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Moderating Role of Person's Job Fit in the IT with Effectiveness of Agile Methodology on Project Success in Tanzania

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Abstract

Despite the importance of computing software, the process of developing software still faces various challenges. One of these is the proper methodology for developing software. This paper aims to analyze the multiple dimensions of software development and how Agile practices can affect them. To gather information about the various dimensions of software development, we surveyed software professionals from different backgrounds. The findings of this study will be used to analyze the effects of ASD on the software industry of Tanzania. The collected information is analyzed in two ways. The first involves summarizing the findings of the surveys. The results of the surveys are presented in a graphical manner. They show the opinions of the survey respondents on the effectiveness of Agile practices. We then used quantitative methods to analyze the data. The results of the surveys support the hypothesis that there is a strong relationship between the effectiveness of Agile practices and the various dimensions of software design. The importance of the job fit of a software development team and the use of agile practices is acknowledged by the findings of the survey. In terms of time, quality, cost, and stakeholder satisfaction, the fit of the team and ASD is very important for successful software development. The findings of this study can be generalized to other companies in the software industry of Tanzania.

Keywords

IT, Project, Software Development, Tanzania

1. Introduction

1.1. Agile Methodology

Due to the continuously changing consumer requirements, the software devel-

opment industry is prone to instability. This is why it is important that the developers are able to deliver innovative and functional products that are designed to meet the needs of their customers. In order to achieve this objective, various software development methodologies were introduced during the 1990s. These included rapid development and incremental development. In 2001, a set of 12 principles and four core values was introduced to the software engineering community through the Agile Software Development Manifesto (Agile Essentials 101, 2021). The principles and values of the Agile Manifesto help improve the quality of the software development process and enable team members to work more effectively. The movement emphasizes the importance of focusing on the client's requirements and adopting a culture that encourages change. The main difference between agile and traditional software development is that the latter focuses more on the interaction between the team members and the project manager. This method also requires the project manager to take part in the planning and implementation of the project.

Contrary to traditional software development methods, agile techniques encourage change and are more likely to attract customers due to the participation of the team members. They also provide a regular and bi-weekly software delivery schedule (Agile Essentials 101, 2021). In addition to helping companies compete, agile techniques also help them gain a competitive advantage by allowing them to deliver fast and consistent software. Unlike other methods, agile techniques rely on feedback to improve customer satisfaction.

In just four years, US companies have wasted over 30 billion dollars on unused software. According to a study conducted by Boston Consulting Group, about 70% of digital transformations in the country didn't achieve desired outcomes. In 2020, the cost of implementing software projects that failed in the U.S (2. A 1E Report 2022) was estimated at around 260 billion dollars, which is more than double the 2018 (**Figure 1**) of 177.5 billion. ASD is a startup that aims to

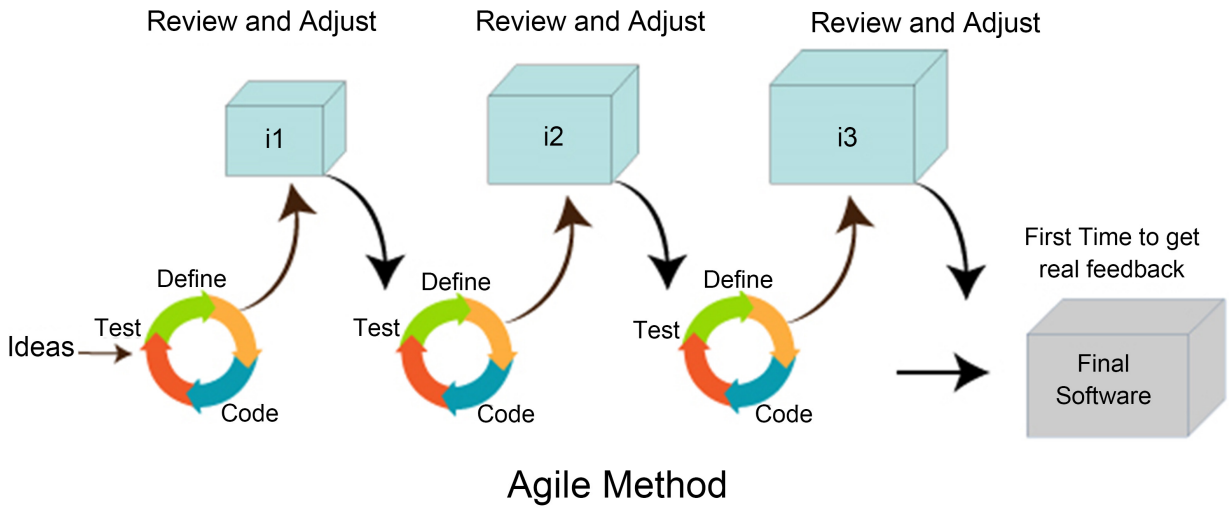

Figure 1. Agile software development (ASD) Methodology. (Author's Source)

