

People Factors Influencing Project Success in Software Development: A Survey of Agile Development Teams in Indonesia

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Abstract— Currently, agile is one method often used in software development. However, implementing agile is not easy. Many factors can affect the successful implementation of agile software development (ASD). One of the factors that often arise is individuals/people. Previous research has proven that the people factor is one of the factors that can increase the success of ASD implementation. However, only one study focuses on the people factor that researchers in Portugal have done. Therefore, this study attempts to identify the effect of people's factors on the success of ASD in Indonesia. Respondents in this study are individuals who have or are currently using ASD. Data collection in this study used a questionnaire and validated the data using Partial Least Squares–Structural Equation Modeling (PLS-SEM). The findings of this study indicate that team capability influences the success of ASD implementation, while personal characteristics, societal culture, and customer involvement have no effect. In addition, other findings personal characteristics can affect team capabilities and customer involvement.

Keywords— *Software Development, Agile Software Development, Team Capability, Customer Involvement, Societal Culture, Personal Characteristic, and Structural Equation Model (SEM).*

I. INTRODUCTION

In this modern era, the industry requires producing software that has high quality with an ever-increasing level of intricacy and changing user requirements [1]. Producing software that has high quality with a high level of complexity is not easy. This is proven by the high percentage of failures in the software industry [2]. Therefore, many industries and practices have switched to using agile software development (ASD) [1].

Agile exists to overcome the limitations of the previous methods, reduce development costs, and provide flexibility in development [3]. Having the advantage of being flexible, agile can improve more conforming products with the business

needs of the industry along the times and become more popular. Agile methodology is popular in software development projects [2].

Although agile gives many advantages, implementing agile in an industry is not easy. Many challenges can affect the success of ASD. Based on the Version one survey conducted in 2021, there are several challenges faced when implementing agile methods. These challenges include 1) 43% organizational culture at odds with agile values, 2) 42% lack of skill/experience with agile methods, and 3) 31% lack of business/customer/product [4]. Based on the survey, the three problems are problems that come from individuals who use agile.

Technical problems are not problems that often arise in the failure of a project, but the project failure comes because of individuals/people [5]. Currently, several researchers have proven that people factors can affect the success of software development using agile methods [6]. The research are [6], [7], [8], [26], and [28], but based on these studies there is only one study that focuses on looking at the influence of the people factor on the success of ASD.

Researchers [6] conducted a study that focused on measuring the relationship between people and ASD, but such research has only been tested in one country. In Indonesia, there has been no research like that done by researchers [6]. Therefore, in this study, we want to examine the influence of people's factors on the success of ASD projects, especially in Indonesia. So the research question is:

"What people factors affecting on agile success software development projects in Indonesia?"

With different population characteristics, researchers hope to provide wider knowledge to researchers or practitioners to increase the success rate of the ASD project.

II. LITERATUR RESEARCH

A. Project Success

Year by year, the success of a project increases together with the ways to gain the projects' success [6]. In the literature section on project success, the author divides it into several aspects. The first is the triple constraint, then critical success factors (CSF) regarding projects contained in previous research, and the last to be discussed is stakeholder involvement.

During the last decades, project success has been one of the most popular academic research and business [9]. Currently, many elements currently impact a project's achievement because of many unique perspectives, opinions, and practices inside the literature [10]. There four important attributes regarding the success of a project are quality (the product produced is a good product), scope (can meet predetermined requirements), time (project completed on time), and cost (cost) and effort does not exceed the provisions) [6][26].

1) The Triple Constraint

Many companies have used the triple constraint to enhance project success. The triple constraint is a model used to measure a project [11].

The triple constraint, typically known as the iron triangle, is the central concept that exists in research or the implementation of a project, where the triple constraint can provide an overview of the main criteria for the success of a project [12].

The triple constraint is an essential benchmark in determining the success of a project. These provisions are primarily based totally on whether or not the project being carried out is finished on time, inside the budget, and achieves the quality, scope, or performance that has been agreed upon from the start. At this time, the triple constraint has become one of the standards in measuring project success [13]. In addition, the triple constraint is used to manage a project so that the project does not deviate and can manage the progress of a project [12].

2) Critical Success Factors (CSF)

In the 1980s critical success factors (CSF) emerged as one of the studies that aimed to identify what causes an organization to become more successful than other organizations. Another definition of CSF is the steps that must be carried out if an organization wants to be successful, where this CSF can be measured and controlled [14][15].

