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Investigating the Role of Critical Success Factors in Achieving the Success of Agile Projects in the Gaza Strip

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Achieving project success is a critical element of project management, and identifying the critical success factors (CSFs) that contribute to it is imperative. Agile project management has gained significant attention due to its flexibility, adaptability, and iterative approach, but achieving project success in agile projects remains a challenge. In order to identify the CSFs that have a significant impact on project outcomes, this study examines the role of CSFs in achieving project success in agile projects. A structured online questionnaire was used to collect data from 109 project managers and team members working on agile projects, which was then analyzed using various statistical methods. According to the study's findings, seven factors significantly influence the success of projects: scope and cost management, leadership, agile analytics techniques, customer involvement, teamwork, planning and scheduling, and effective communication, which account for 71.9% of the total variance explained by the CSFs components. The analysis of Pearson correlation coefficients between CSFs and agile project outcomes indicates a positive correlation between each CSF and the four project outcomes (timeliness, cost, quality, and customer satisfaction). The regression analysis includes two significant predictors: scope and cost management, and planning and scheduling, explaining 67.7% of the variation in project outcomes. The findings provide valuable insights for project managers in the Gaza Strip to enhance project success with agile methods by focusing on CSFs.

ACM CCS (2012) Classification: Software and its engineering → Software creation and management → Software development process management

Software and its engineering → Software creation and management → Software development process management → Software development methods → Agile software development

Keywords: software project, agile methodology, critical success factors, project outcomes

1. Introduction

Software plays a crucial role in various aspects of modern society, including business, entertainment, healthcare, and education. It automates processes in the business world, enhances productivity, and improves customer service. In entertainment, software enables the creation, editing, and streaming of media. Healthcare relies on software for managing patient records, appointments, prescriptions, and research. In education, software aids in online course development, student record administration, and research facilitation. Overall, software greatly enhances convenience, effectiveness, and enjoyment in our daily lives.

According to the Gartner 2020 report, it is projected that, in 2023, worldwide IT spending will reach $4.5 trillion, representing a 2.4% increase compared to the previous year [1]. The report also forecasts a steady growth in software development spending, with an estimated compound annual growth rate of 7.2% from 2020 to 2024. This continuous investment in software development is driven by the rising demand for innovative and advanced software solutions that cater to the needs of individuals, organizations, and businesses on a global scale. In response to the increasing software demands, agile methodologies emerged in 2000 as a revolutionary approach to software development. By prioritizing flexibility, collaboration, and the delivery of software that aligns with the evolving needs of

stakeholders, agile has completely transformed the software development and delivery process.

There are two goals for this study. Firstly, it aims to identify and evaluate the CSFs that play a pivotal role in ensuring the successful completion of agile software projects. Through this, the study seeks to determine the relative importance and significance of these factors in contributing to project success. Secondly, the study aims to investigate the impact of these identified CSFs on the outcomes of agile software projects. This includes analyzing the effect of these factors on various project aspects, such as budget, time, quality, and customer satisfaction.

2. Research Questions

In order to meet the research objectives, the following questions will be addressed:

RQ1: Is there a link between CSF and agile project outcomes?

RQ2: What effect do CSFs have on agile projects outcomes?

RQ3: What effect do CSFs have on agile project cost?

RQ4: What effect do CSFs have on agile project timeliness?

RQ5: What effect do CSFs have on agile project quality?

RQ6: What effect do CSFs have on customer satisfaction?

3. Research Hypotheses

The following hypotheses have been developed in response to the research questions:

H1: There is a strong link between CSF and agile project outcomes.

H2: CSFs have a significant impact on agile project outcomes.

H3: CSFs have a significant impact on the project cost.

H4: CSFs have a significant impact on agile project timeliness.

H5: CSFs have a significant impact on agile project quality.

H6: CSFs have a significant impact on customer satisfaction.

4. Review of Literature

4.1. Software Development Methodologies (SDM)

Software Development Methodologies (SDM) refers to the framework used to structure, plan, and control the software development processes. Numerous SDM, each with its own set of principles, practices, and processes guide software development. Agile and plan-driven methodologies are two of the most popular SDM. A plan-driven or traditional methodology is a method of software development that follows a strict, linear process. There are many traditional software development methods and approaches, such as the waterfall approach, iterative and incremental approach, spiral approach, evolutionary approach, *etc.* [2]. Traditional methodologies are known for their emphasis on detailed planning, complete designs, full coding, extensive testing and documentation, but they can be rigid and unsuitable for rapidly changing environments [3]. According to [4], many projects that use traditional software development methods addressed major issues, particularly in maintenance and changes based on user requests.