provide software development solutions that are designed to help companies solve their most common problems. These include time and cost-savings, superior quality, and better customer service. Over the years, researchers have been developing new software development techniques that can improve the efficiency and success of projects. One of these techniques is the Agile Software Development methodology. This has led to the rapid emergence and evolution of agile innovation, which has greatly impacted the field of information technology. The benefits of adopting agile development techniques have been widely acknowledged by the industry (Chiyangwa & Mnkandla, 2018). It has led to the development of new concepts and procedures that can help companies improve their productivity and quality.

In 1975, a strategy was developed that helps companies manage the complexity of their software development processes. This has since become an integral part of agile development (Nerur, Mahapatra, & Mangalaraj, 2005). Due to the increasing popularity of artificial intelligence and neural networks, as well as the increasing number of services that are related to software development, many companies have started to realize that the human side of the process has been compromised.

One of the most important advantages of adopting agile development is its ability to split a procedure into short iterations, which makes them easier to manage and react to. This method also helps reduce the risk of failure by adapting to market changes (Inflectra, 2022, https://www.inflectra.com/Ideas/Whitepaper/Introduction%20to%20Agile%20Development%20Methods.aspx). Various types of development methods are used by agile companies, such as Scrum, Crystal Model, Extreme Programming, and Design Driven Model. They completely utilize the framework provided by the Agile manifesto (Inflectra, 2022, https://www.inflectra.com/Ideas/Whitepaper/Introduction%20to%20Agile%20Development%20Methods.aspx).

1.2. Person's Job Fit

The team members are the heart of a project, but it is also important to consider the person-job fit when using the ASD methodology. The concept of person-job fit refers to the combination of the characteristics of the job and the needs of the person (Edwards, 1991). The concept of the person-job fit is to ensure that the employees have the necessary skills and knowledge to carry out the tasks (Khan, Qureshi, & Abbas, 2010). It has been observed that when staff members or workers are selected as a perfect fit for a particular assignment, they tend to show an increased confidence and attachment to the job (Mann & Maurer, 2005).

The candidate's ambition and skills should match the requirements of the job. In addition, the team's productivity is also taken into account to determine the job fit (Hsu, Weng, Cui, & Rand, 2016). Job requirements and criteria can be

used to identify the appropriate level of expertise that the employee has. An organization's success is built on the commitment of its employees to provide the best possible service to its customers (Hummel, Rosenkranz, & Holten, 2013). This is done through the establishment of a culture that values the contributions of its staff members.

1.3. The IT Industry of Tanzania

The information technology industry of Tanzania has been one of the fastest-growing sectors in the world over the past couple of years. In 2019, it was ranked as one of the top four countries when it comes to the freelance development of software. There are also a number of software houses operating in the country that are working for multinational corporations. The country's information technology industry was able to grow its value by 100% to reach a total of about $3.5 billion in 2019. Due to the low cost of doing business in Tanzania, many multinational companies have started establishing offshore operations in the country.

As countries around the world look to develop policies that will help their information technology industries grow, the government of Tanzania has been working on developing regulations that will allow the country's companies to compete in the global market. Some of these include providing 100% equity ownership of the companies operating in the country, as well as tax exemptions for the export of information technology products. The PSEB is an organization that is dedicated to promoting Tanzania's information technology industry both internationally and nationally. It has over 3000 companies that it has registered, and these have expertise in various areas such as business resource planning, software development, and mobile content creation.

Compared to other countries such as India, China, and Singapore, Tanzania's software industry is regarded as market-efficient and provides moderate quality (Investment Policy, 2013, https://invest.gov.pk/sites/default/files/inline-files/IT.pdf). However, it still needs to improve the quality of its products and services in order to compete in the international market. Despite the country's potential and success, the software industry is still relatively young. This provides the industry with an opportunity to develop new strategies and methods in order to improve the efficiency of its operations (Investment Policy, 2013, https://invest.gov.pk/sites/default/files/inline-files/IT.pdf). The global economic crises and pandemics have also affected the country's software development industry. Businesses operating in this sector can only survive if their projects are successful.