Project success factors are independent factors that can increase the project's success [9]. The more research on the

success of a project, the more CSF that will appear. Based on the results of research on the CSF of a project, project definition, support from management, and attention to the external environment are part of the success of a project. [9]. Several studies found that the success of a project is based on the involvement of project management whose task is to control the project so that it is completed on time, according to budget, and can meet customer requirements based on the quality that has been agreed from the beginning [16].

Based on several studies, the most popular CSF in a project is the project's objectives, commitment from stakeholders, the project team, and user involvement in a project [10].

3) Stakeholders Involvement

The success of a project consists of several factors including the people who manage the project, team members, their skills, and competencies [10]. There are 148 journals about software development projects that explain the CSF of the project. There are three main things, namely organizational, team, and customer factors. The presence of customers is very important in ASD, customer presence is expected to be involved in all phases [5].

B. Agile Software Development

Traditional software development has a different stage and every stage is interrelated with each other. Each stage has a different time and each stage has detailed information. These stages include research, planning, design, development, testing, configuration, and maintenance [17][18].

According to [31] in [19] ASD depends on each iterative stage, where the stages of requirements analysis, design, development, and product testing are carried out in the iteration. The development of agile teams is a very important factor, it is because individuals have the freedom and responsibility in development. Frequent changes to the requirements that have been determined, it is necessary to have good collaboration with the customer so that the adjustment process can be carried out as quickly as possible. This is done so that the resulting product can be what the customer wants [19][27]. Therefore, the product owner or customer in the agile method always gets information on product developments in the iteration [17].

C. Structural Equation Model (SEM)

SEM is an analytical method for multivariate data. The multivariate analysis uses statistical methods that can simultaneously analyze many variables. The variables usually represent individuals, companies, events, activities, situations, and others. There are two kinds of SEM, namely covariance-based SEM (CB-SEM) and partial least squares SEM (PLS-SEM). PLS-SEM is used to see the pattern of latent relationships in data [24].

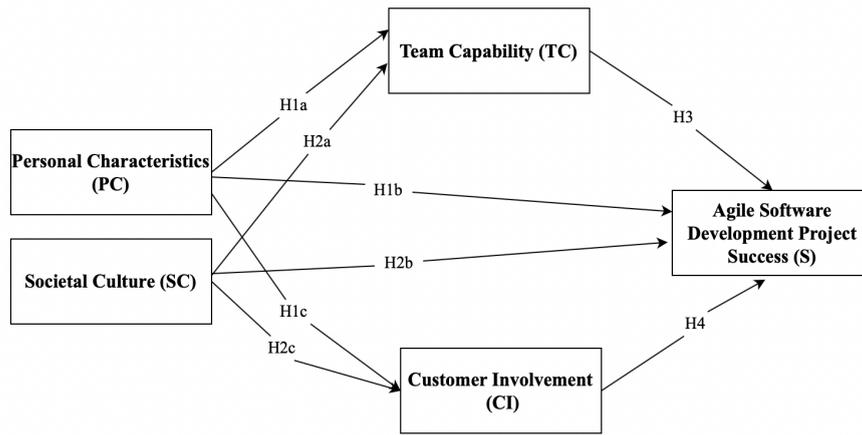


Fig. 1 Theoretical framework

D. Proposed Theoretical Framework and Hypothesis

The people factor is an essential factor in the success of the ASD project [29]. It has been proven by several researchers such as [6], [7], [26], [8], and [28] that people factors can influence the success of ASD projects. However, only one researcher focuses on measuring the relationship between people factors and project success, especially on ASD projects, namely the researcher [6].

This study uses several variables taken from some research researchers, namely [6], [7], and [26]. That study proved that people factors could significantly influence the success of ongoing ASD projects. However, research that focuses on measuring the people factor as in research [6] has only been tested in Portugal. Therefore, in this study, we want to examine the influence of people factors on the success of ASD projects in Indonesia. Therefore, the theoretical framework in this study refers to studies [6], [7], [26], [8], and [28]. Figure 1 is the suggested theoretical framework in this study is:

1) Personal Characteristics (PC)

Personal characteristics are one of the variables that have been proven to affect the success of software development [20]. Personal characteristics are factors that describe a person's attitude, such as honesty, motivation, collaboration, having a sense of responsibility, skills in building communication, interpersonal skills, and always being ready to learn [7][6]. Based on the description of personal characteristics, the hypotheses proposed in this study are:

H1a: Personal characteristics can affect team capability

H1b: Personal characteristics can affect agile software development

H1c: Personal characteristics can affect customer involvement.