Agile methodology is a flexible and iterative approach that prioritizes rapid prototyping, continuous delivery, and frequent collaboration between developers and stakeholders. Agile and plan driven project management methodologies are diametrically opposed. Agile precise, such as Scrum and Kanban, are iterative and incremental, which means they involve repeating work cycles in order to deliver functional software quickly [4]. The flexibility and adaptability that agile methodologies promote are one of their main advantages [5]. Since the work is divided into smaller iterations, changes, and adjustments can be made more easily as the project progresses. This is especially helpful when a project's requirements are not clear at first or when it is anticipated that the project will change over time. However, the iterative nature of agile can result in changing requirements and priorities, making project timeframes and deliverables difficult to anticipate. The plan-driven approach, also referred to as the traditional, is a project management methodology that places significant emphasis on meticulous planning

and executing project activities in a sequential manner [4]. In this approach, the project requirements are usually well-defined and remain stable right from the start, and the entire project is extensively planned and documented in advance. This methodology is particularly suitable for projects where the requirements are clear and stable throughout the project lifecycle.

Recent statistics indicated that 71% of US companies use agile methodologies for software development projects, according to data from [6]. The success rate for these Agile projects is 64%, compared to just 49% for Traditional, or plan-driven, projects. Accordingly, Agile projects have a nearly 50% higher success rate than waterfall projects. Agile adoption has led to an average 60% increase in revenue and profit for businesses. Scrum is the agile framework that is used the most, according to 61% of respondents from 76 different countries [7].

4.2. Agile Methodologies

Agile methods prioritize adaptability, teamwork, and quick turnaround in software development. This approach is guided by principles such as rapid solution deployment, continuous delivery of valuable products, efficient resource utilization, quick issue detection, customer focus, effective collaboration and communication, adaptability, and flexibility [8]. The values and guiding principles of agile software development are outlined in the 2001 publication of the agile manifesto. A team of programmers in response to the perceived rigidity and lack of teamwork in conventional software development techniques created it [9]. Individuals and interactions, according to the Agile Manifesto, are more important than "processes and tools," and "working software" is more important than "comprehensive documentation". It also emphasizes the importance of adapting to change rather than sticking to a strict plan. Agile development practices are a collection of principles and techniques for creating software that is both flexible and efficient. These practices are intended to assist teams in responding quickly to changing requirements, frequently delivering working software, and collaborating with stakeholders throughout the development process. As per the findings of [10], agile-based software development offers several benefits, including enhanced communication and coordination among team members, faster releases, adaptable design, and a more streamlined process. Because they increase their success and decrease problems and failures, they have a positive effect on IT software projects [11]. Nonetheless, [12] note that adopting agile methods can lead to lower product quality due to the unreliability of these methods. The two main drawbacks of agile methods, as outlined by [2], are the lack of formal documentation and difficulties in maintenance.

4.3. Key Factors for Successful Agile Project Management

The management of agile software projects plays an important role in the success or failure of projects [12]. Many factors can contribute to the success of an agile software project. It is essential to identify these factors in software development projects as it allows project teams to better understand the factors that contribute to the success of their projects [13, 14]. Wherefore, various studies have identified CSFs that contribute to the success of project planning, software development, IT, and Agile software development projects. For example, [15] found that factors such as project management, the competence of the project manager and team, the use of effective methodologies, tools, and techniques, and proper documentation are critical for the success of project planning in the Malaysian public sector. [16] identified factors such as a committed and motivated team, active involvement of the client, clearly defined specifications and requirements, good leadership, and well-defined project goals and objectives as crucial for the success of software development projects in South African organizations. [17] conducted a systematic literature review and found that soft skills such as involvement, support, communication, and commitment are important for the success of IT projects. According to [13], key success factors of the PRINCE2 project management method in software development projects include defined roles and responsibilities, scope management, management by stages, well-planning, top management support, time management, risk management, monitoring project progress, change management, communication management,

quality management, project team competency, managing product delivery, cost management, learning from experience, and planning. In their 2018 study, Kulathunga and Ratiyala sought to identify the CSFs that influence the success of scrum SDP. They discovered that elements like management commitment, organizational environment, team capability, customer involvement, customer satisfaction, use of agile software techniques, project management process, project nature, project type, project acceptability, and intention to use all had a significant and favorable impact on the success of these projects. Studies have shown that despite the growing use of agile methodologies, a sizable proportion of IT projects continue to fail. The Standish Group reported that 83.9% of IT projects fail partially or completely [4, 10, 18]. In order to understand the reasons behind this failure rate, various research studies have been conducted to identify and evaluate the CSFs that influence the efficiency of software development projects. Table 1 shows the CSFs for Agile Project Management and references in the literature.

Table 1 outlines CSFs for project management based on literature references. The CSFs are categorized into ten areas: leadership, planning and scheduling, communication, teamwork, scope and risk management, quality and customer satisfaction, organizational environment and culture, agile analytics techniques, project characteristics, and continuous improvement.