Despite the global pandemic, Tanzania's software development and information technology industries are still growing. Although agile methods can provide organizations with a lot of advantages, they can also be very pain-filled. This is why it is important that software development companies in the country im-

prove their project failure rate. In Tanzania, only 15% of e-government projects are successful, while around four out of every ten projects fail. Many companies in the country still use traditional methods for developing and managing software projects, and this is one of the main reasons why they are experiencing project failures. Due to the complexity of information technology projects, software development companies in Tanzania often face issues when it comes to managing them. This is why it is important that they adopt agile methods in order to improve their efficiency.

The formation of the PSEB has also helped the software industry in Tanzania. There have been numerous studies about the adoption of agile methods in the country, but the exact effects of this method on the country's information technology industry are not yet known. To gain a deeper understanding of the effects of ASD on the industry, we conducted a survey of the country's software development professionals. The goal of this study was to analyze the various aspects of a project's success, such as its scope, quality, cost, and stakeholder satisfaction. There is a lack of consensus regarding the definition of success in the software development industry, so we decided to focus on the aspects of project success that are most important to a company's success.

The findings of this study will be used by the software development industry in Tanzania and globally. In the first section of this article, we introduce the concept of agile methods and the information technology industry in the country. In the next section, we will talk about the survey's demographics and the research methodology. The next section of the study provides a statistical analysis of the data collected during the survey. It then concludes the paper with a future research direction.

2. Related Work

2.1. Agile Methodology Adoption Worldwide

The global economy has been affected by various factors such as the economic slowdowns, the ongoing pandemic of COVID-19, and the recession. The information technology industry has also been affected by these changes. Due to the effects of these factors, many companies have had to lay off employees. The quality of a product is directly affected by the changes in the way information technology companies operate. This is why we will talk about various studies on the adoption of agile techniques from the early days of the practice to the present.

One of the most common findings of these studies is that the adoption of agile methods is increasing at a healthy pace. This is because agile methods are becoming more prevalent in both the software development and management sectors. In 2001, a study was conducted by the Agile Cutter Consortium to investigate the adoption of the methodologies (Cockburn & Highsmith, 2001).

The study was conducted in various countries, such as Australia, North America, Europe, and India. It was able to collect data from almost 200 individ-

uals. It revealed that many organizations have adopted at least one agile method, and it performed well in terms of customer satisfaction, quality delivery, and performance.

The study also highlighted the advantages of agile methods, such as their ability to keep track of the changes in the customer's needs and provide them with the necessary information to make informed decisions. In 2005, another study revealed that 14% of organizations are using agile methods. Another study was conducted from February to March 2014 to analyze the effects of agile methods on an organization. It was able to collect data from 114 participants (North American and European Enterprise Software and Services Survey, 2005; Agile Adoption Mini-Survey, 2014). The results of the study revealed that almost 10% of the respondents regarded the adoption of agile methods as a great success.

A survey conducted by Hewet and Packard, a leading IT consultancy, revealed that 16% of the respondents are currently using agile methods, while 51% are leaning toward using hybrid approaches (Hewlett-Packard Enterprise Development LP, 2017, https://softwaretestinggenius.com/docs/4aa5-7619.pdf). Only 2% are using pure waterfall. Most companies and development teams now adopt agile methods, while the minority uses waterfall techniques. According to a survey conducted by digital.ai, the adoption of agile methods within the software development industry has increased from 37% in 2021 to 86% in 2021 (State of Agile Report, 2021, https://info.digital.ai/rs/981-LQX-968/images/RE-SA-15th-Annual-State-Of-Agile-Report.pdf). Another study conducted by the company, which was entitled "Covid-19 pandemic 2020", revealed that the prevalence of distributed agile teams increased (Agile Adoption Report, 2021, https://certiprof.com/pages/certiprof-agile-adoption-report-2021). 72% of the teams noted that they work in different locations. The study also noted that the number of individuals with less than two years of experience using agile methods has increased significantly. In 2022, almost all developers in the different fields, such as HR, sales, and marketing, have fully embraced the agile approach.

2.2. Importance of Persons Job Fit

In software development, one of the most challenging factors is to increase the production of apps while avoiding project failures. This can be done through the use of real work and analysis. The success of a project can also be influenced by the team's dynamism and culture. One of the most important factors that a company can consider when it comes to hiring and retaining the right people is the availability of a supportive and conducive environment. This can help boost the productivity of the team and improve the project's meaningful and productive outcome (Shin, 2004). The person-job fitness of an individual is based on the consistency of their work and mission.

