Failure Factors in Agile Software Projects in SME Orgainzations

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***Abstract*—In this research, we explored the use of Agile methods in small and medium-scale software development organizations. Specifically, focusing on three different types of agile approaches which are: Extreme Programming (XP), Scrum Methodology, and Dynamic System Development Methods. Most of the development methods and techniques are not employed as is, due to various constraints, including lack of budget, time, and personnel, amongst others. Existing development methods are adopted based on different factors, including project characteristics, development teams, and users. However, only 1 hypothesis was supported out of a total of 12, identifying one significant factor that can cause a failure, which is the large size of the organization, besides identifying a new failure attribute, which is losing control over the work.**

Keywords- *Agile Methods; Failure Factors; Adopting Agile in Organizations*

I. INTRODUCTION

At present, and as a general rule, all information technology applications depend on software at all levels [1]. The need to develop new software methods came as a result of changing requirements and a dynamic business environment, forcing the developers to try and find new methods that can be adopted in these scenarios [2]. Also, it is vital at any rate for the developers to react to the changeable environment and to understand that the process of developing software is now in itself a changeable subject [3].

During the development process, it is hard to define the requirements at the very beginning seeing that many changes cannot be prevented [4]. This is distinctive in construction and manufacturing enterprises, where, by nature, it is appropriate for all requirements to be determined in advance [5].

Issues in software methods do not stem from software environments. They have originated from past methodologies, including problems that are heavyweight, authenticated, and concentrated on plan-driven approaches.

In the last few years, Agile approaches have become increasingly popular in the software development industry, and the methods applied have brought about a considerable amount of controversy [6]. As such, the employment of Agile methods has helped to deal with problems faced during software development. These methods make room for the delivery of software at a faster pace and to guarantee that the product meets clients' changing needs [7]. Numerous

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organizations have sought to adopt Agile methods to make use of their various advantages, which comprise, to mention a few, quicker return on investment, better programming quality, and greater client satisfaction [8].

Implementing Agile methods by software development organizations can be an easy route or a hard one depending on certain aspects, such as the individuals involved [9], as well as the organizational factor [10]. These are considered vital before the application of Agile methods and while software development is under way [11]. As a result, to make the process of applying the Agile method effective, some features can help organizations achieve this without fear of failure, provided that they are also aware of the failure factors that can make this course turn into an unsuccessful venture.

There are many pieces of research related to the success factors related to using Agile methods in organizations, such as [12] and [13]. Yet, there is not enough research when it comes to Agile application in SMEs in particular. For this reason, we focused on studying the factors affecting the employment of Agile methods in small and medium software development organization to deliver guidelines for success and failure factors.

As for the scope in detail, the goal of this study is to explore the factors influencing Agile adoption methods in a software development organization that already has such methods in place, in addition to its focus on failure factors. Obtaining information from such companies would provide us with their experience and how they developed their work in the process. The data acquired will encourage other companies to adopt Agile methods without fear of failure, as it aids in implementing Agile methods successfully, and to avoid setbacks by learning the lessons from those who previously used Agile in their work.

II. BACKGROUND

A. Agile Methods

Agile principles were more commonly addressed towards the late 1990s, but the Agile Manifesto was pronounced in 2001 (“Agile Manifesto”, 2001). This was when numerous IT experts began to work exclusively on new ways to deal with developing software. As a result of their research, new methodologies emerged, each with its popular features. The name “Agile Manifesto” came into the spotlight at a conference in Utah in 2001 (“Agile Alliance. Manifesto for Agile Software Development”, 2001). These methodologies were produced given a similar rule that an ideal way to check a system is to generate working renditions for the client, and subsequently, refresh it as indicated by their comments. Agile methodologies are built on four principles by their authors (“Agile Alliance. Manifesto for Agile Software Development”, 2001). These are:

1 To create software that ensures customer satisfaction through continuous delivery of working programming and receiving feedback from the client; 2 to deal with the change of requirements at any phase during the developing process in such a way that the client would be satisfied with the development process; 3 to promote daily interaction between the developers and the clients and throughout the process of project development; and finally 4, to develop on a test-driven premise, which requires writing a test before writing the code. Here, the test suite is run on the application.

Agile processes are regarded as another host attempting to challenge the constraints of traditional software development methodologies by utilizing a particular strategy [14]. There are many types of Agile approaches, the most common eight of which are as following: Agile Scrum

Methodology, Lean and Kanban Software Development, Extreme Programming (XP), Crystal, Dynamic Systems Development (DSDM), Feature-Driven Development (FDD), Rational Unified Process (RUP), Adaptive Software Development (ASD). Each one of these methods shares some fundamental standards, for example, promote consumer satisfaction, deal with changing requirements, frequently deliver working programming, and create close cooperation between developers and business people [7].