4.4. Criteria for the Success of Software Development Projects (SDPs)

Success criteria are the measurable goals and objectives established to determine the success or failure of SDPs, which may vary from project to project, making it challenging to predict success. According to [8, 16, 17, 20], important criteria for project managers and stakeholders include achieving project goals, customer satisfaction with activity quality, and knowledge generation. Other studies have found that IT success criteria include factors such as time, budget, project management, system quality, user satisfaction, and economic value [17]. Other researchers have identified budget, schedule, scope, and team building and dynamics as important criteria for software project outcomes [26]. To assess the success of an agile project, this study employed a set of 17 criteria derived from a thorough literature review (refer to Appendix B). The utilized criteria are as follows:

1. Timeliness: Completed on time and within the set deadline.
2. Cost: Completed within budget.
3. Quality: Meets established standards and requirements.
4. Customer satisfaction: Receives positive feedback and exceeds customer expectations

5. Research Methodology

In this study, a thorough examination was conducted to analyze the CSFs and their impact on the outcomes of agile software projects. The research methodology encompassed an in-depth literature review and the creation of an online questionnaire comprising 52 items. Initially, the questionnaire addressed eight dimensions that were derived from the insights obtained during the literature review (refer to the Appendix). To collect data, the questionnaire was administered to the participants of the study. Each statement in the questionnaire was rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Google Forms, known for its user-friendly interface, was utilized to create the questionnaire. Once the data collection phase was complete, the collected data were analyzed using Microsoft Excel 2010 and SPSS 20, which are well-established software tools for data analysis. The reliability and validity of the questionnaire were assessed through statistical reliability analysis and principal components analysis (PCA). Reliability analysis examined the consistency and stability of the questionnaire's items, whereas PCA was employed to reduce the dimensionality of the data while retaining essential information. Furthermore, this study employed stepwise multiple regression techniques to investigate the research hypotheses. Stepwise multiple regression is a statistical method used in this study to construct a regression model by iteratively selecting and removing independent variables (CSFs) based on their statistical significance.

Table 1. CSFs on Agile Project Management.

CSFs	Sub-CSFs	Literature references
1. Leadership	The commitment by management with a clear vision	[5, 19]
	Top management support	[8, 13, 20, 21]
	Project management	[12, 15, 17]
2. Planning and scheduling	Keeping task sizes small	[19, 21]
	Clear and linked project objectives	[20]
	Cost management	[13, 17, 22, 23]
	Planning and schedule	[8, 13, 14, 17, 20, 22]
	Resources	[22, 23]
	Prioritizing task	[13, 23]
	Assign work to right person	[13]
	Defined roles & responsibilities	[13]
	Managing product delivery	[13]
	Project documentation	[15]
3. Communication	Effective communication	[12-14, 20, 21, 23]
	Customer involvement	[5, 8, 14, 20, 21, 23]
4. Teamwork	Teamwork	[13, 16, 20]
	Project team competency	[5, 12–15, 21]
	Intension	[5]
	Committed and motivated team	[16]
5. Scope and risk management	Scope management	[13, 22]
	Risk management	[13, 21, 22]
6. Quality and customer satisfaction	System quality	[17]
	Customer satisfaction	[5, 8, 17, 24]
	Quality management	[13, 21]
	Customer commitment	[24]
7. Organizational environment and culture	Organizational environment	[5, 8, 14]
	Corporate culture	[8, 21, 24]
8. Agile analytics techniques	Agile analytics techniques	[5, 13, 14, 21, 23]
	Problem-solving	[25]
	Technical competency	[24]
9. Project characteristics	Project nature	[5,8]
	Project type	[5]
	Project acceptability	[5]
10. Continuous improvement	Monitor project progress	[13]
	Change management	[13]
	Learn from experience	[13]
	Training and education	[21]

5.1. Sampling

The study had a specific focus on individuals working in the software industry in Gaza. A random sample was selected to ensure representative data. The survey was distributed to a total of 185 individuals, including 150 programmers and systems developers, as well as 35 individuals from universities and colleges who are actively involved in software development. The distribution of the questionnaire was carried out through e-mail and social media channels. From the distributed questionnaires, a total of 109 responses were obtained. Among the participants in the study, 73.1% were male, while 26.9% were female. Regarding team size, 61.5% of the participants belonged to teams with less than 10 members, 34.6% were from teams with 10–12 members, and only 3.8% were from teams with more than 12 members. Concerning their roles within the team, 35.9% of the participants were project managers, 55.9% were developers, and 10.2% held other roles. These findings are summarized in Table 2.

5.2. Reliability and Validity Analysis

Cronbach's alpha is used as a measure of internal consistency, which assesses the reliability of a scale. In this study, the reliability of the instrument's items was evaluated using Cronbach's alpha, which resulted in a value of 0.83. This high value indicates a strong level of consistency among the items in the scale.

