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Study to delimit the factors that contribute to the adoption of an Agile Methodology

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ABSTRACT [1]

Agile methodologies are increasingly being adopted by companies. The research on adopting an agile approach is based on the elements required for its implementation. On the other hand, a quantitative study on the challenges of adopting an agile approach is interesting. The main objective of this work is to present the results of a study on the factors that have a significant relationship with the adoption of an agile approach over a traditional one by work teams in software development companies. With this objective, a systematic analysis of works that mention this transition was carried out, to extract and synthesize the existing challenges. These challenges were used to outline a conceptual framework to evaluate the connection between the challenges that work teams have to suffer from the linear relationship with the adoption of an agile approach. Next, a construct was used to test and evaluate the factors that are part of the proposed framework. The findings indicate that what leads to the decision the transition from the traditional approach to agile is the quality, complexity, and management of iterations where the work is visible to the users; factors that have a significant linear relationship with the adoption of an agile approach. We recommend that organizations consider these findings during their adoption phase of any agile methodology over a traditional one.

Keywords: Agile methodologies, traditional methodologies, systematic analysis, quantitative study, and work teams.

1. INTRODUCTION

Agile project management represents an iterative approach to managing projects where the focus is on working in small batches, visualizing processes to create transparency, collaborative work with the client, and obtaining feedback as quickly as possible, the above allows adapting to changing requirements in the right way and will allow you to produce higher quality products and services [1].

In addition, Agile project management helps teams find and resolve problems faster and frees up resource capacity, enabling rapid solution implementation.

This research focuses on providing qualitative knowledge about the agile approach that leads work teams to adopt the agile approach within the context of software developments in companies in Mexico when they are especially used to following traditional methodologies.

This work is part of an investigation that seeks to propose a model that can be used to test and evaluate the challenges for the adoption of an agile approach in software development companies in Mexico.

In this research, objectives were identified as a means to achieve the goal of this study:

- To identify, explore and analyze the factors that contribute to a company's desire to adopt an agile approach;
- To explore the current scope and nature of companies in Mexico concerning agile;
- Determine whether the work that companies do can be done using an agile approach;
- Recognize if it is convenient for them only to identify agile practices to continue applying them and choose based on them, the objectives they want to achieve to move towards agile;
- Analyze the benefits of having an agile approach as an area of expertise for the teams; and
- Seek certification of team members in a specific agile methodology if the company requires it to facilitate the adoption of agile.

In short, this research study aims to answer the following questions:

[1] We would like to express our deep gratitude to Dra. María-Elena Acevedo-Mosqueda and Dra. Nareli Cruz-Cortés for their peer-editing of this document.

- What are the factors that contribute to the adoption of an Agile Methodology?
- What is the current situation of agile in Mexican companies?
- What is the degree of participation and involvement of the development team in the adoption and work with an agile methodology?
- What are the perspectives of software development teams in Mexico regarding the situation of changing from a traditional approach to an agile one?
- What are the benefits of working with agile as an area of expertise for team members?

Before conducting the study, a research proposal was developed including the research methodology to be followed.

Therefore, it is necessary to determine the factors that contribute to the adoption of an Agile Methodology, for this purpose in this article the work carried out is distributed in the following sections: The second section describes the background of the subject. The third presents the methodology, including the statistical analysis techniques used to analyze and validate the data collection instrument. Section 4 shows the diagnosis, then section 5 shows the discussion and results of the research findings, and finally, some conclusions are provided in section 6.

2. BACKGROUND

Defining the agile approach

The agile approach to software development seeks to distribute or divide software systems in development or operation with rapid iterations.

The phrase "agile methodology" is misleading because it leads to thinking that an agile approach is the best way to approach software development. However, it is important to consider what to do exactly during software development, consider the agile approach as a way of thinking that supports collaboration and monitoring workflows, and define values that guide work teams to make decisions about what they do and how they do it. [2]

Agile software development methodologies seek to provide viable products of working software systems in a short time to achieve thereby, improving customer satisfaction. The agile approach is flexible and improves teamwork by offering constant improvements. Agile software development typically involves small teams self-organizing and self-managing during software development and meeting with company representatives regularly in person during the project development lifecycle. software. The agile methodology favors a simple approach to software documentation and accepts the changes that may occur in the different phases of the life cycle. [3]

Agile approach challenges

Agile transformation can pose challenges in many places in the lifecycle. If the wrong person in the company interacts with the work team, decisions about the functionalities may be delayed, and the person or persons chose in the organization to interact with the software developers must represent the business. Involving an unauthorized person as a representative of the company will complicate the development and increase the production cycles and therefore its cost and there will be no agility.