A gap still exists in the understanding of how to analyze and work on projects

based on their pace and the factors that can affect their success (Investment Policy 2013, https://invest.gov.pk/sites/default/files/inline-files/IT.pdf). According to the study, the team's dynamism and culture can also help determine the success of a project. In software development, teamwork is also important as it can help boost the team's performance and improve the project's quality (Tims, Bakker, & Xanthopoulou, 2011). Numerous studies have shown that working together can help improve communication and collaboration (Zhu, Zhou, & Seguin, 2006). In software development, roles are also important as they can help promote collaboration. One of the most common models used in collaboration is the E-CARGO, which is a framework that has been proposed for the management of roles and groups (Zhu, H. E-CARGO and Role-Based Collaboration, 2021, Zhu, H. Role-Based Collaboration and E-CARGO, 2015). According to a study conducted by performance management firm, the majority of organizations do not consider their performance management system to be exceptional. The study was conducted on a wide range of organizations that are adopting agile methods. They ranged in size and served various industries (Al-Kassem, 2017).

3. Methodology

The study was conducted in Tanzania to collect knowledge management standards and practices related to agile software development. The main objective of the research is to find a link between project success and agility, and a mediating role for the job fit of individuals. The study was conducted to establish a correlation between the use of agile methods and the success of a project. It also analyzed the role of the personal job fit in the link between the success of a project and the use of agile software.

Hypothesis 1. The Agile approach has a positive impact on the success of a project.

Hypothesis 2. The job fit mediates the impact between the Agile method and project success.

This survey was conducted to gather information about the various IT organizations that are registered with the PSEB. Through a simple random sampling method, the survey was able to collect data from around 350 IT companies. Out of the 300 responses that were submitted, 276 were selected for analysis. The main objective of the survey was to gather information about the various aspects of the IT industry. To ensure that the data collected is usable, the survey was conducted with two separate questionnaires One of these is designed to measure the link between the use of Agile and the success of a project, while the other is designed to measure the relationship between the people and the organization.

For the survey, we used the work of Aga et al. (Aga, Noorderhaven, & Vallejo, 2016), and Agrawal, 2014 (https://www.academia.edu/8070190/A_Questionnaire_of_an_Agile_Survey) as models for the design of the questionnaires. To ensure that the questions are re-

levant and concrete, special considerations were made to the way they were presented. The questions were analyzed using a 5-point Likert scale to explain the scope of the study. The survey was distributed to the employees of various software houses. Other organizations, such as those in the public and private sectors, also participated in the survey. The results of the survey were then analyzed using a quantitative approach. The participants came from various software houses and organizations operating in Tanzania's major cities, such as Dar ES salaam, Arusha, Mbeya, and Mwanza.

3.1. Respondents' Age Distribution

Figure 2 shows the age distribution of the respondents. It revealed that almost half of them were between the ages of 34 to 41. The other 37% were in the 26 to 33 age bracket.

3.2. Respondents' Job Experience Distribution

Figure 3 shows the distribution of the number of years of experience of the survey respondents. As shown in this figure, 43% of the respondents had 6 to 10 years of development experience, 26% had 10 years or more, and the remaining had less than 5 years of experience.

3.3. Respondents Gender Distribution

Figure 4 provides a look at the gender distribution of survey respondents and shows that 75% of the survey respondents were male and the remaining 25% were female.

3.4. Respondents' Job Role Distribution

Figure 5 shows the role distribution of the survey respondents. This figure indicates that the majority of the respondents were programmers, i.e., 23%, 14% were from IT management, 9% from project management, 13% from requirement analysis, and 10% from quality assurance.

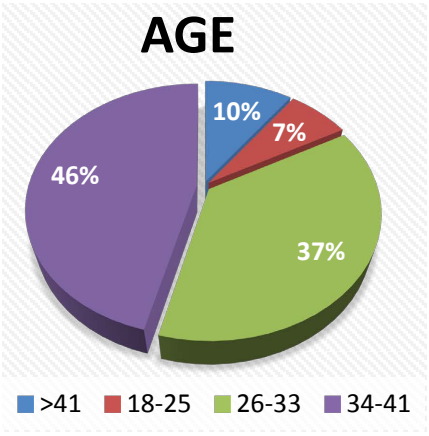

Figure 2. Age distribution of respondents. (Author's Source)