5.3. Principal Components Analysis (PCA)

In this study conducted in the Gaza Strip, PCA was employed to reduce the dimensions of CSFs for agile development practices and their impact on project success. The PCA method utilized eigenvalues and cross-loading to determine the number of dimensions in the questionnaire. A survey was conducted with the participation of 109 respondents who were requested to provide their responses to 52 items designed to assess the eight dimensions of CSFs (see Appendix A). Due to concerns regarding cross-loading, 11 items were excluded from the data analysis. Consequently, the dataset was reduced to 41 items. The analysis revealed that out of the eight dimensions examined, only seven exhibited eigenvalues greater than 1.0, indicating their significance. Table 3 displays these seven dimensions, along with their corresponding associated items.

Table 2. Demographics of the Study.

Characteristics		**Sample Number**	**%**
Gender	Male	82	73.1
	Female	27	26.9
Team Size	Less than 10	7	61.5
	10-12	31	34.6
	Greater than 12	71	3.8
Role in the team	Project manager	37	33.9
	Developer	61	55.9
	Other	11	10.2

Table 3. Results of Factor Analysis.

CSFs	1	2	3	4	5	6	7
Factor 1: Scope and cost management							
1. The project scope is managed and changes are effectively controlled.	.598						
2. The team is able to balance the need for speed and quality.	.577						
3. The team is able to manage changes to the project scope.	.666						
4. The team regularly communicates project status	.699						
5. The team is able to manage project costs within the budget.	.831						
6. The team effectively balances the need for speed and cost efficiency.	.695						
7. The team is able to manage changes to the project scope to minimize cost impact.	.692						
8. The team regularly communicates project cost status to stakeholders	.704						
9. The team is able to effectively negotiate and manage contracts with external vendors.	.772						
10. The project budget is managed and regularly updated.	.801						
Factor 2: Leadership							
1. The project leader effectively communicates the project vision and goals.		.705					
2. The project leader effectively delegates tasks and responsibilities.		.506					
3. The project leader fosters a collaborative and inclusive work environment.		.779					
4. The project leader effectively manages conflicts and resolves issues.		.818					
5. The project leader is knowledgeable about agile methodologies and practices.		.832					
6. The project leader effectively balances the needs of multiple stakeholders.		.633					
7. The project leader is able to make decisions in a timely and effective manner.		.639					

CSFs	1	2	3	4	5	6	7
Factor 3: Agile analytics techniques							
1. The team effectively leverages data and analytics to inform decision-making.			.730				
2. The team regularly reviews and adjusts analytics approaches as needed.			.693				
3. The team effectively integrates data and analytics into the project workflows.			.744				
4. The team effectively balances the need for speed and accuracy in their analytics work			.727				
5. Team members actively participate in meetings and decision-making processes.			.523				
Factor 4: Customer involvement							
1. The customer actively participates in defining project requirements.				.804			
2. The customer is involved in regular meetings to review project progress.				.732			
3. The customer provides timely feedback on project deliverables.				.773			
4. The customer is able to communicate their needs to the development team.				.652			
5. The customer is able to adjust requirements as needed during the project.				.794			
Factor 5: Teamwork							
1. Team members are able to effectively collaborate and share information.					.792		
2. Team members are able to effectively manage conflicts and resolve issues.					.655		
3. Team members are willing to help each other when needed.					.856		
4. Team members are able to balance the needs of multiple stakeholders.					.663		
5. Team members have a positive attitude and work well together.					.764		

CSFs	1	2	3	4	5	6	7
Factor 6: Planning and scheduling							
1. The team is able to estimate task completion times.						.722	
2. The team effectively prioritizes tasks to ensure the project stays on track.						.622	
3. The team effectively balances the need for speed and quality						.719	
4. The team is able to balance the needs of multiple stakeholders.						.676	
5. The project timeline is managed and updated.						.467	
Factor 7: Effective communication							
1. The team regularly holds meetings to discuss progress and address any issues							.784
2. The communication between team members is clear and concise							.784
3. Team members are open to receiving feedback and criticism							.816
4. The team regularly communicates with stakeholders to ensure their needs are being met							.727

The results of Table 3 showed that seven CSF factors had been identified. Together, these factors led to the explanation of 71.9% of the total variance explained by the CSF component. Seven factors contribute to successful agile project management. The first factor is scope and risk management, which involves effectively managing project scope, changes, status, costs, and stakeholder communication. The second factor is leadership, which involves effective communication, delegation, conflict resolution, knowledge of agile methodologies, and decision-making skills. The third factor is agile analytics techniques, which involves leveraging data and analytics to inform decision-making and integrating them into project workflows. The fourth factor is customer involvement, which involves the customer's active participation in defining project requirements and providing feedback. The fifth factor is teamwork, which involves effective collaboration, conflict resolution, and positive attitudes. The sixth factor is planning and scheduling, which involves accurate estimation, prioritization, and effective timeline management. Finally, the seventh factor is effective communication, which involves regular meetings, clear and concise communication, openness to feedback, and stakeholder communication.