Therefore, one of the first challenges, when you want to adopt agile, is that the representative of the organization must be in business. He must have a complete vision of the application that needs to be developed. He should be able to call functions, just as he should be able to prioritize features, this will help iterations produce viable products for the business.

Another challenge is the duration of the iterations, to be agile they should not be “long”. When migrating from traditional/conventional delivery lifecycles, some people feel uncomfortable working in short cycles, for example, 2 weeks, it seems that the longer the duration the more comfortable they are, but this moves away from agile and is counterproductive. Agile is delivering working software as soon as possible.

Another challenge is the regular meetings of the business representative with the agile work team, which will be effective only if they have a short time interval. When migrating from a traditional life cycle, which has a longer duration but less frequent reviews, people tend to feel uncomfortable or even watched or feel that there is excess with follow-up meetings at work.

On the other hand, the intermediary of the agile work team that interacts with the business representative must be effective, must be able to articulate well, and guarantee effective follow-up to the team. Any point that could go beyond agile duration meetings will tire the team and can lead to discussions and not a follow-up of the work progress to achieve a short iteration, within the established time, which generally should not be longer than 4 weeks, providing visibility to the client of the progress of the software project. [4]

Theoretical framework

Research by Lan [5], and Chang & Thong [6] explain that IT adoption studies (Technology Information) use models such as TAM (Technology Adoption Models) and focus on the technical aspects of innovation. However, a more inclusive model was required with complex Agile methodologies such as Scrum, where collaboration between individuals within teams and organizations is important. The combination of factors affecting adoption led to the selection of the Diffusion of Innovation theory (DOI) as the theoretical lens for the Conceptual

Framework (CF) [5].

Agility is today a key dimension of organizational excellence, as it encompasses the ability to respond successfully to changes in the surrounding environment. Although existing research has investigated specific perspectives on organizational agility, an integrative framework has yet to be introduced in the literature. This work studies the gap by presenting a conceptual model that encapsulates several critical dimensions for the development of agility within organizations. An extensive review of the literature is used to identify concepts related to agility, and a design science approach is taken to construct the framework. Three macro-areas are described in terms of 7 propositions and dimensions and 30 elements related to an agility development initiative [7]

3. METHODOLOGY

Research outline

Bergman [12] identified qualitative and quantitative research methods/approaches/orientations. Although these approaches differ, each has strengths and weaknesses. In this study, a mixed methods research approach was employed that blends elements of qualitative and quantitative methods within one study [12]. The chosen research approach was appropriate, as it allowed for the initial qualitative exploration of the research topic on a small scale, to gain insight into the research situation, i.e., how companies were diagnosing themselves concerning employing an agile approach and literature research of related work; the collection of information for the development of a measurement instrument; and the subsequent comprehensive analysis to succeed in identifying factors that may be considered for the interests of this study.

Therefore, the research scheme consists of a systematic literature review. The systematic analysis of the literature review allows for evaluating, and establishing a state of the art of topics related to research in development [8] and in addition, a construct has been designed, which will allow a survey of software developers' work teams using both traditional and agile methodologies.

This review is carried out to have quantitative data on the adoption of the agile approach. With this, we have the characteristics of the challenges of adopting the Agile approach to train factors and establish a conceptual framework.

As part of the methodology for this research, a questionnaire was designed to serve as a basis for the literature review, helping the selection of keywords according to the opinion of work teams that responded to the survey, with this construct we seek to identify the preferences for agile or the transition from traditional to agile and also supported with the answers provided by the teams, to identify the factors that we seek to establish or delimit with this paper. The questionnaire is aimed at the adoption of the agile approach by work teams; they are questioned about the problems for their transition, what are the team's objectives for the adoption of agile, it is sought to find if there are no anomalies within the organization or within the team that hinder the adoption of agile and identify if there is a particular interest in any agile methodology (for example eXtreme Programming, Scrum among others), we also want to know what agile techniques they choose as a team to support the management and monitoring of agile practices, we explore what agile practices based on the objectives of the team have been implemented to streamline developments, we want to highlight the benefits that companies have had with the use of the agile approach, verify whether before adopting agile they followed a traditional methodology and the complications for the transition.