While traditional methodologies, for example, the life-cycle approach and object-oriented (OO), still have control over the area of systems development, many articles and several opinion polls clearly show the growing popularity of Agile methodologies [15]. The appearance of these methodologies led to a division in the software development sector to oppose the traditional views, with each group advocating their own methodology's benefits. Also, a more balanced perspective is offered of the two competing methodologies by the few who propose that each method has its strengths as well as limitations and that they may not be suitable for specific types of projects [15]

B. Failure Research

Research of failure or issues in software development is commonly dependent on lessons learned from specific ventures. However, they are, for the most part, similar and generalized [16]. For example, in 1999, Reel concentrates more on general software development ventures and collects ten indications of programming development ventures failure, no less than seven of which are located even before an outline is produced or a line of code is written (Reel, 1999). Also, the issues in transitioning organizations to Agile methods were studied by Cohn and Ford in 2003 [17]. Whereas in 2004, Larman debates in detail the errors and confusion that happened during developing Agile projects [18]. There was research done by Boehm and Turner in 2005, which confirms administration challenges during the implementation of Agile projects [19], while another study was conducted by Nerur that includes issues in administration angle as well as the people, process, and technological aspects of the transition to Agile ventures [15]. So in light of the previously mentioned literature, failure can be grouped into four classifications which are: organizational, people, process, and technical.

Moreover, in 2008 Vijayasarathy and Turk show that a portion of the factors that cause the failure of Agile projects involve the absence of offices for pair programming, people's resistance, and depending just on financial assessment criteria [20]. Another worry is administrative disregard and organizational impedance to change. Chow and Cao (2008) talk about failure factors and classify the failure into four groups which are: organizational, people, process, and technical [12].

III. METHODOLGY

To define the research hypotheses of failure factors, certain related attributes are needed to delineate the general view of success for a specific venture. In this respect, Cohn, Ford, and Lindvall [21] recommend these criteria: quality (i.e., providing a working item), scope (meeting all prerequisites set by clients), timelines, and Cost. Also, [22] identified decreased delivery agenda and increased return on investment (ROI) as success attributes, adding that output, functionality, and client satisfaction can also be seen as quality criteria. These features are listed in Table 1.

Table 1. Success Attributes.

Dimension	Attribute
Overall realized level of success	1. Quality (delivering good product or project outcome, customer satisfaction)
	2. Scope (Dealing with requirements in better way
	3. Time and cost estimation
	4. reducing the delivery schedules
	5. Increasing the return on investment,

A. Research Question

What are the factors that can make the process of adopting Agile methods fail?

Ascertaining the failure factors of adopting Agile methods in project development is one of our objectives, and a five-point Likert scale was used to reflect the level of perception of the question by the respondent. Failure factors were classified into four categories: organizational, people, process, and technical. Several hypotheses were developed to find out which factor has the most impact on the process of adopting Agile methods. There are roughly 11 hypotheses related to four dimensions of failure factors as shown below:

1. Hypotheses related to the organization dimension:

H1. The Absence of management support in projects can be the main reason for the failure of the ASD projects.

H2. When the size of the organization is large, the possibility of failure of the ASD projects increases.

H3. When the culture of the organization is too traditional and political, the possibility of failure of the ASD projects increases.

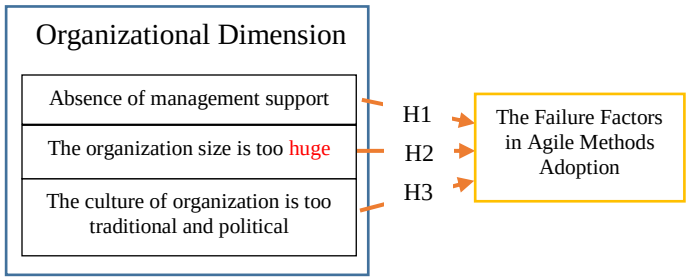


Figure1. The research model for failure factors in terms of organizational dimension.

2 Hypotheses related to the people dimension:

H4. Having poor relationships with customers in projects can be the main reason for the failure of ASD projects.

H5. The absence of cooperation during developing a project can be the main reason of the failure of ASD projects.

H6. When the essential skill-set is not provided in a project, the possibility of failure of ASD projects increases.

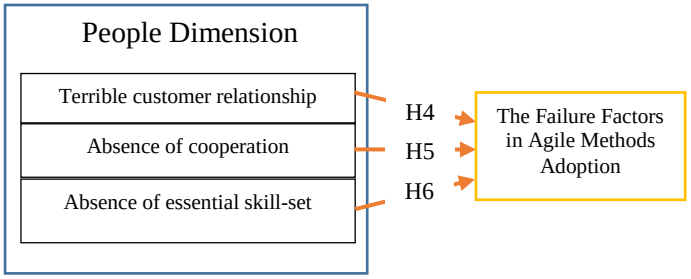


Figure2. The research model for failure factors in terms of people dimension.