6. Results and Discussion

In this section, we present the findings of our study, which aimed to examine the hypotheses and answer the research questions. We provide an overview of the results obtained from different analyses conducted in the study.

6.1. Descriptive Analysis

6.1.1. Descriptive Analysis of CSFs

The results in Table 4 show the CSFs for the agile project and their mean scores.

Based on the table provided, leadership is the top-ranked CSF with a mean score of 4.352, indicating its high importance to the success of the project. This suggests that having effective leaders who can guide the team, provide direction, and make important decisions is critical for achieving project success. Agile analytics techniques and teamwork are also highly ranked, with mean scores of 4.438 and 4.408, respectively. This indicates that adopting agile analytics techniques and fostering a collaborative team environment are important factors in achieving project success. Scope and cost management, effective communication, and planning and scheduling are also important CSFs, although they are slightly less critical than the top-ranked factors. Finally, customer involvement is ranked last among the CSFs, indicating that while it is important, it may not be as critical as the other factors in ensuring project success.

6.1.2. Descriptive Analysis of Project Outcomes

Table 5 shows the mean scores of the project outcomes for the agile project. Customer satisfaction is the top-ranked project outcome, indicating its high importance to the success of the project. This suggests that meeting or exceeding the expectations of customers is critical for achieving project success. Quality is also highly ranked, with a mean score of 4.298, indicating the importance of delivering a product or service that meets or exceeds the required standards. Timeliness and cost are also important project outcomes, although they are ranked slightly lower than customer satisfaction and quality. Timeliness refers to completing the project on time, while cost refers to delivering the project within the allocated budget. Overall, the table highlights the key project outcomes that need to be considered to ensure the success of the agile project.

Table 4. CSFs Mean Scores.

No.	CSFs	Mean	%
1.	Scope and cost management	4.165	83.3
2.	Leadership	4.352	87.04
3.	Agile analytics techniques	4.438	88.76
4.	Customer involvement	3.997	79.94
5.	Teamwork	4.408	88.16
6.	Planning and scheduling	4.123	82.46
7.	Effective communication	4.231	84.62

Table 5. Project Outcomes Mean Scores.

No.	Project Outcomes	Mean	%
1.	Timeliness	4.089	81.78
2.	Cost	4.038	80.76
3.	Quality	4.298	85.96
4.	Customer satisfaction	4.455	89.1

6.2. Correlation Analysis

The Pearson correlation coefficient is a statistical measure that quantifies the strength and direction of the linear relationship between two continuous variables. It is denoted by the symbol "r" and ranges from −1 to +1. The relationship between CSFs and Project Outcomes was investigated using the Pearson correlation coefficient and the results are shown in Table 6.

Table 6 presents the results of the Pearson correlation coefficient analysis that investigates the relationship between CSFs and project outcomes. The analysis shows the correlation coefficients between each CSF and the four project outcomes (timeliness, cost, quality, and customer satisfaction). The results indicate that scope and cost management, leadership, agile analytics techniques, and customer involvement are significantly positively correlated with all four project outcomes (with correlation coefficients ranging from .267 to .662), at the 0.01 level (2-tailed). This suggests that these CSFs are highly important for achieving all four project outcomes. Teamwork is significantly positively correlated with timeliness and cost (with correlation coefficients of .369 and .328, respectively) at the 0.01 level (2-tailed), but has a weak correlation with quality and customer satisfaction. Planning and scheduling are significantly positively correlated with all four project outcomes (with correlation coefficients ranging from .499 to .724) at the 0.01 level (2-tailed), indicating its importance in achieving project outcomes. Effective communication is only weakly correlated with project outcomes, with correlation coefficients ranging from .118 to .248 and being significant at the 0.05 level (2-tailed) for timeliness and cost. Overall, the results suggest that some CSFs have a stronger relationship with project outcomes than others, and that project success is more likely when these CSFs are effectively managed. Hence, the first hypothesis (H1) is accepted.

Table 6. Pearson Correlation Coefficient between CSFs and Project Outcomes.

CSF	Project outcomes			
	Timelines	Cost	Quality	Customer satisfaction
Scope and cost management	.662**	.601**	.511**	.569**
Leadership	.299**	.472**	.452**	.258**
Agile analytics techniques	.390**	.467**	.461**	.329**
Customer involvement	.312**	.448**	.361**	.267**
Teamwork	.369**	.328**	.150	.096
Planning and scheduling	.344**	.724**	.547**	.499**
Effective communication	.239*	.248*	.233*	.118

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

6.3. Regression Analysis

6.3.1. The Effect of CSFs on Project Outcomes

The impact of CSFs on project outcomes (timeliness, cost, quality, and customer satisfaction) was investigated using stepwise regression analysis. Stepwise regression analysis is a statistical technique used to determine the most relevant predictors or independent variables to include in a regression model. An iterative process automatically selects variables based on their statistical significance and contribution to the model's predictive power. Table 7 shows the results of a stepwise regression analysis examining the impact of CSFs on project outcomes.