2) Societal Culture (SC)

Most of the members stated that they are accustomed to adhering to the culture based on their origin. Based on several studies, culture can influence the success of software development. Such as a team consisting of people who have good attitudes such as progressive, communicative, dynamic, and come from the same area [7]. Based on the previous explanation regarding societal culture, the proposed hypotheses are:

H2a: Societal culture can affect team capability

H2b: Societal culture can affect agile development project success

H2c: Societal culture can affect customer involvement

3) Team Capability (TC)

A good team can easily develop software quickly and meet its customers' needs [7]. A team with high commitment and technical expertise can reduce the occurrence of risks that arise from the development team so that the success of a project can be increased [5]. Then the hypothesis regarding team capability is:

H3: Team capability can affect agile software development project success.

4) Customer Involvement (CI)

Customer participation in software development projects can give the project a greater chance of success [5]. Based on this explanation, the proposed hypothesis is:

H4: Customer involvement can affect agile project software development success.

III. METHODOLOGY

A. Research Steps

There are seven stages in this research, where stages are described in figure 2.

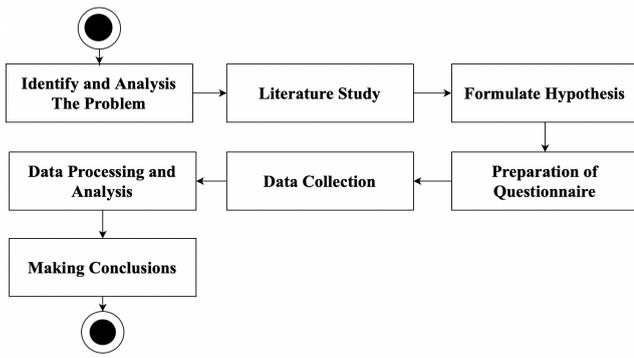


Fig. 2 Research Steps

Stage 1: Identity and Analysis of the Problems

In this first stage, identifying the problems around and analyzing these problems can be made to produce research questions.

Stage 2: Literature Study

In the second stage, a literature study was carried out on matters relevant to this research. The author's relevant literature search uses keywords and the snowball method.

Stage 3: Formulate Hypothesis

After the literature study stage, the authors identify the hypotheses proposed.

Stage 4: Preparation of Questionnaire

After determining each variable and hypothesis, the author arranges questionnaire questions distributed to respondents.

Stage 5: Data Collection

Data collection using Google Forms shared using WhatsApp and Instagram.

Stage 6: Data Processing and Analysis

After the data is collected, the writing performs data processing and analysis.

Stage 7: Making Conclusion

At this stage, the authors make conclusions based on the research results that have been done.

B. Data Collection

This study uses a questionnaire method. Researchers used a Likert scale to identify responses from each respondent. Likert scale is a method used to measure responses from respondents, whether the responses are positive, negative, or neutral responses. Usually, there are five choices: Strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5) [21].

The online questionnaire distributed aims to determine people factors' influence on the success of agile software

development. This questionnaire consists of 21 questions, of which there are five questions regarding personal characteristics, societal culture four questions, team capability five questions, customer involvement three questions, and agile development project success three questions.

C. Research Model

This study uses a quantitative method in which the data analysis process uses SEM-PLS (Partial Least Square) assisted by the SmartPLS version 3.3.3 application. SEM was used to identify factor analysis [22]. PLS-SEM can be used to model a structural equation in a research project [23].

Determination of the sample in this study is using the Cohen method, where the minimum number of samples is 30-100 samples. The sample is an element selected from a larger population. The element is selected based on a sampling technique to represent the population as a whole [24].

IV. RESULT AND DISCUSSION

A. Demographic Responden

Respondents in this study are individuals who have or are currently using agile in developing their software systems. Questionnaires were distributed to 48 respondents using the judgment sampling technique. There are six general questions regarding the criteria from respondents and the remaining 21 questions regarding five variables, including personal characteristics, societal culture, team capability, customer involvement, and agile development project success.