3. Hypotheses related to the Process Dimension:

H7. Absence of customer presence in projects can be the main reason of the failure of the ASD projects.

H8. Absence of tracking mechanisms during agile progress in projects can be the main reason for the failure of the ASD projects.

H9. When the role of the customer is determined in projects, the possibility of failure of the ASD projects is increased.

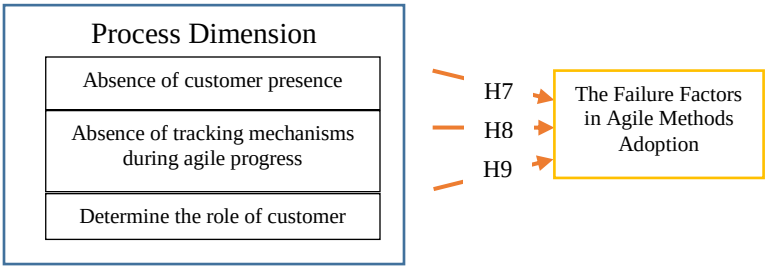


Figure3. The research model for failure factors in terms of the process dimension.

4. Hypotheses related to the technical dimension:

H10. The absence of a full set of right agile practices in projects can be the main reason for the failure of the ASD projects.

H11. Inadequacy of the technology and tools in projects can be the main reason for the failure of the ASD projects.

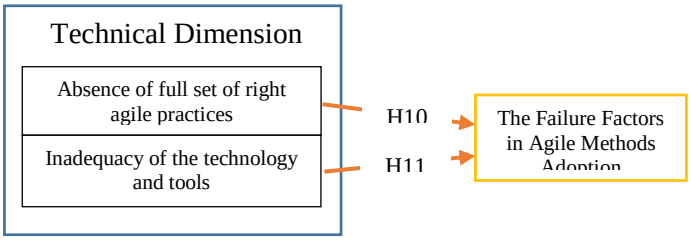


Figure4. The research model for failure factors in terms of the technical dimension.

Data Collection:

To collect responses for the survey, the Web site (https://goo.gl /forms/yNAd6Aiqr ON2AKFF3) was employed to gather the data. All responses were stored immediately in an Excel file. The target audience is individuals from companies that have adopted Agile in their ventures. The sample size is fifty-two software development companies. The questionnaire was filled by software development companies from eight different countries, but most of the responses (57.7%) are from Turkey, followed by India, Brazil, and Malta at 15.4%, 13.5%, and 7.7%, respectively. The other countries present the lowest number of responses, standing at 1.9%, as shown in Table 2.

Table 1. The countries and percentages as participants in the survey

Country Name	Frequency	Percent
Turkey	30	57.7
India	8	15.4
Brazil	7	13.5
Malta	4	7.7
Finland	1	1.9
Saudi Arabia	1	1.9
U.A.E	1	1.9
Total	52	100.0

Considering that the purpose of this research is to explore the adoption of Agile methods in small and medium enterprises; therefore, most of the responses were collected from companies of such size, namely 24 small companies and 11 medium companies. While some responses were also collected from large companies, 17 firms, to be exact, as part of the samples are shown in Table 3.

Table 2. The size of the companies

Number of staff	Frequency	Percent	Company size
Less than 20	24	46.2	Small
Greater than 200	17	32.7	Large
20- 200	11	21.2	Medium
Total	52	100.0	

Reliability and validity test:

Since this study is exploratory, there is a need for reliability analysis for which purpose the Cronbach's alpha is used as it is the most well-known and efficient technique today to calculate inner consistency reliability [23]. Higher estimations of Cronbach's alpha respectively demonstrate more notable consistency in the variance of the specimen test scores when the value exceeds 0.7 as the standard in a survey study.

Cronbach's alpha for a set of test scores in this research yield 0.8 for the failure factors and acceptance of Agile. According to these results, there is an indication of clear accuracy of the statistical deductions from the information; that is, there are no issues with the inner consistency reliability tests.

Table 4. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha based on standardized items	N of items
.895	.896	11

IV. RESULTS

To understand the correlation between failure factors and success attributes, we consider the independent variable $\mathbf{X_i}$, whose numerical values are assigned according to the response as follows:

Very important 1

Important 2

Neutral 3

Unimportant 4

Very unimportant 5

Correspondingly, dependent variables $\mathbf{Y_i}$ represent success attributes and attain numerical values according to the breakdown below:

Strongly agree 5

Agree 4

Neutral 3

Unimportant 2

Very unimportant 1

The success attributes which are defined as dependent variables are:

1. Better control over the work (Depen1).

2. Dealing with changing requirements (Depen2).

3. Increasing quality (Depen3).

4. Time and cost (Depen4).

5. Customer satisfaction (Depen5).

6. Reducing delivery schedules (Depen6).

7. Increasing return on investment (Depen7).

Afterward, for each factor $\mathbf{X_i}$, and each quality attribute $\mathbf{Y_i}$, the Pearson correlation coefficient $\mathbf{r_{ij}}$ has been computed using SPSS software. It is known that the uncorrelatedness of random variables is a strictly stronger condition than their independence. Therefore, a non-zero correlation coefficient indicates relationships between variables.