The regression model consisted of two significant predictors, namely scope and cost management, and planning and scheduling. These factors demonstrated a substantial impact on the dependent variable. However, variables such as leadership, agile analytics techniques, customer involvement, teamwork, and effective communication did not exhibit a statistically significant influence in the model and were subsequently excluded. The coefficient for scope and cost management is 0.412 with a standard error of 0.053, suggesting that an increase in the level of scope and cost management is associated with a positive impact on the project outcomes. Similarly, the coefficient for planning and scheduling is 0.333, with a standard error of 0.053, indicating that a higher level of planning and scheduling is positively related to an improved project outcome. The model's goodness of fit is demonstrated by the R-squared value of 0.677, which implies that the predictors explain 67.7% of the variation in the project outcome. The adjusted R-squared value of 0.671 suggests that the model is likely to generalize well to new data. The F-value of 105.86 and the associated p-value of 0.000 indicate that the model is statistically significant, and the predictors are useful in predicting the project outcome. Based on these results, we can partially accept the second hypothesis (H2).

6.3.2. The Effect of CSFs on Project Cost

The impact of CSFs on project timeliness was investigated using stepwise regression analysis. Table 8 displays the effect of CSFs on project cost, along with their unstandardized coefficients, standardized coefficients, t-values, and significance levels.

The results in Table 8 demonstrates a moderate positive correlation between CSFs (scope and cost management and customer involvement) and project cost, with the R-value of 0.685b. On the other hand, factors such as leadership, agile analytics techniques, planning and scheduling, teamwork, and effective communication did not show a significant influence in the model. The R-squared value of 0.469 suggests that the scope and cost management and customer involvement can explain 46.9% of the variability in project cost, and the adjusted R-squared value of 0.458 indicates that the model is a good fit. The F-value of 44.57 and significance level of 0.000 confirm the statistical significance of the model. Based on these results, we can partially accept the hypothesis (H3).

Table 7. The Effect of CSFs on Project Outcomes.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.111	.214		5.189	.000
Scope and cost management	.412	.053	.520	7.812	.000
Planning and scheduling	.333	.053	.419	6.289	.000

R = .823, R^2 =.677, Adjusted R^2 = .671, F value = 105.86, Sig. F = 0.000

Table 8. The Effect of CSFs on Project Cost.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.841	.352		2.388	.019
Scope and cost management	.613	.077	.606	7.955	.000
Customer involvement	.162	.067	.183	2.408	.018

R = 685, R^2 = .469, Adjusted R^2 = .458, F value = 44.57, Sig. F = 0.000

6.3.3. The Effect of CSFs on Project Timeliness

The impact of CSFs on project timeliness was investigated using stepwise regression analysis. Table 9 displays the effect of CSFs on project cost, along with their unstandardized coefficients, standardized coefficients, t-values, and significance levels.

The results in Table 9 demonstrate a strong correlation between CSFs (scope and cost management and Planning and scheduling) and project timeliness, with the R-value of 0.768. The R-squared value of 0.591 suggests that the scope and cost management and planning and scheduling can explain 59.1% of the variability in project timeliness, and the adjusted R-squared value of 0.458 indicates that the model is a good fit. The F-value of 72.84 and significance level of 0.000 confirm the statistical significance of the model. Based on these results, we can partially accept the fourth hypothesis (H4).

6.3.4. The Effect of CSFs on Project Quality

The impact of CSFs on project quality was investigated using stepwise regression analysis. Table 10 displays the effect of CSFs on project cost, along with their unstandardized coefficients, standardized coefficients, t-values, and significance levels.

The results in Table 10 demonstrate a moderate correlation between CSFs (scope and cost management, planning and scheduling, and leadership) and project quality, with the R-value of 0.628. The R-squared value of 0.394 suggests that the scope and cost management, planning and scheduling, and leadership can explain 39.4% of the variability in project quality, and the adjusted R-squared value of 0.376 indicates that the model is a good fit. The F-value of 21.69 and significance level of 0.000 confirm the statistical significance of the model. On the other hand, factors such as agile analytics techniques, customer involvement, teamwork, and effective communication did not show a significant influence in the model. Based on these results, we can partially accept the fifth hypothesis (H5).

Table 9. The Effect of CSFs on Project Timeliness.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
Planning and scheduling	.675	.090	.564	7.521	.000
Scope and cost management	.360	.089	.303	4.037	.000

R = .768[b], R^2 = .591, Adjusted R^2 = .582, F value = 72.84, Sig. F = 0.000

Table 10. The Effect of CSFs on Project Quality.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.459	.365		3.992	.000
Planning and scheduling	.250	.088	.289	2.829	.006
Scope and cost management	.248	.079	.289	3.139	.002
Leadership	.178	.085	.195	2.110	.037

R = .628, R^2 = .394, Adjusted R^2 = .376, F value = 21.69, Sig. F = 0.000

6.3.5. The Effect of CSFs on Customer Satisfaction

The impact of CSFs on project Quality was investigated using stepwise regression analysis. Table 11 displays the effect of CSFs on customer satisfaction, along with their unstandardized coefficients, standardized coefficients, t-values, and significance levels.