44.2% of respondents in this study are workers who work in technology companies and, on the other hand, in financial companies or the government. Most of these companies have 101 to 500 employees. A total of 66.7% of the respondents' jobs are as development members and the rest as Product Manager/Product Owner, and others. Then the respondents in this study mostly have experience in practicing agile for two years by 47.9%, and only about 10.4% have experience of more than five years.

B. Measurement Model

1) Convergent Validity Test

The authors conducted a convergent validity test to ensure that each indicator tested in the study is a valid indicator [22]. The average variance extracted (AVE) is one of the indicators used in the convergent validity test [25]. The standard used in the validity test for outer loading is more than 0.7, and the standard AVE value equals 0.5 [22]. Table I is the result of the AVE calculation.

TABLE I
RESULT OF ITEM LOADING AND AVE

Code	Loading Factors	AVE
PC1	0.786	0.705

Code	Loading Factors	AVE
PC2	0.865	
PC3	0.849	
PC4	0.838	
PC5	0.858	
SC1	0.812	0.596
SC2	0.804	
SC3	0.807	
SC4		
TC1	0.769	0.648
TC2	0.799	
TC3	0.892	
TC4		
TC5	0.895	
CI1	0.744	0.618
CI2	0.811	
CI3	0.802	
S1	0.749	0.617
S2	0.777	
S3	0.828	

Based on Table I, there is no question that the value of loading factors is below 0.7, while for the variables no variable has an AVE value below 0.5, so no items are omitted. The test results show that all items of the instrument have passed the convergent validity test.

2) Discriminant Validity Test

To ensure that each construct tested in this study is independent by doing an independent construct [22]. The standard value used discriminant validity test must be greater than 0.7 [30]. Table II is the result of the discriminant validity test.

Based on the results described in Table II, the items using green color are all valid.

TABLE II
DISCRIMINANT VALIDITY TEST

	CI	PC	S	SC	TC
CI1	0.744	0.388	0.347	0.355	0.337
CI2	0.811	0.397	0.296	0.201	0.402
CI3	0.802	0.659	0.351	0.503	0.562
PC1	0.470	0.786	0.478	0.401	0.564
PC2	0.454	0.865	0.591	0.541	0.708
PC3	0.601	0.849	0.486	0.582	0.600
PC4	0.568	0.838	0.675	0.661	0.636
PC5	0.601	0.858	0.426	0.619	0.637
S1	0.304	0.522	0.749	0.424	0.455
S2	0.232	0.400	0.777	0.330	0.584
S3	0.449	0.576	0.828	0.507	0.610
SC1	0.356	0.657	0.581	0.812	0.503
SC2	0.465	0.502	0.350	0.804	0.434
SC3	0.389	0.512	0.298	0.807	0.439
SC4	0.266	0.370	0.398	0.653	0.413
TC1	0.444	0.508	0.630	0.557	0.769
TC2	0.531	0.657	0.501	0.559	0.799
TC3	0.207	0.693	0.688	0.474	0.892
TC4	0.578	0.381	0.369	0.219	0.641
TC5	0.470	0.716	0.593	0.478	0.895

3) Reliability test

After passing the test and validity stages of the research model, the next stage is to test reliability. The reliability test is a test carried out to ensure that specific things work together to explain general things, where 0.7 is the limit value used to determine the level of reliability [22], Rule of thumb alpha Cronbach must be greater than 0.7, and for Composite

reliability must be greater than or equal to 0.7 [30]. Table III is the result of the reliability test in this study.

TABLE III
RESULT OF CRONBACH'S ALPHA AND COMPOSITE RELIABILITY

Code	Cronbach's Alpha	Composite Reliability	Information
CI	0.702	0.829	Reliable
PC	0.895	0.923	Reliable
S	0.700	0.828	Reliable
SC	0.771	0.854	Reliable
TC	0.861	0.901	Reliable

Based on Table III, there is no one variable whose value of Cronbach's alpha is below 0.7, so all of them are valid and reliable.

C. Measurement of Structural Model (Inner Analysis Model)

1) R-Square Test

The authors used the R-Square test for the Structural model analysis stage in this study. According to the results of the tests, the values for R square for variable customer involvement is 0.417, team capability is 0.575, and software development on agile project success is 0.535.

According to the results of these tests, it can be concluded that team capability and customer involvement can affect software development on agile project success of 53.5%. In addition, there are personal characteristics and societal culture that can influence 57.5% of the team's capability. Then for the last one, the personal characteristics and societal culture can influence 41.7% of customer involvement.