In essence, this coefficient describes how close the relationship between variables is to a linear one, while the sign of **r** demonstrates whether the relationship is positive (**r**>0) or negative (**r**<0). After a correlation coefficient was calculated, its significance has been tested. To be more specific, the following test procedure has been applied for each success factor, and the correlation coefficient $\mathbf{r_{ij}}$ has been computed using SPSS software.

Subsequently, $\mathbf{r_{ij}}$ each has been tested whether it provides a significant relationship at the level of significance $\alpha = 0.05$ or that is it has been checked if $\mathbf{X_i}$ is a significant explanatory variable for $\mathbf{Y_i}$. This has been done by using the hypotheses of the form:

H_0: $\mathbf{r_{ij}} = 0$ ($\mathbf{X_i}$ is not a significant explanatory variable of $\mathbf{Y_i}$).

H_1: $\mathbf{r_{ij}} \neq 0$ (**Xi** is a significant explanatory variable for $\mathbf{Y_i}$).

The test is a two-tailed t-test, with t (n-2) = t (50) distribution and the t-statistic

$$\mathbf{t=r}\ \frac{\sqrt{n-2}}{1-r^2}$$

From the observed value of the test statistic. The P-value was obtained and the null hypothesis has been rejected if and only if P<0.05. The table in appendix A shows which of the correlations coefficients appear to be significant. In terms of failure factors, the relationship between failure factors and success attributes is a negative correlation, because variable Xi (failure factors) increases as the other variable Yi (success attributes) decreases, and vice versa. From the observed value of the test statistic, the P-value was obtained and the null hypothesis has been rejected if and only if P<0.05. On the whole, we assumed that 11 failures can cause failure for each and every quality attributes A1-A7. After conducting 11*7 tests as described above, 4 of the factors we removed as unessential which are F4, F5, F6, and F8. In addition, it has been found that the remaining factors are important only for some, rather than all attributes. Going into details the most effective factors are F2 and F11, which have negative relationships with 3 attributes.

However, depending on the significance values and the values of correlation coefficients, we either accept or reject the 11 hypotheses that we have previously introduced, which are tested with 7 attributes (a-g). This means we have 77 tests or hypotheses to test, there are 12 hypotheses which are accepted and 65 hypotheses are rejected. The results of the acceptance/rejection of hypotheses are as follows:

H1.a), H1.b), H1.c), H1.e), H1.f), and H1.g) are rejected, while H1.d), is accepted.

H2.a), H2.d), H2.f), and H1.g) are rejected, while H2.a), H2.b), H2.e), are accepted.

H1.a), H1.a), H1.a), H1.a), H1.a), H1.a), H1.a), is accepted.

H3.a), H3.c), H3.d), H3.e), H3.f), and H3.g) are rejected, while H3.b) is accepted.

H4.a), H4.b), H4.c), H4.d), H4.e), H4.f), and H4.g) are rejected.

H5.a), H5.b), H5.c), H5.d), H5.e), H5.f), and H5.g) are rejected.

H6.a), H6.b), H6.c), H6.d), H6.e), H6.f), and H6.g) are rejected.

H7.a), H7.c), H7.d), H7.f), and H7.g), are rejected, while H7.b), and H7.e), are accepted.

H8.a), H8.b), H8.c), H8.d), H8.e), H8.f), and H8.g) are rejected.

H9.a), H9.c), H9.d), H9.f), and H9.g), are rejected, while H9.b), and H9.e), are accepted.

H10.a), H10.b), H10.c), H10.d), H10.f) and, H10.g) are rejected, while H10.e), is accepted.

H11.c), H11.d), H11.f), and H11.g) are rejected, while H11.a), H11.b) and H11.e), are accepted.

Liner multiple regression analysis:

The impact of failure factors on success attributes can be observed in the Table in Appendix **A.** It can be perceived that four dependent variables are affected by failure factors which are: better control over the work, dealing with changing requirements, cost and time, and customer satisfaction. So the multiple regression analysis is conducted between each one of the dependent variables (success attributes) and seven independent variables (failure factors that are accepted in the correlation test). The significant (seg) and the regression coefficient values can be used to measure the relationship between dependent variables and independent variables.