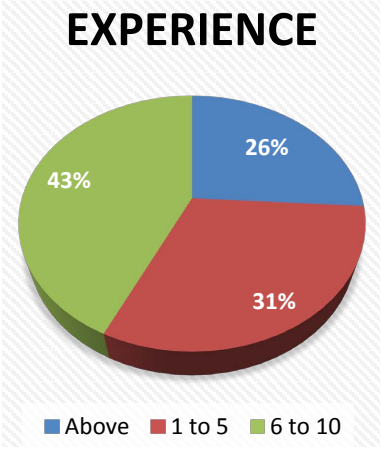

Figure 3. Experience distribution of respondents in years. (Author's Source)

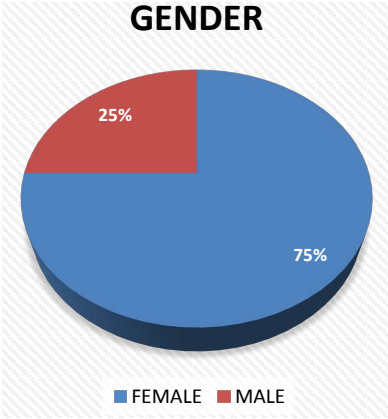

Figure 4. Gender distribution of respondents. (Author's Source)

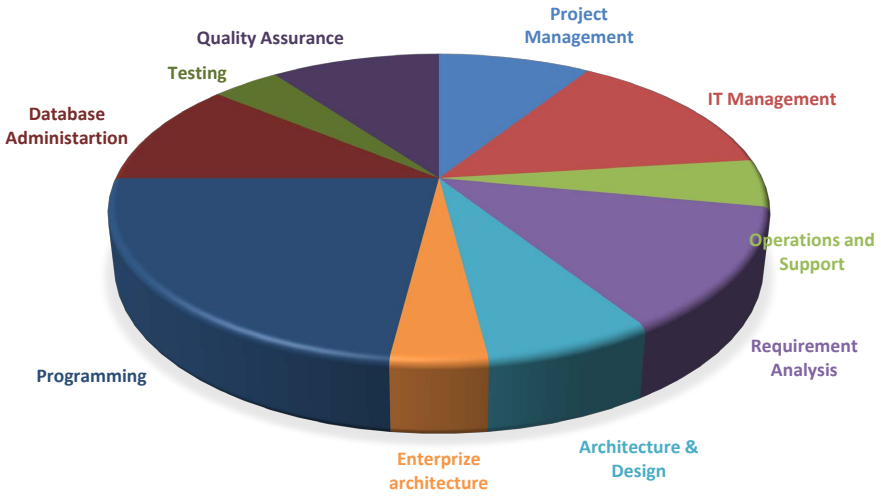

Figure 5. Role distribution of respondents.

4. Results and Discussions

In this section, we present the main findings of our survey. The feedback that we received from the survey participants regarding the effect of Agile on the differ-

ent aspects of software development is presented here in the form of pie charts.

4.1. Productivity

The results of the survey were presented in Figure 6. The respondents were asked to rank the effects of various Agile techniques on their productivity. The majority of them think that these methods have a higher impact on their work. On the other hand, some believe that the effects are somewhat lower.

4.2. Project Success

The results of the survey revealed that about 41% of the respondents think that Agile projects have a success rate of 50% to 74%, while 37% think that it's 75% to 90%, and 12% believe it's between 25% and 49%.

4.3. Stakeholders' Satisfaction

The percentage of projects that have successfully completed an Agile project is shown in Figure 7. The survey respondents' point of view on the project stakeholders' satisfaction is also shown in Figure 8. It shows that most of them think that adopting an Agile approach has a positive effect on their satisfaction. On the other hand, 5% think that the impact of the approach on their satisfaction is higher.

4.4. Product Quality

The survey respondents' views on the effect of Agile on the quality of a product were shown in Figure 9. The percentage of respondents who believe that it has a significant effect on the product's quality was 55%, 16% believed that it does not have a significant impact, and 4% said that the effect is much lower.