According to the results in Table 11, there are two CSFs presented: planning and scheduling and scope and cost management. The table shows that both factors have a significant impact on customer satisfaction. Planning and scheduling have a beta value of 0.424, a t-value of 4.592, and a significant level of 0.000. Scope and cost management have a beta value of 0.275, a t-value of 2.972, and a significant level of 0.004. The combined model shows a positive correlation with customer satisfaction, with an R-value of 0.615. The R-squared value of 0.379 indicates that 37.9% of the variability in customer satisfaction can be explained by the CSFs, and the adjusted R-squared value of 0.366 implies that the model is a good fit for the data. Finally, the F-value of 30.77 and significance level of 0.000 indicates that the model is statistically significant. Based on these results, we can partially accept the sixth hypothesis (H6). Based on the findings discussed in the preceding sections, Figure 1 provides a visual representation of the model highlighting the relationships between the independent variables (CSFs) and the dependent variable of project outcomes (time, cost, quality, and customer satisfaction). This model encapsulates the results obtained from the analysis and serves as a visual summary of the relationships identified in the study.

Table 11. The Effect of CSFs on Customer Satisfaction.

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.993	.318		6.262	.000
Planning and scheduling	.359	.078	.424	4.592	.000
Scope and cost management	.234	.079	.275	2.972	.004

R = .615, R^2 = .379, Adjusted R^2 = .366, F value = 30.77, Sig. F = 0.000

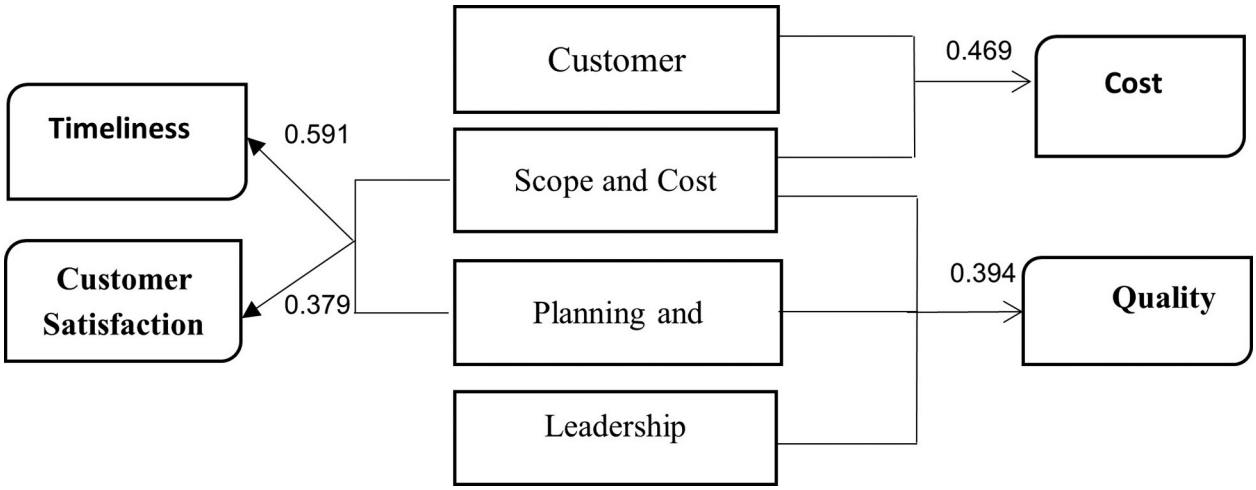

Figure 1. Agile Success Model.

7. Conclusion

This study used factor analysis to identify the CSFs that contribute to the success of agile development practices in project management in the Gaza Strip. It also investigated the impact of CSFs on project outcomes, including timeliness, cost, quality, and customer satisfaction. The findings indicate that project success is significantly influenced by seven factors, namely: scope and cost management, leadership, agile analytics techniques, customer involvement, teamwork, planning and scheduling, and effective communication. These factors accounted for 71.9% of the total variance explained by the CSF components. The results of stepwise regression analysis show that scope and cost management, as well as planning and scheduling, are significant predictors of project outcomes. The study also shows that CSFs, such as scope and cost management, customer involvement, planning and scheduling, and leadership, have varying degrees of impact on project cost, timeliness, quality, and customer satisfaction. Overall, the study finds that CSFs are useful in predicting project outcomes and can be used to improve project success. The findings of this study provide valuable insights into the factors that contribute to successful agile project management in the Gaza Strip. Project managers and organizations that would like to improve their agile development practices and increase the success rate of their projects can use the results. By focusing on these CSFs, project managers can ensure that their projects are effectively managed, stakeholders are satisfied, and project goals are achieved. However, it is important to note that this study has its limitations. The study only focused on the CSFs for agile development practices and did not examine other factors that may affect project success but were not considered in this study. Future research should explore these factors in more depth to provide a more comprehensive understanding of the factors that contribute to successful project management.