Better control over the work attribute:

There are two factors in this model that determine the role of the client factor, and organization size is too large. By looking at the significant (seg) value in (Table 5), it can be noticed that organization size is too large is a significant factor $p=0.007$, since $b=-0.22$ is negative, which indicates that the increase in an organization's size leads to decrease control over the work in the venture. On the other hand, the rest of the factors are not significant because ($p>0.05$), which seems they are not related to control over work.

Table 5. Shows regression coefficients for Depen_variable 1.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.070	.229		22.097	.000
	Organizational dimension _F2_The Organization size is too large	-.227-	.081	-.373-	-2.820-	.007
	Process dimension _F11_Determine the role of client	-.133-	.086	-.206-	-1.552-	.127

a. Dependent Variable: The usage of Agile provides _ better control over the work

Histogram

Dependent Variable: The usage of agile provides_better control over the work

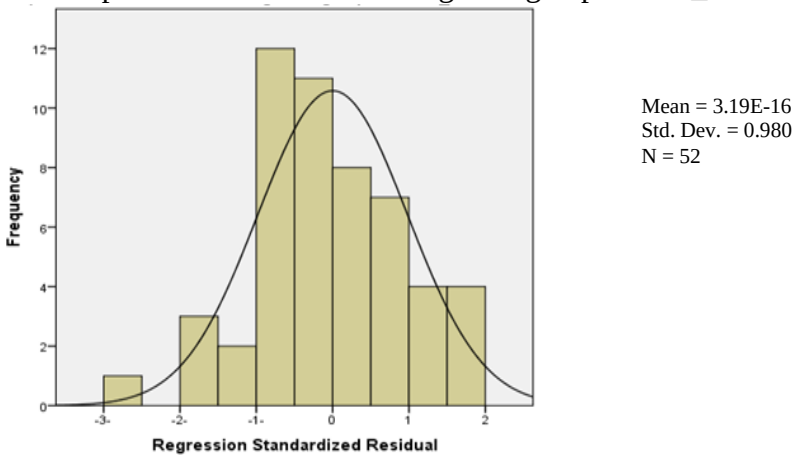


Figure 5 shows frequency versus regression standardized residual for Depen_variable 1.

Dealing with changing requirements attribute:

There are five factors which have an impact on this attribute which are: Determine the role of client, the organization size is too large, absence of full set of right Agile practices, absence of customer presence, and the culture of the organization is too traditional and political. Significant (seg) values in (Table 6) show all the factors are not significant (p>0.05) which appears they are not related to dealing with changing requirements

Table 6. Shows regression coefficients for Depen_variable 2.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 ıstant)	5.197	.341		15.222	.000
anizational dimension					
_The Organization size is too e	-.135-	.113	-.189-	-1.193-	.239
anizational dimension					
_The culture of Organization o traditional and political	-.017-	.132	-.023-	-.126-	.901
hnical dimension					
_Absence of full set of right e practices	-.134-	.143	-.151-	-.938-	.353
ess dimension					
)_Absence of customer ence	-.161-	.142	-.205-	-1.135-	.262
ess dimension					
1_Determine the role of the ıt	-.047-	.138	-.061-	-.339-	.736

a. Dependent Variable: Agile methods were used because it copes with_ changing user requirements in a better way

Histogram

Dependent Variable: Agile methods were used because it copes with_changing user requirements in a better way

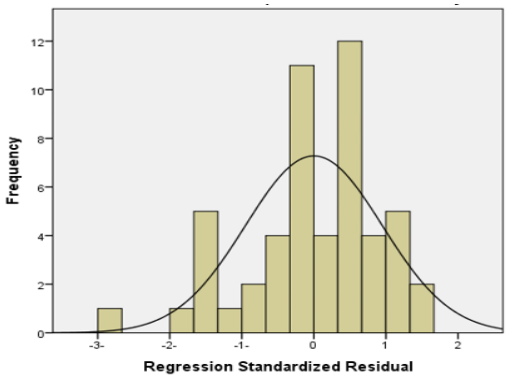


Figure 6. Shows frequency versus regression standardized residual for Depen_variable 2.

Effort estimation (cost and time) attribute:

There is only one factor that has an impact on this attribute which is: Absence of management support. By looking at the significant (seg) value in (Table 7) it can be noticed that, absence of management support is a significant factors p = 0.017, but since b = 0.29 is positive which indicates that the increase management support is a significant factor p = 0.017, but since b = 0.29 is positive which indicates that the increase management support leads to an increase in effort estimation in venture which means the relationship is not negative.