The design of the construct allowed us to review factors as independent variables and the adoption of the agile approach as a dependent variable. The survey was conducted online due to the COVID-19 health contingency and was used as a scale to measure the opinions of professionals who develop using an agile methodology and who work within organizations in Mexico [9].

A pilot study, an exploratory factor analysis, the Bartlett test, and Kaiser-Meyer-Olkin were carried out to validate the scale. Cronbach's alpha coefficient is used for reliability to measure the internal consistency of the scale [9].

4. DIAGNOSIS

Exploratory factor analysis is a statistical method used to describe the variability of the observed variables in terms of the unobserved [5]. The validation of the construct items, against the established conceptual factors based on the systematic analysis, led to a first-order and second-order exploratory factor analysis. In the first order, the exploratory factor analysis considered the 78 items of the construct (survey) to construct 14 newly validated factors. These factors were subjected to second-order exploratory factor analysis to develop four theoretical constructions, which are developed to try to solve the problem of adopting the agile approach. The validity analysis proceeded by the scores generated by the first-order exploratory factor analysis. The first and second-order exploratory analysis scores were then summarized.

For the study and establishment of the conceptual framework, the terms that were established as criteria for the literature search were considered (see Table 1), which allowed, in turn, to have the basis for the design of the construct that will serve to survey developer companies that require or be in the process of adopting an agile

approach.

Table 1. Search for challenges in the adoption of the agile approach / Items that establish the conceptual model

Individual factors to consider in team members	Teamwork factors	Technology factors	Company/business factors
1. Scale of commitment of the person to the team 2. Self-organization and self-management (experience) 3. Excess time in analysis and design	4. Resistance to change 5. Communication between team members and with the coordinator and the company representative 6. Specialization of each member 7. Management of iterations 8. Teamwork	9. Affinity 10. Complexity of use 11. Relative advantage	12. Company Collaboration 13. Support from the organization's management area 14. Organizational culture and acceptance of change 15. Organizational structure of the company that allows agility 16. Qualities of the company representative for interaction with the work team 17. Recognition and respect between the company and team 18. Company resources 19. Training of the company representative and the people who will be involved with the software project

To test the adequacy of the sampling, the Kaiser-Meyer-Olkin measure was used. The Kaiser-Meyer-Olkin value obtained was 0.88. The Bartlett test was performed to determine whether factor analysis was useful. Bartlett's test for the significance level of sphericity was 0.00. The results of these tests indicate that exploratory factor analysis of the data set was worthwhile.

To determine the number of factors derived from the individual factors, eigenvalues greater than 1 were used. The cumulative percentage of constructs was 75.8%.

In summa, of the 78 items of the questionnaire, 14 factors were retained for rotation because their eigenvalues were greater than or close to one. The first 14 factors together explained 75.8% of the total variance.

Due to the cutoff criterion of the factorial load of 0.40, it was found that 12 elements were loaded in the first factor, and these were later labeled as "Company behavior". Eight items were loaded in the second factor, labeled "Iteration management by the representative of the organization and the work team". Nine elements are loaded in the third factor, called "Relative advantage of the use of technology". Four items loaded in the fourth, fifth, sixth, and seventh factors respectively, labeled "Self-organization and self-management (experience)", "Training of the representative of the company and of the people who will be involved with the software project", "Specialization of each team member (includes the company representative)" and "Recognition and respect between company and team." Seven items loaded into the eighth factor, called "Customer Collaboration." Three items loaded into the ninth factor, labeled "Affinity." Five items loaded in the 10th factor, labeled "Time spent on analysis and design." Three items loaded in the eleventh and twelfth factor respectively, labeled "Scale of commitment of the person to the team" and "Complexity of use". Eight items were loaded into the thirteenth factor, labeled "Teamwork," and four items were loaded into the fourteenth factor, labeled "Company Resources."

Fig. 1 shows the mapping of the 19 initial conceptual model factors to the 14 validated factors. Where, the second-order exploratory factor analysis was performed on the 14 derived factors that were obtained and validated, from the output of the first-order exploratory factor analysis.