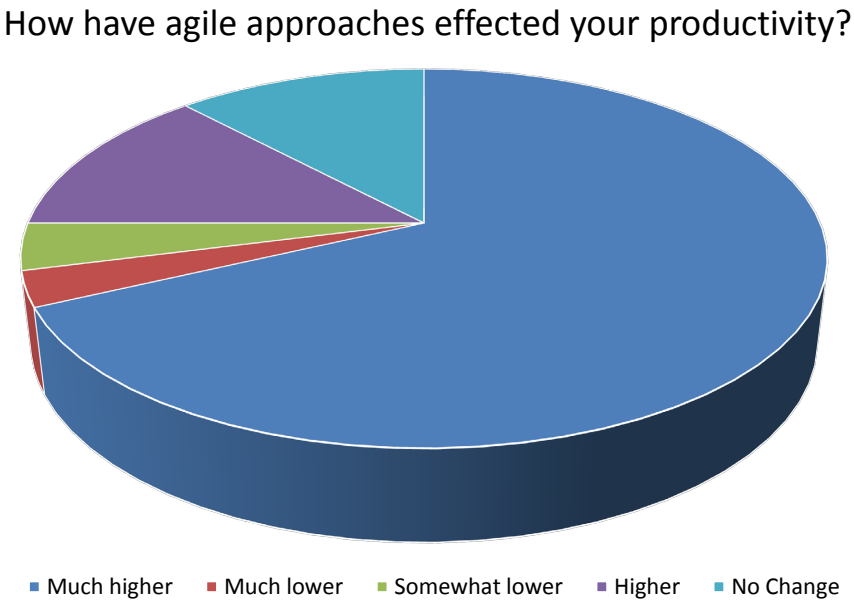

Figure 6. Effect of agile on productivity. (Author's Source)

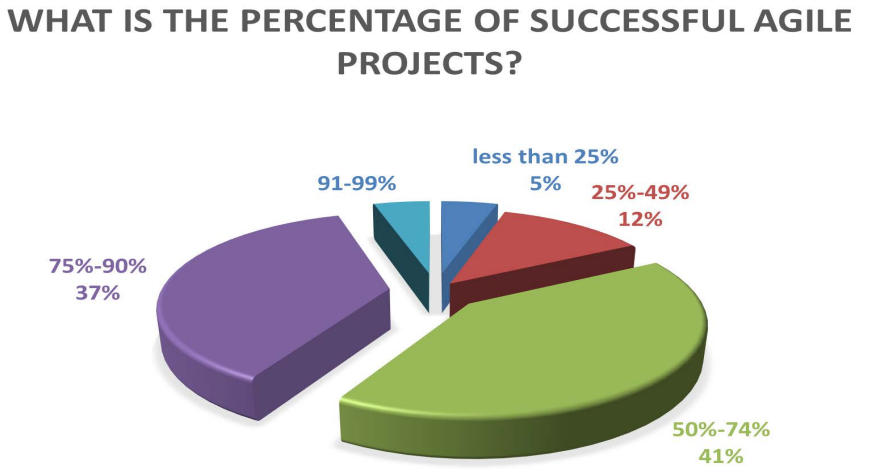

Figure 7. Percentage of successful agile projects. (Author's Source)

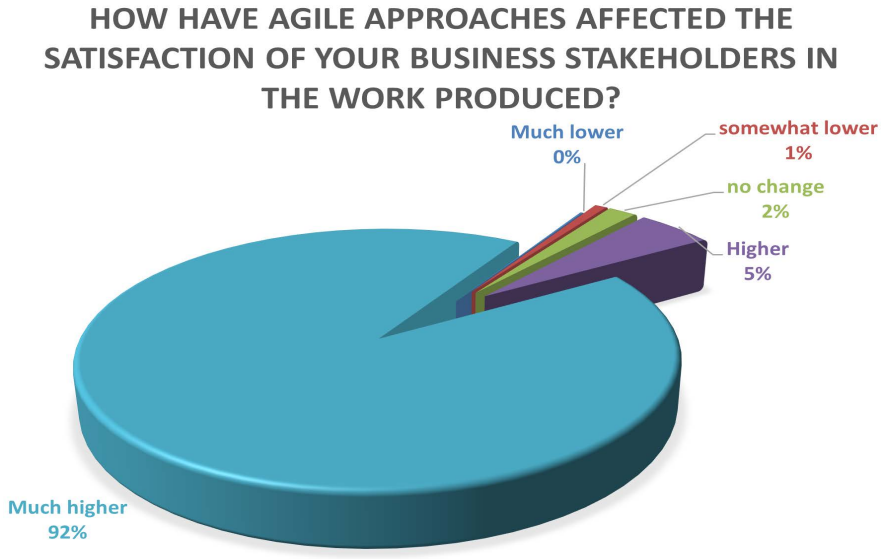

Figure 8. Effect of agile on stakeholders' satisfaction. (Author's Source)

