34%

In [2] where used different set of characteristics, like stakeholder involvement and team availability, and to identify it's values correct formulas to calculate those characteristics are introduced. According to article results should be in scale high-medium-low. Formula for stakeholder involvement will look this way:

$$S_i = \frac{N_t}{N} \times 100 \quad (3)$$

Where S_i is stakeholder involvement and N_i is number of interaction quantities and they should be combined in this way: for high interactions answer "Daily" should be used, for low is "Monthly" and for medium is sum of the rest answers for the "Stakeholder involvement" question.

As result High interaction is 28%, Medium interaction 50% and Low interaction is 22%. Those results falls into common sense that mean that medium iteration should be biggest one.

For resource availability formula will be more complex because it gathers information out of three questions from questionnaire:

$$R_a = \frac{N_{positive}}{N_{Teams}} \times 100 \quad (4)$$

Where R_a is resource availability, $N_{positive}$ is number of positive ("Yes") responses for questions "Team was fully staffed on time and budget", "There were cases of team member retention" and

"All team members where expected seniority" in Teams type. N_{Teams} is quantity of answers for those three questions, typically should be three times more than N.

Result or resource availability with given data is 51,3% and it's mean that in half case all parameters of Team composition were correct and there were no issues with it.

Next formula is for identifying methodology that was initially used in given (3):

$$M_i = \frac{N_i}{N} \times 100 \tag{5}$$

Where M_i is each methodology type from the question "Which PM methodology was used" and N_i is number of answers for each methodology type.

Quite interesting will look metrics about correlation between methodology that was initially used and used after the change, but this not direct scope of this article. Results shown in Table 6.

Table 6
Used methodology percentage

Methodology	Percentage
Scrum	20
Kanban	18
Waterfall	24
Hybrid	18
No methodology	6
Other	14

Next and the most important characteristic that needs to be digested is correlation between project failure and wrong methodology. To calculate it Pearson correlation coefficient will be used:

$$r = \sum (P_f - \frac{P_f^{-¿)(M_f - M_f^{-¿)}}{\sqrt{\sum (P_f - P_f^{¿} \times \sqrt{\sum (M_f - M_f^{¿}¿¿} \tag{6}$$

where r is Pearson correlation coefficient, $P_f^{-¿¿}$ and $M_f^{-¿¿}$ are means of corresponding items and M_f is wrong methodology indicator that calculates with next formula:

$$M_f = \frac{N_{Change}}{N_{Methodology}} \times 100 \tag{7}$$

where N_{Change} is number of answers "Methodology not suitable" and "Client insist" in question "Why was the methodology changed" and $N_{Methodology}$ is overall quantity of answers on this question.

Result based on the data available is 48% and it means that in most of half of the cases methodology was changed during the project.

In result this Pearson correlation coefficient should show us actual correlation between methodology and project failure and with value more that zero direction will be positive that will mean that have correlation between those characteristics exists.

For methodology correlation coefficient is weak but positive 0,092 and it means that there exists correlation between methodology and project success.

As for the risks there two simple formulas for most remediated and not remediated risk:

$$R_i = \frac{Rr_i}{N_{Rr}} \times 1cs00 \tag{8}$$

Where R_i is each remediated risk from question "Most common risks that were mitigated", Rr_i is number of answers for each remediated risk and N_{Rt} is number of overall answers in the question. Similar for not remediated:

$$Rn_i = \frac{Rnr_i}{N_{Rr}} \times 100 \tag{9}$$

Where Rn_i is each not remediated risk from question "Most common risks that were converted into issues", Rnr_i is number of answers for each not remediated risk. Result is shown in Table 7.

Table 7
Percentage of remediated and not remediated risks

Risk name	Remediated, percentage	Not remediated, percentage
Scope creep	16	12
Budget overrun	18	24
Team retention	24	26
Unclear requirements	18	18
Other	24	20

Interesting enough that Team retention risk sits on first place in both remediated and not remediated risks

Another crucial formula is formula for correlation between risk monitoring frequency and project failure. This formula can show if risk monitoring is important for project failure or not. To calculate this value another variant of Pearson correlation coefficient will be used:

$$r = \frac{n\sum\left(R_{mf} - P_o\right) - \sum R_{mf} \sum P_o}{\sqrt{\left[n\sum {R_{mf}}^2 - \left(\sum R_{mf}\right)^2\right]}¿¿¿} \tag{10}$$

where R_{mf} is risk monitoring frequency, P_o is project outcome and n is number of responses.

Since desired outcome need to have more value and for that reason Fail value have higher numeric value than Success. Results on given data show 0,1475 and it means that there no visible correlation between project success and risk monitoring frequency.

Next value that needs to be assessed is correlation between team composition and project failure. To calculate this value firstly needs to be assessed team composition values and calculate them with given formula:

$$T_s = S + R + \sum C + E \tag{11}$$

where T_s is team composition score, S is staffing status from the question in Table 1, R is retention status, $\sum C$ is sum of retention cases and E is expected seniority value. In that case max value of T_s should not exceed 5 for each case.

Since team composition value logic calculated overall Pearson coefficient for correlation between team composition and project failure can be calculated with next formula:

$$r = \frac{n\sum (T_s - P_o) - \sum T_s \sum P_o}{\sqrt{\left[n\sum T_s^{\,2} - \left(\sum T_s\right)^2\right]}¿¿¿} \tag{12}$$

where T_s team composition score, P_o project outcome and n number of responses.

Results here are more expected, correlation is 0,2421 and it means that there correlation between Team composition and project success.