Table 7. Shows regression coeffients for Depen_variable 4

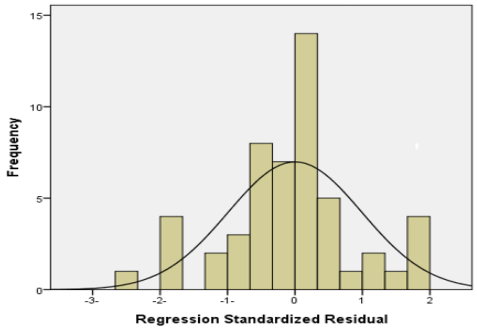
Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	3.167	.263		12.050	.000
Organizational dimension _F1_Absence of management support	.292	.118	.329	2.463	.017

a. Dependent Variable: Agile is used because it helps in effort estimation_(cost,schedule)

Histogram

Dependent Variable: Agile is used because it helps in effort estimation (cost, schedule)



Mean= 3.99E-16
Std. Dev. = 0.990
N = 52

Figure 7. Shows frequency versus regression standardized residual for Depen_variable 4.

Customer satisfaction attribute:

There are five factors in this model which are: the organization size is to large, absence of full set of right Agile practices, absence of customer presence, and absence of tracking mechanisms during Agile progress and determine the role of client. significant (seg) values in (Table 8) shows all the factors are not significant (p>0.05) which would suggest they are not related to customer satisfaction.

Table 8. Shows regression coefficients for Depen_variable 5.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.195	.362		14.359	.000
	Organizational dimension _F2_The Organization size is too large	-.205-	.107	-.262-	-1.909-	.062
	Technical dimension _F7_Absence of full set of right Agile practices	-.115-	.146	-.119-	-.791-	.433
	Process dimension _F9_Absence of customer presence	-.206-	.169	-.241-	-1.224-	.227
	Process dimension _F10_Absence of tracking mechanisms during Agile progress	-.031-	.168	-.037-	-.183-	.855
	Process dimension _F11_Determine the role of client	-.008-	.151	-.009-	-.052-	.959

a. Dependent Variable: Agile methods were used because _ provide customer satisfaction

Histogram

Dependent Variable: Agile methods were used because_provide customer satisfaction

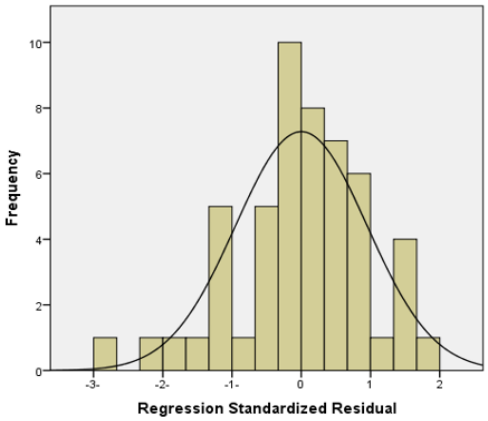


Figure 8. Shows frequency versus regression standardized residual for Depen_variable 5.

Overall, by studying the negative correlation between failure factors and success attributes, we discovered that some factors have a negative relationship with success attributes, then the multiple regression analysis is applied. As a result, in control over the work model The organization size is too large is selected as the most significant factor. The rest of the models show no significant factors. To compare the seven models, the adjusted R-square statistic is used, because it compensates for the number of variables in the model, and it will only increase if added variables contribute significantly to the model. The control over the work and customer satisfaction models are the best models because the adjusted R-square is 20% and 16.4.1% respectively as shown in (Table 9).

Table 9. Shows regression model summary for failure factors.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.481[a]	.232	.200	.5840
2	.459[a]	.210	.125	.7183
3	.368[a]	.135	.100	.8162
4	.496[a]	.246	.164	.7674

a. Predictors: (Constant), Indep11, Indep2

b. Predictors: (Constant), Indep11, Indep2, Indep7, Indep9, Indep3.

c. Predictors: (Constant), Indep4, Indep11.

d. Predictors: (Constant), Indep11, Indep2, Indep7, Indep9, Indep10.

e. Dependent Variable: Depen1, Depen2, Depen4, Depen5.

To finalize the hypothesis testing, we can use the observations above to reduce the number of the hypotheses to one and 11 hypotheses are rejected. This means the presence of those factors did not make a significant difference to the value of the success dimensions. The accepted hypotheses is:

Where Y is a failure dependent variable, L is the losing control over the work dimension, **β** is the partial regression coefficient for the Failure Factor (FF). The multiple regression analysis was when the size of the organization is large, the possibility of ASD projects' failure is increased in terms of (a) control over the work.

The general model of multiple regression can be as shown in the equation below, assuming that there are k independent variables [24].

$$y=\beta_0+\beta_1x_1+\beta_2x_2+\ldots..+\beta_k x_k+\varepsilon$$

Where y is the dependent variable and x_1, $x_2 \ldots x_k$ are the independent variables, and β is the regression coefficient, and Ɛ is the random error component. In the case of our study, the above translates to the following general equation.