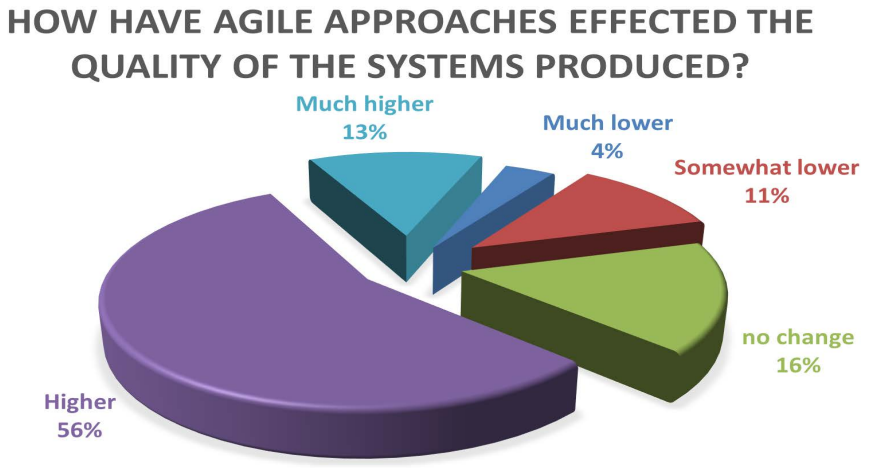

Figure 9. Effect of agile on product quality. (Author's Source)

4.5. Development Cost Reduction

The graph shows the results of our survey regarding the effects of agile on the cost of a project. The majority of the respondents stated that the approach has a higher effect on the development cost, while 18% think that it has a lower effect.

5. Statistical Analysis

The results of the survey were analyzed using statistical tools to summarize the information collected. This report provides a summary of the data and its corresponding findings.

5.1. Descriptive Statistics

A summary of statistics is known as descriptive statistics. It summarizes the data and provides insight into its distribution. It also reveals the outliers and the association between variables. This type of data contains important details such as the sample size, maximum and minimum values, standard deviations, and average values. The first column of Table 1 provides the details of the various variables. The second, third, and fourth columns define the minimum, maximum, and value, respectively. The fifth, sixth, and seventh columns highlight the mean, standard deviation, and the sum of values.

5.2. One-Way ANOVA

The one-way ANOVA compares the means of the groups of data you are interested in and determines whether any of those means are statistically significantly different from each other. It tests the null hypothesis. Mathematically, it is given by the following expression.

$$\text{HO: } m_1 = m_2 = m_3 \ldots = m_k \tag{1}$$

where m is the group mean and k is the total number of groups. If one-way ANOVA results are statistically significant, the Alternative Hypothesis (HA) is accepted, which suggests that there are at least two group means that are statistically significantly different from each other. The difference in the means is captured in the F-static or F-Value. The F-value also determines the *P*-value; which is the probability of getting a result at least as extreme as the one that was observed, given that the null hypothesis is true.

An ANOVA control is a way to see if the results of a survey or experiments are important. This helps you to see if the null hypothesis is rejected or if the

Table 1. Descriptive analysis.

Variable	N	Min	Max	Sum	Mean	SD
Agile Methodology	276	1.00	5.00	509.00	1.8442	0.66960
Person job fit	276	1.00	3.90	602.30	2.1822	0.40865
Project Success	276	1.20	4.00	646.40	2.3058	0.45579
Valid N	276					

alternate theory is adopted. As part of our analysis to see if the age of the professional, project size, the size of the project team, the project manager's experience, the duration of the project, the level of education, and gender distribution affect the project's performance, these variables were classified as covariates.

Table 2 summarizes the F and Significance values of the ANOVA test for Gender, Experience, Qualification, and Age. From this table, it can be observed that the significance value for all of these variables is greater than 0.05 (the critical value), and therefore based on our data, they do not influence the dependent variable, i.e., Success of the Project.

5.3. Reliability Analysis

The reliability test is about whether a measurement is free from random error. Evaluation of reliability is determined by the proportion of systemic variation in a scale, where measurements are repeated several times. Therefore, if the reliability measurement relation is strong, the scale yields consistent outcomes and is thus accurate.

To perform reliability analysis for our collected data we calculated the Cronbach coefficient. Cronbach's alpha is a measure of internal consistency and shows how closely related a set of items are as a group (Table 3).

5.4. Correlations Analysis

A statistical tool for measuring connection or the relationship strength between two consecutive numerical variables is called correlation analysis. Correlation is measured between independent variables (IVs) and the dependent variables (DVs). Correlation coefficients, therefore, provide a statistical perspective on how the linear relationship between IVs and DVs is directed and strengthened. Pearson's correlation coefficient measures the statistical relationship, or association, between two continuous variables and varies between 1 and +1 to show a positive or negative correlation. Table 4 provides the valid ranges for positive correlation. Given paired data consisting of n pairs, rxy is defined as in Table 4.