D. Hypothesis Testing

At this stage, the proposed hypothesis is tested, wherein this study uses the bootstrap method. The bootstrap method can help analyze the accuracy of each predicted parameter [25]. The criteria for acceptance or rejection of the hypothesis is if the T-statistical significance value > 1.96 and or the P-value < 0.05 at the 5% (α 5%) significance level, then H_a is accepted. H_0 is rejected, on the contrary, if the t-statistical value < 1.96 and/or value P-value > 0.05 at the 5% significance level (α 5%), then H_a is rejected and H_0 is accepted [30].

Information on the hypothesis is accepted or not based on the value of t-statistics and P values. Table IV is the result of the hypothesis test.

TABLE IV
HYPOTHESIS-TESTING

	Original Sample (O)	T Statistics	P Values
Customer Involvement Agile Software Development Project Success	-0.063	0.426	0.670
Personal Characteristics Customer Involvement	0.584	4.651	0.000
Personal Characteristics Agile Software Development Project Success	0.208	0.913	0.360
Personal Characteristics Team Capability	0.656	4.085	0.000
Societal Culture Customer Involvement	0.087	0.494	0.622
Societal Culture Agile Software Development Project Success	0.134	0.642	0.512
Societal Culture Team Capability	0.141	0.944	0.346
Team Capability Agile Software Development Project Success	0.507	2.979	0.003

Based on the results from Table IV shows that based on the predetermined statement regarding the acceptance of the hypothesis, it can be seen that not all hypotheses in this study are accepted. Only three accepted hypotheses are H1a, H1b, and H3. Details regarding the acceptance of the hypothesis are contained in Table V.

TABLE V
RESULT OF HYPOTHESIS

Code	Hypothesis	Result
H1a	Personal characteristics can affect team capability	Hypothesis Accepted
H1b	Personal characteristics can affect agile software development	Hypothesis Declined
H1c	Personal characteristics can affect customer involvement	Hypothesis Accepted

H2a	Societal culture can affect team capability	Hypothesis Declined
H2b	Societal culture can affect agile development project success	Hypothesis Declined
H2c	Societal culture can affect customer involvement	Hypothesis Declined
H3	Team capability can affect agile software development project success	Hypothesis Accepted
H4	Customer involvement can affect agile project software development success	Hypothesis Declined

E. Discussion and Result

This study aims to measure whether the people factor influences the project's success, after processing using PLS-SEM shows that H1a, H1c, and H3 are accepted hypotheses. The first hypothesis that is proven is H1a, where personal characteristics can influence team capability. The results of this hypothesis are the same as that of the researcher [6], who is the first study to validate empirically. Based on the research results, it can be seen that a good team is a team that has members with good characteristics. As explained by [6] regarding the personal characteristics needed for ASD, the personal characteristics needed in ASD are quite different from traditional software development, such as the need to self-regulate or the need for an attitude that likes to work together in doing tasks.

Furthermore, the personal characteristics of H1c can influence customer involvement. Results Based on the analysis, it is proven that the characteristics of the customer can provide an overview of how the customer supports ASD. Examples of attitudes such as being patient, willing to try to understand the ASD process, willing to discuss, and willing to be involved are attitudes that can help in ASD.

Then for H3, that team capabilities can affect the success of ASD projects, the results are the same as a research [6] that team capabilities have an advanced influence on the success of ASD projects. As long as the ASD project consists of a team that has good skills and uses the correct agile style, the project has a high success rate [26]. Based on these results, it is proven in Indonesia that team capability is indeed important in ASD.

V. CONCLUSIONS

This study identified the influence of people on the success of ASD. In this study there are five variables and there are eight hypotheses. The five variables are team capability,

personal characteristics, customer involvement, societal culture, and agile project software development success.

This study shows that of the four variables, only one variable can influence agile project software development success in Indonesia, namely the team capability variable. These results are the same as the results of research [6] which proves that team capability has a large enough influence on the success of ASD. Three variables that do not affect the variable are customer involvement, personal characteristics, and variable societal culture.

In addition, other variables can influence team capability and customer involvement, namely, variable personal characteristics. So to increase the success of software development using agile methods in Indonesia, the industry must be able to improve its team's ability. In addition, other variables can influence team capability and customer involvement, namely the personal characteristics variable. Therefore, apart from team capability, personal characteristics are important things to consider when creating an ASD team.

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