$Y\ (L) = \beta_1 FF_1$

Done on one level which is the full. Where the full model level, all 8 independent variables were entered into a regression model at the same time.

V. DISCUSSION

This study explores the factors of adopting Agile methods in small and medium enterprises, 52 responses were collected from around the world. 35 responses were from small and medium companies while 17 responses were from large companies. Finally, the responses were used to make a comparison between small and medium companies with large ones.

The descriptive statistics were used to analyze most of the data, as result responses came from Turkey, India, Brazil, and Malta. Small and medium companies have years of experience and several projects developed using Agile more than large companies. This is an expected result since Agile methods were initially intended for utilization in small, single-group projects [18]. Then, to increase the accuracy of our conclusions the multiple regression techniques were utilized, as results on only 1 hypothesis were supported out of 12, identifying one significant factor that can cause failure which is the large size of the organization, besides identifying a new failure attribute which is losing control over the work. There has been no previous study used to investigate the failure factors by using negative correlation relationship with success attributes as we did, so our results are considered new in this regard.

VI. CONCLUSION

This study used survey data to examine the failure factors of Agile software development projects using quantitative methods. The data gathered from 52 Agile software development companies from a different size of organizations and geographic areas gave enough data for statistical analysis to touch base at various conclusions.

In terms of failure factors, only 1 hypothesis was supported out of 12, identifying one significant factor that can cause failure which is the large size of the organization, besides identifying a new failure attribute that is losing control over the work. However, the main contribution of this study is to diminish a large number of recounted achievement variables to three basic ones given survey information analysis, and it also reduced failure factors to one main factor besides identifying new failure attributes as shown above.

Research limitations:

This study is constrained by the presumption limits that the information acquired across various work functions are equally critical. It would have been very interesting to explore if at all there will be any distinctions in the outcome in light of the work elements of the respondents. Nevertheless we leave this as a future action of potential utility. Also, considering the large Agile society population, a bigger sample size from more countries could provide more generic and precise statistical calculation and examination, and could give a chance to compare factors between different size companies. Despite the fact that the responses were from different countries, we could not compare factors of adopting Agile methods among these countries due to the small sample size of each country.

Future work:

There are some issues which deserve more investigation in the future. The three most important are:

1. It would be beneficial to have further research through designing a new survey to study the identified failure attributes in detail in software development companies.

2. Increase sample size to compare the adoption of Agile methods between different companies based on their size.

3. Including more respondents from different countries to compare between them in terms of adopting Agile methods.

REFERENCES:

[1] Mens, T., Wermelinger, M., Ducasse, S., Demeyer, S., Hirschfeld, R. & Jazayeri, M. (2005). Challenges in software evolution. Principles of Software Evolution. Eighth International Workshop on.

[2] Lan, C. & Ramesh, B. (2007) Agile software development: ad hoc practices or sound principles? IT Professional, 9, 41-47.

[3] Abbas, N., Gravell, A. M. & Wills, G. B. (2008) .Historical roots of Agile methods: Where did "Agile Thinking" come from?. IN ABRAHAMSSON, P.

[4] Williams, L., & Cockburn, A. (2003) Agile software development: It's about feedback and change. Computer, 36, 39-43.

[5] Rajlich, V. (2006). Changing the paradigm of software engineering. Commun. ACM, 49, 67-70

[6] Highsmith, J. (2002a). Agile Software Development Ecosystems. Boston: Addison, MA.

[7] Paetsch, F., Eberlein, A., & Maurer, F. (2003). Requirements Engineering and Agile Software Development. In WETICE (Vol. 3, p. 308).

[8] Cockburn,& Highsmith,(2001). Agile software development: The people factor. Computer, 34, 131-133.

[9] Lee, E. C. (2008). Forming to performing: Transitioning large-scale project into Agile. IN MELNIK. M. (Eds.) AGILE 2008 Conference. Toronto, CANADA, IEEE Computer Soc.

[10] Strode, D., Huff, S., Wellinton, N., Tretiakov, A., North, P. & Zealand, N. (2008a). Investigating the Target Environment for Agile Methods. 19th Australian Conference on Information System. Christchurch, Australia.

[11] Iivari, J. & Huisman, M. (2007). The relationship between organizational culture and the deployment of systems development methodologies. Mis Quarterly, 31, 3558.

[12] Chow, T., & Cao, D. (2008). A Survey Study of Critical Success Factors in Agile Software Projects. The Journal of Systems and Software, 81, 961-971.

[13] Kumar A, & Goel.B.(2012). Factors Influencing Agile Practices: A Survey.

[14] Chan, F. K., & Thong, J. Y. (2009). Acceptance of Agile methodologies: A critical review and conceptual framework. Decision support systems, 46(4), 803-814

[15] Nerur S.,Mahapatra,R.K. & Mangalaraj,G. (2005). Challenges of migrating to Agile methodologies. Communications of the ACM 48 (5), 72–78.