In our case N = 276 and $p < 0.001$, the theoretical correlations for Agile methodology use, person-job fit, and project success are presented in Table 5. It can be observed from this table that all these variables are significantly correlated with each other (r_0.959 for all cases) and are measured as (multi-Collinearity).

Table 2. ANOVA table.

Covariates	F Value	Significance Value
Gender	2.029	0.155
Age	0.778	0.067
Qualification	0.708	0.548
Experience	2.491	0.085

Table 3. Cronbach's coefficients for project success, Agile methodology use, and person's job fit.

Variables	Items	Cronbach's Alpha
Project Success	9	0.852
Agile Methodology Use	8	0.742
Person's Job Fit	8	0.569

Table 4. Correlation type and its numerical ranges.

Correlation Type	Numerical Range
Weak Correlation	0.0 - 0.4
Moderate Correlation	0.4 - 0.6
High Correlation	0.6 - 0.8
Multi Correlation	More than 0.8

Table 5. Correlation for project success, agile methodology use and person's job fit.

Variables Success	Agile Methodology Use	Person's Job Fit	Project
Agile Methodology Use	1	0.959	0.988
Person's Job Fit	0.959	1	0.963
Project Success	0.988	0.963	1

5.5. Regression Analysis

To know the mutual impact of different variables in this study, we performed a regression analysis of our data. Regression analysis is a group of statistical techniques used to evaluate associations between a dependent variable and one or more independent variables. The dependent variable (or the outcome variable) is the variable that we want to predict. The variable we use to anticipate the value of the other variables is referred to as the independent variable (or the predictor). Gender, age, education and experience are used as demographics. We control demographic values in regression analysis. We used regression analysis to test our two-research hypothesis introduced in Section 3, using SPSS as a tool. The testing results of are as follows

1) Hypothesis 1: The Agile Approach Has a Positive Impact on the Success of a Project for Hypothesis 1, the regression analysis results are summarized in Table 6. This table shows a strong relation between Agile Methodologies' Effectiveness and project success, because the value of b is 0.690 significant value of p_0.001. Hypothesis 1 is acceptable since the results indicate that there is a 0.698-unit change in project success when there is a 1-unit change in Agile methodology effectiveness.

2) Hypothesis 2: The Job Fit Mediates the Impact between the Agile Method and Project Success for Hypothesis 2. If the job fit is strong, the relation between the Agile approach and project success would be amplified. From Table 6, we can observe this relationship. Results of the regression analysis in this table show that the person's job fit moderates the relation between Agile methodology and

Table 6. Correlation for project success, agile methodology use, and person's job fit.

	b	R2	Sigp
Step I			
Model			
Step II			
Agile Methodology	0.690	0.476	0.00
Step III			
Moderator	0.990	0.980	0.00

project success, as the value of b is 0.990 at the significance level of $p < 0.001$. The results indicate that the success of the project was caused by a 0.980-unit change in project success when person-job fit has moderated the relationship between Agile and project success. Therefore, our research Hypothesis 2, the job fit mediates the impact between the Agile method and project success, is also accepted.

6. Conclusion

The objective of this study was to analyze the influence of Agile methodology on the success of a project in Tanzania's software industry. Through a survey procedure, the researchers were able to collect information from around 350 IT organizations. The researchers were able to collect data from around 300 individuals, who are mainly involved in the development of Agile projects. Although the information they provided was comprehensive, only 276 of them were used for analysis. The data collected during the study were analyzed both statistically and visually. The researchers concluded that Agile methods play a significant role in the success of a project. They also found that the job fit of the individuals who were involved in the development of the projects had a moderate relationship between the success of the project and the methodology. Statistical analysis of the data collected during the study provided the researchers with reliable conclusions. In the future, they might expand the scope of their work by studying the internal dynamics of an Agile team. For instance, they could look into the roles of various team members and the characteristics of successful teams. The authors of the study provided their contributions in various forms. Some of these included the conceptualization, validation, and formal analysis of the data collected during the study. They also contributed to the writing of the study's manuscript by reviewing and editing the original draft. In addition, they were involved in the project administration, funding acquisition, and data curation.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Abbreviations

The following abbreviations are used in this manuscript:

ASD: Agile Software Development.

PSEB: Tanzania Software Export Board.

IVs: Independent Variables.

DVs: Dependent Variables.