5. DISCUSSION AND RESULTS

In the previous section, the methodology used to derive the factors and the validated theoretical variables of the conceptual construct resulting from the syntactic analysis of the information is described. This section provides a statistical analysis of the results obtained with this methodology.

The schematic representation of the notation for this study is illustrated in Fig. 2.

Result 1: Test of the strength of the relationship of fourteen first-order factors

To test the relationship between the different factors, a correlation matrix was used. A Spearman correlation analysis was performed on all factors, due to the skewness of the data discovered during the normality tests.

The analysis revealed statistically significant correlations for the relationships between the adoption of the agile approach and all the factors at the 0.01 level, except "Teamwork" which was significant at the 0.05 level ($p = 0.018$), and "Excess time in the analysis and design "no significance ($p = 0.514$), see Table 2, where

Factor 1= Adopting an agile approach
Factor 2 = Self-organization, and self-management (experience)
Factor 3 = Organizational Behavior
Factor 4 = Sprint Management
Factor 5 = Relative Advantage
Factor 6 = Training
Factor 7 = Specialization

Factor 8 = Recognition
Factor 9 = Customer Collaboration
Factor 10 = Compatibility
Factor 11 = Escalation of Commitment
Factor 12 = Complexity
Factor 13 = Teamwork
Factor 14 = Resource Management
Factor 15 = Over- Engineering.

Result 2: Test the correlation between four variables of the construct and the adoption of the agile approach
To test the strength of the relationship between the four variables of the construct, a correlation matrix was used, as well as between the four variables and the dependent variable. A Spearman correlation analysis was performed, due to the skewness of the data discovered during the normality tests. The analysis revealed statistically significant correlations for the relationships between the adoption of the agile approach and the four variables at the 0.01 level, see Table 3.

Result 3: Test the probability that a relationship between two or more variables in the factorial relationship analysis is not just a coincidence
All assumptions of normality were fulfilled when regression analysis was performed on the 14 factors. Tolerance values were above 0.01, all VIF (Variance Inflation Factor) values were below 10, and the non-multicollinearity assumption was met. For the 14 factors, a multiple linear regression was carried out to examine whether the "Excess time in analysis and design", the "Relative advantage of the use of technology", the "Recognition and respect between company and team", the "Self-organization and self-management (experience)", the "teamwork", the "Specialization of each member of the team (includes the representative of the company)", the "Scale of commitment of the person with the team ", the" affinity ", the management of" Company resources ", the" collaboration with the client ", the" complexity of use ", the" Training of the company representative and the people who will be involved with the project of software ", the" management of the iterations ", and the impact in the "Culture of the organization and acceptance of the change" when adopting an agile approach. The general model (predictors: Excess time in the analysis and design, Relative advantage of the use of technology, Recognition, and respect between company and team", Self-organization and self-management (experience), Teamwork, Specialization of each team member (includes the company representative), Scale of commitment of the person with the team, Affinity, Management of company resources, Collaboration with the client, Complexity of use, Training of the company representative and people who will be involved with the software project, Iteration management, Company collaboration) explained 52.9% of the variance of adoption of the agile approach, which turned out to be statistically significant (F (14,206) = 15.40, p <0.0001).