[16] Coram M, & Bohner S. (2005). The Impact of Agile Methods on Software Project Management A Brief Look at Agile Methods. Engineering, pp. 363–370. Create a survey using Google Form. Retrieved from, https://support.google.com/docs/answer/87809?hl=en.

[17] Cohn, M., & Ford, D.(2003). Introducing an Agile process to an organization. Computer 36 (6), 74–78.

[18] Larman, C. (2004). Agile & Iterative Development. Addison-Wesley, Boston, Massachusetts.

[19] Boehm, B., & Turner, R.(2003). Using risk to balance Agile & plan-driven methods. Computer 36 (6), 57–66.

[20] Vijayasarathy,L. R., & Turk, D. (2008). Agile Software Development: A Survey of Early Adopters. Journal of Information Technology Management, 21(2). 701

[21] Lindvall, M., Muthig, D., Dagnino, A., Wallin, C., Stupperich, M., Kiefer, D., et al., 2004. Agile software development in large organizations. Computer 37 (12), 26– 34.

[22] Misraa, S.G., Kumarb, V., & Kumarb, U. (2009). Identifying some important success factors in adopting Agile software development practices. The Journal of Systems and Software 1869–1890.

[23] Rubin A, & Babbie E. (1997). Research Methods for Social Work. Brooks/Cole, Pacific Grove, CA.

[24] McClave J, Benson P. (1988). Statistics for business and economics. San Francisco: Dellen Pub. Co.;

[25] Dhir S, Kumar D, Singh VB. (2018) Success and Failure Factors that Impact on Project Implementation Using Agile Software Development Methodology. Springer, Singapore.

[26] Tam C, Moura EJda C, Oliveira T, Varajão J. (2020). The factors influencing the success of on-going agile software development projects. International Journal of Project Management. 38 (3), 165-176

Appendix A

CORRELATION TEST RESULTS FOR FAILURE FACTORS

FF/ A	Depen1	Depen2	Depen3	Depen4	Depen5	Depen6	Depen7
Indep1	r= -0.155 p= 0.273	r= -0.211 p= 0.134	r=0.000 p=1.000	r=0.329 p=0.017	r=0.000 p=1.000	r=-0.026 p= 0.853	r=- 0.106 p=0.456
Indep2	r= 0.440 p=0.001	r= -0.311 p=0.025	r= -0.100 p=0.480	r=-0.154 p= 0.276	r= -0.372 p=0.007	r=-0.143 p= 0.312	r= -0.122 p=0.389
Indep3	r= -0.163 p= 0.247	r= -0.311 p= 0.025	r=0.122 p=0.389	r=0.210 p=0.135	r= -0.111 p= 0.432	r=0.048 p=0.733	r= -0.146 p= 0.301
Indep4	r= -0.199 p= 0.157	r= -0.027 p= 0.850	r=0.094 p=0.509	r=0.252 p=0.072	r= -0.170 p= 0.228	r=0.158 p=0.263	r= 0.198 p=0.159
Indep5	r= -0.157 p= 0.265	r= -0.113 p= 0.424	r=0.083 p=0.557	r=0.228 p=0.104	r= -0.120 p= 0.397	r=0.122 p=0.389	r= 0.039 p= 0.781
Indep6	r= -0.057 p= 0.686	r=- 0.206 p= 0.142	r= -0.102 p= 0.474	r=0.193 p=0.171	r= -0.074 p= 0.604	r=0.028 p=0.844	r=0.031 p=0.826
Indep7	r= -0.052 p= 0.714	r= -0.306 p= 0.027	r=0.054 p=0.706	r=0.119 p=0.402	r= -0.287 p= 0.039	r= -0.059 p=-0.677	r=- 0.226 p= 0.108
Indep8	r= -0.104 p= 0.463	r= -0.168 p= 0.235	r= -0.171 p= 0.266	r=- 0.053 p=-0.711	r= -0.222 p= 0.144	r=- 0.118 p=-0.405	r= -0.095 p= 0.501
Indep9	r= -0.222 p= 0.113	r= -0.381 p= 0.005	r= -0.096 p= 0.498	r=0.215 p=0.125	r= -0.409 p= 0.003	r=0.052 p=0.713	r= 0.023 p= 0.871
Indep10	r= -0.173 p= 0.220	r= -0.113 p= 0.426	r=0.014 p=0.922	r=0.200 p=0.156	r= -0.348 p= 0.011	r=0.000 p=1.000	r=0.003 p=0.983
Indep11	r= -0.327 p= 0.018	r= -0.329 p= 0.017	r= -0.106 p= 0.455	r=0.068 p=0.633	r= -0.324 p= 0.019	r=- 0.127 p=-0.371	r= -0.203 p= 0.149