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Appendix A

CSFs Measurement Questionnaire for Agile Projects.
Please use the checkmark (✓) to indicate your level of approval on the following axes:

CSFs	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
Factor 1: Effective communication					
1. The communication between team members is clear and concise.					
2. The team regularly holds meetings to discuss progress and address any issues.					
3. Team members are open to receiving feedback and criticism.					
4. The team regularly communicates with stakeholders to ensure their needs are being met.					
5. The team has established clear channels of communication for both routine updates and urgent messages.					
6. A daily meeting is held to discuss the progress of the team.					
Factor 2: Customer involvement					
7. The customer actively participates in defining project requirements.					
8. The customer is involved in regular meetings to review project progress.					
9. The customer provides timely feedback on project deliverables.					
10. The customer feels a sense of ownership in the project outcome.					
11. The customer can successfully express their requirements to the development team.					
12. The customer is able to adjust requirements as needed during the project.					
Factor 3: Planning and scheduling					
13. The project timeline is well-managed and kept up to date.					
14. The team can reliably predict task completion times.					
15. The team effectively prioritizes tasks to ensure the project stays on track.					
16. The team is able to effectively balance the needs of multiple stakeholders.					
17. The milestones determined effectively.					
18. The role of each team member is defined.					

CSFs	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
Factor 4: Leadership					
19. The project leader effectively communicates the project vision and goals.					
20. The project leader effectively delegates tasks and responsibilities.					
21. The project leader fosters a collaborative and inclusive work environment.					
22. The project leader effectively manages conflicts and resolves issues.					
23. The project leader is knowledgeable about agile methodologies and practices.					
24. The project leader effectively balances the needs of multiple stakeholders.					
25. The project leader is able to make decisions in a timely and effective manner.					
Factor 5: Teamwork					
26. Team members actively participate in meetings and decision-making processes.					
27. Team members are able to effectively collaborate and share information.					
28. Team members are able to effectively manage conflicts and resolve issues.					
29. Team members are willing to help each other when needed.					
30. Team members are able to effectively balance the needs of multiple stakeholders.					
31. Team members have a positive attitude and work well together.					
32. The team is committed and motivated					
Factor 6: Scope and risk management					
33. Risks are identified early.					
34. The project scope is effectively managed and changes are effectively controlled.					
35. Risks are effectively assessed and managed.					
36. The team is able to effectively balance the need for speed and quality.					
37. The team is able to effectively manage changes to the project scope.					
38. The team regularly communicates project status					

CSFs	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
Factor 7: Agile analytics techniques					
39. The team effectively leverages data and analytics to inform decision-making.					
40. The team regularly reviews and adjusts analytics approaches as needed.					
41. The team effectively integrates data and analytics into the project workflows.					
42. The team effectively balances the need for speed and accuracy in their analytics work					
43. The team effectively applies problem-solving techniques.					
Factor 8: Cost management					
44. The project budget is effectively controlled and updated on a regular basis.					
45. The team can efficiently manage project expenditures while staying within budget.					
46. The team effectively balances the need for speed and cost efficiency					
47. The team can successfully manage changes to the project scope to minimize cost impact.					
48. The team regularly communicates project cost status to stakeholders.					
49. The team is able to effectively negotiate and manage contracts with external vendors.					
50. The team created periodical financial reports.					
51. Project costs are tracked continuously.					

Appendix B

Agile Project Outcomes Measurement Questionnaire
Please use the checkmark (✓) to indicate your level of approval on the following axes:

Success Criteria	Strongly agree	Agree	Moderate	Disagree	Strongly disagree
Factor 1: Project cost					
1. The work was finished on time and on budget.					
2. Keep project expenditures within the allotted spending.					
3. Carefully strike a balance between the demands of efficiency and speed.					
4. Changes in the scope of the project were successfully managed.					
Factor 2: Timeliness					
5. The project was finished on schedule.					
6. The project's timeframe was followed exactly as intended.					
7. Manage unforeseen delays in an efficient manner.					
8. Determine which tasks must be prioritized.					
9. Successfully handled project scope adjustments within the allotted time.					
Factor 3: Project quality					
10. Successfully managed and avoided project work faults.					
11. Successfully incorporated quality control procedures into project workflows.					
12. Timely and successfully handled and resolved issues with quality.					
13. Strike a good balance between the demands of speed and quality.					
Factor 4: Customer satisfaction					
14. The customer was happy with the project's level of engagement and communication.					
15. The quality of the project deliverables met the customer's expectations.					
16. The client was happy with the project's overall result.					
17. The customer was pleased with the project's level of cost effectiveness.					

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