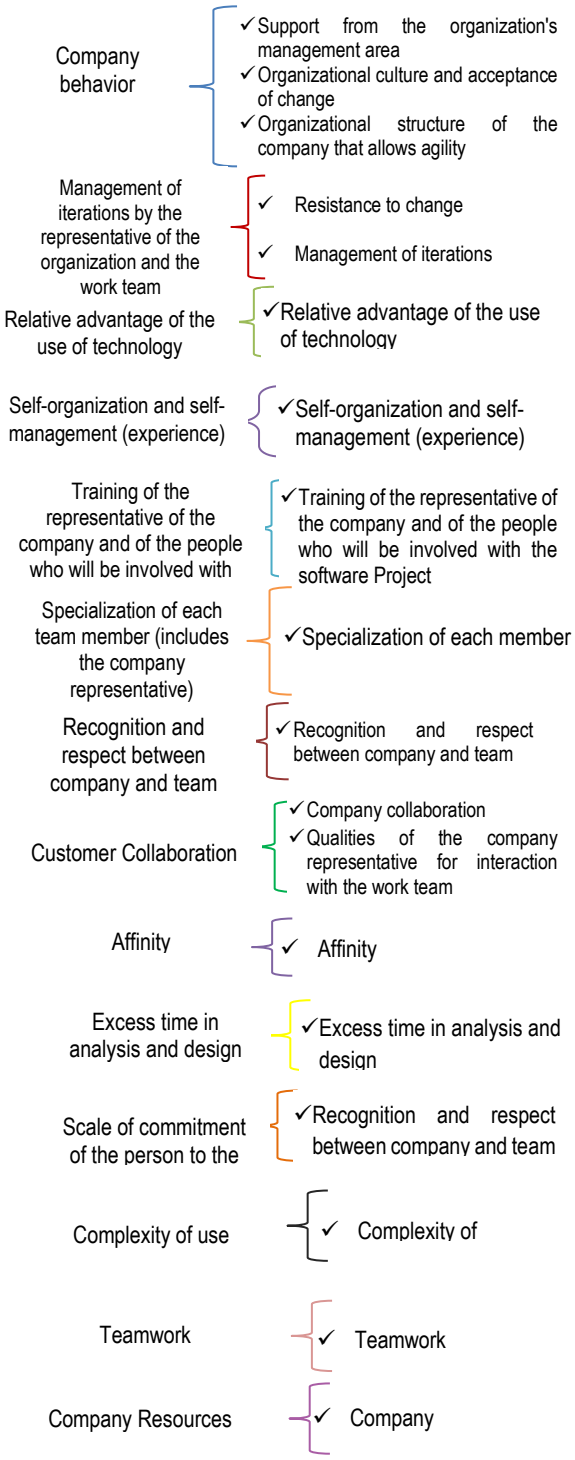

Fig. 1. Mapping of the initial factors to the validated factors with the first-order exploratory factor analysis output

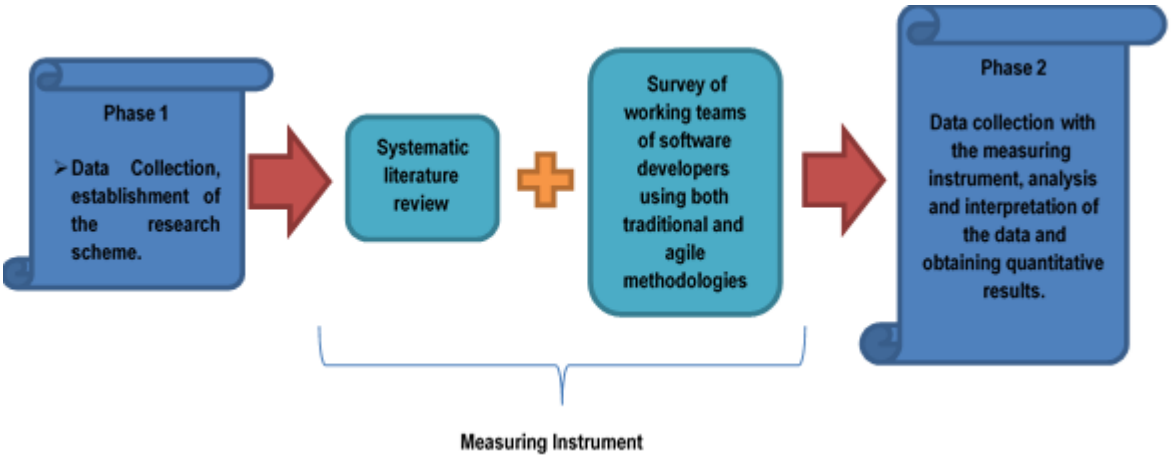

Fig. 2 Notation used to obtain results for the mixed exploration proposed for this research