Next parameter is correlation between project complexity and project failure.:

$$r = \frac{n\sum (P_c - P_o) - \sum P_c \sum P_o}{\sqrt{\left[n\sum P_c^{\,2} - \left(\sum P_c\right)^2\right]}¿¿¿} \tag{13}$$

where P_c project complexity, P_o project outcome and n number of responses.

Result is same as in risk monitoring parameter, correlation coefficient is negative, -0,006 and it meant that there not visible correlation between project complexity and project success rate.

This formula is correlation between project success and project industry:

$$I_{si} = \frac{Pf_i}{I_i} \times 100 \tag{14}$$

where I_{si} is success rate in specific industry and I_i quantity of specific industry in questionnaire answers. Results are shown in Table 8.

Table 8
Results of correlation between project industry and project success

Industry name	Success rate, percentage
Tech	100
Healthcare	60
Retail	50
Finance	50

Transportation	0
Food and beverages	40
Logistics	0
E-Commerce	14
Edtech	60
Government	20
Oil&Gas	50
Manufacturing	66
Other	0

As the foundational dataset for this research is still undergoing refinement, it must be acknowledged that the current responses collected from various industries may not fully reflect the final or most accurate data. This limitation arises from the preliminary nature of the dataset and the fact that certain industry sectors lack sufficient. In particular, some industry types reported zero or near-zero success percentages, which may not indicate an actual absence of successful or failed projects but instead highlight limitations in sample size at this stage of the study.

This observation presents a methodological challenge from a statistical standpoint. The presence of sectors with missing or non-numeric success data can distort the overall interpretation of industry-level performance trends. As a result, caution must be exercised when drawing generalized conclusions across industry categories, as some of the observed inconsistencies may be attributable to incomplete data rather than to underlying differences in project execution or methodology selection.

Despite these constraints, the article presents a comprehensive analysis of project characteristics and their potential correlations with outcomes. These analyses were performed using structured data collected through questionnaires. The summarized findings of this analysis, including identified correlations and their respective significance levels, are presented in Table 9 below. This table encapsulates the core empirical insights gained through the current phase of research and serves as a foundation for further refinement and validation as the dataset evolves.

Table 9
Results of IT projects characteristic and correlation analysis

Formula name	Results
Project failure rate	66%
Project success rate	34%
Stakeholder involvement	High interaction 28%; Medium interaction – 50% and Low interaction – 22%
Resource availability	51,3%

Initial methodology	Scrum – 20%; Kanban – 24%; Waterfall – 24%; Hybrid – 18%; No methodology – 6%; Other – 14%
Wrong methodology	48%
Not remediated risk	Scope creep – 12%; Budget overrun – 24%; Team retention – 26%; Unclear requirements – 18%; Other – 20%
Remediated risk	Scope creep – 16%; Budget overrun – 18%; Team retention – 24%; Unclear requirements – 18% and Other – 24%
Correlation between project failure and wrong methodology	0.092 Weak correlation
Correlation between risk monitoring frequency and project failure	-0,1475 No correlation
Correlation between team composition and project failure	0,2421 Weak correlation
Correlation between project complexity and project failure	-0,006 No correlation
Correlation between project success and project industry	Tech -100%; Healthcare – 60%; Retail – 50%; Finance – 50%; Transportation – 0%; Food and beverages – 40%; Logistics – 0%; E-Commerce – 14%; Edtech – 60%; Government – 20%; Oil&Gas – 50%; Manufacturing – 60%; Other – 0%

3. Conclusion

The analysis of project failure rates and their correlation with various project characteristics has yielded several key insights. The study found a project failure rate of 66%, with only 34% of projects classified as successful. Among the factors investigated, methodology selection, team composition, and risk monitoring practices emerged as critical influences on project outcomes.

The data revealed a weak but still existing correlation (0.092) between project failure and incorrect methodology selection, with 48% of respondents indicating that the chosen methodology was later deemed unsuitable. This suggests that while methodology plays a role in project success, other factors may have a stronger impact. Similarly, team composition showed a weak correlation (0.2421) with project failure, reinforcing the idea that staffing issues contribute to project challenges but may not be the sole determining factor.

On the other hand, risk monitoring frequency showed no significant correlation (-0.1475) with project failure, implying that merely tracking risks does not necessarily prevent failure unless

appropriate mitigation actions are taken. Additionally, project complexity also showed no correlation (-0.006) with failure, suggesting that project outcomes are not solely dictated by complexity but rather by how well they are managed.

Stakeholder involvement also played a notable role, with high interaction levels (28%) correlating with better project success rates, while low interaction (22%) tended to be associated with poorer outcomes. The study also identified key risks that were either mitigated or not, with budget overruns (24%) and team retention issues (26%) being the most common risks that led to project difficulties.

Overall, these findings highlight the need for a holistic approach to project management, where methodology selection, risk mitigation, stakeholder engagement, and team composition are all carefully considered to improve success rates. As data collection continues, further analysis may refine these insights and provide more definitive conclusions on how best to enhance project management practices for better outcomes.

The results of this study have the potential to be integrated into a specialized mobile application tailored for use within specific industries. This application could serve as a valuable tool not only for internal departments, such as a Project Management Office (PMO), but also for external stakeholders including consulting firms, partner organizations, and companies that are involved in auditing processes. By embedding the study's findings into the app, it becomes a centralized platform for informed decision-making and project planning.

In addition to suggesting appropriate methodologies, the application would function as a proactive advisory system for project managers. It would offer practical guidance and predictive alerts about potential challenges or obstacles that may arise during different project phases. This feature aims to empower project leaders with foresight and preparedness, ultimately contributing to higher project success rates and more efficient resource allocation.

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Declaration on Generative AI

During the preparation of this work, the authors used ChatGPT in order to: Paraphrase and reword. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the publication’s content.

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