Table 2. Factors used in the study, correlations between them

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14	Factor 15
Factor 1	1.00	.30^^	.28^^	.30^^	.66^^	.22^^	.23^^	.20^^	.34^^	.50^^	.22^^	.34^^	.16^	.20^^	.05
Factor 2	.30^^	1.00	.14^	.32^^	.29^^	.26^	.25^^	.19^^	.20^^	.23^^	.27^^	19^^	.21^^	.06	.09
Factor 3	.28^^	.14^	1.00	.25^^	.29^^	.58^^	.24^^	.66^^	.72^^	.27^^	.30^^	.36^^	.16^	.64^^	.18^
Factor 4	.30^^	.32^^	.25^^	1.00	.10	.25^^	.01	.09	.26^^	.09	.08	.10	.71^^	.16^	.26^^
Factor 5	.66^^	.29^^	.29^^	.10	1.00	.29^^	.27^^	.24^^	.35^^	.64^^	.28^^	.51^^	.71^^	.24^^	.02
Factor 6	.22^^	.26^	.58^^	.25^^	.29^^	1.00	.28^^	.65^^	.51^^	.23^^	.21^^	.26^^	.01	.39^^	.01
Factor 7	.23^^	.25^^	24^^	.01	.27^^	.28^^	1.00	.24^^	.31^^	.32^^	.34^^	.31^^	.10	.24^^	.23^^
Factor 8	.20^^	.19^^	.66^^	.09	.24^^	.65^^	.24^^	1.00	.55^^	.24^^	.16^^	.34^^	.07	.48^^	.09
Factor 9	.34^^	.20^^	.72^^	.26^^	.35^^	.51^^	.31^^	.55^^	1.00	.29^^	.29^^	.39^^	.07	.57^^	.12
Factor 10	.50^^	.23^^	.27^^	.09	.64^^	.23^^	.32^^	.24^^	.29^^	1.00	.22^^	.58^^	.11	.25^^	.04
Factor 11	.22^^	.27^^	.30^^	.08	.28^^	.21^^	.34^^	.16^	.29^^	.22^^	1.00	.27^^	.01	.30^^	.33^^
Factor 12	.34^^	.19^^	.36^^	.10	.51^^	.26^^	.31^^	.34^^	.39^^	.58^^	.27^^	1.00	.01	.42^^	.14^
Factor 13	.16^	.21^^	.16^	.71^^	.01	.10	.07	.7	.11	.01	.02	.01	1.00	.13^^	.28^^
Factor 14	.20^^	.06	.64^^	.16^	.24^^	.39^^	.24^^	.24^^	.57^^	.25^^	.30^^	.42^^	.13	1.00	.24^^
Factor 15	.05	.09	.18^	.26^^	.02	.01	.23^^	.23^^	.12	.04	.33^	.14^	.28^^	.24^^	1.00

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

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

Table 3. Correlations between the four factors (Items that establish the conceptual model) of the construct (survey) and the adoption of the agile approach

	Agile Adoption	Individual factors to consider in team members	Teamwork factors	Technology factors	Company / business factors
Agile Adoption	1.00	.29**	.20**	.53**	.30**
Individual factors to consider in team members	.29**	1.00	.16**	.38**	.39**
Teamwork factors	.20**	.16**	1.00	.07	.25**
Technology factors	.53**	.38**	.07	1.00	.42**
Company / business factors	.30**	.39**	.25**	.42**	1.00

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

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

For the four variables of the construct, a simple linear regression model was carried out and with it, examine whether the individual factors to consider in the team members, the work team factors, the technology factors, and the Company/business have an impact on the adoption of the agile approach. The model revealed that 33.40% of the variance in the adoption of an agile approach turned out to be statistically significant ($F(4.206) = 25.34$, $p < 0.0001$). An inspection of the Individual predictors to consider in team members revealed that technology factors and work team factors are significant predictors of adopting an agile approach. Higher levels of technology factors are associated with higher levels of adoption of the agile approach, and higher levels of team factors are associated with higher levels of adoption of the agile approach.

Discussion

It is important to note that initially, the conceptual framework of the challenges of adopting the agile approach, based on the systematic analysis of information related to the use of agile methodologies or the transition of work teams to them, had 19 factors (views as independent variables). However, during the validation of the scale, using the exploratory factor analysis applied to the variables of the questionnaire, 14 factors were validated and extracted. The loading of the questionnaire factors to new factors showed that the initial model had to be evaluated; For which, the factors of the questionnaire with their common points and the corresponding factor loadings were considered and evaluated and it was revealed that of the 19 initial independent variables, 14 factors were correctly loaded and this leads to the 19 hypothetical factors being assigned to the 14 validated factors (shown in Fig. 1).

Most of the mappings in Fig. 1 can be said to be self-explanatory, however, four factors have more than one variable and they are the behavior of the company, management of the iterations by the representative of the organization, and the team of work, collaboration with the client and teamwork.

The behavior of the company (as an organization) focuses on the way people behave in organizations, the way they interact with each other, and the way they work within the structures of organizations to carry out their work [10].

In [10], the author also states that the way managers manage others is significantly affected by the behavior of the company as an organization.

The importance of an iteration must be short is verified, which can be affected by resistance to change and an incorrect administration of the iterations, this is highlighted by the inclusion of these characteristics within the iteration management. Work teams interested in adopting an agile approach should perform their tasks within one iteration, at best, although it is recognized that this may not be the case for all planned tasks. Neither the company nor the team should resist the change when requested to do so or the change is made during an iteration; this leads us to review the values of the so-called Agile Manifesto and very particularly for this point, to reiterate the fourth value of agile development, which is "responding to change by following a plan". Based on this, it is appropriate that the management of iterations and resistance to change are part of the management of the iterations by the representative of the organization and the work team [11].

In Fig. 3 the conceptual framework derived from this study is shown, considering that it is made up of 4 factors, which have a set of 14 adequate variables that show the challenges to be considered, the points where attention must be paid to the adoption of an agile approach in a software development company.

Adoption of the agile approach			
Individual factors to consider in team members	**Teamwork factors**	**Technology factors**	**Company / business factors**
1. Avoid scale of commitment of the person to the team 2. More self-organization and self-management (experience) 3. Less specialization of each member	4. More Iterations management 5. More Teamwork 6. No excess time in analysis and design	7. More affinity, looking for compatibility 8. Less complexity of use 9. More relative advantage	10. More company collaboration 11. More recognition and respect between company and team 12. More company resources management 13. More training of the company representative and the people who will be involved with the software Project 14. More culture of the organization and acceptance of the change

Fig. 3. Conceptual framework highlighting the challenges of the company for the adoption of the agile approach, within the critical factors identified in the study

6. CONCLUSIONS

With this research, the research methodology followed in conducting the study to delineate the factors contributing to the adoption of an agile methodology has been documented.

As described in the article, to conduct the research, a mixed method research approach was followed, which involved mixing qualitative and quantitative methods in one study to provide a comprehensive understanding of the research phenomenon [12]. Importantly, the results section discusses how various qualitative and quantitative aspects of this research were mixed at various stages of the study (as is the case with the systematic literature review and survey application) [12].

The reasons for mixing these methods were: "to use the qualitative data to develop a new measurement instrument (characteristics identified from the systematic review) and to explain the quantitative results obtained from the survey with the qualitative data to confirm that the factors identified are appropriate for the present study". On the other hand, it is important to note that, although they mixed these methods, the quantitative method was more dominant than the qualitative method because it was possible through the survey to census the presence of the identified factors in development teams with ongoing projects with both traditional and agile methodologies.

Therefore, the quantitative method served to reaffirm the results obtained with the systematic literature review, both having the same importance for the present research since they complement each other.

The mix of these methods, although lengthy, costly, and time-consuming, was integrated rather than competing with each other, and, consequently, the data obtained in this study is considered to be complementary, rich, and complete, adding the expected value to this research and allowing to document the empirical findings/results of this study.

It can be concluded that employing an agile approach, no matter which methodology is involved, for software development, is a current trend due to the fact that it improves project delivery times.

The adoption of an agile approach, therefore, tends to increase in work teams. The research presented in this work contributes to the knowledge of agile and its adoption because it tries to propose a consolidation of the critical factors and the challenges that a company faces when considering a transition to agile, it is possible to establish a conceptual framework where the challenges that stand out most in the adoption of this type of approach are.

The main objective of this research was, based on the literature, to delimit the factors that tend to influence the adoption of an agile approach in general, according to the perception of work teams that develop software and that are trying to use an agile methodology, and who works within organizations in Mexico. It was possible to validate factors that have a direct relationship with the behavior of companies and development teams to achieve the adoption of the agile approach.

It should be mentioned that, due to the constant appearance of works in this area, this research can be expanded by including more literature in the systematic analysis and may perhaps find new challenges for the adoption of the agile approach, it can also try to work with a larger population for greater precision of the findings. It would be useful to follow up with organizations on the successes or failures in applying the agile approach and see if they have not adopted new practices to overcome the challenges.

To ensure the success of the company and that it remains present in its future, it must achieve the adoption of new technologies, and methodologies, and innovate the way of carrying out its developments, so that it sees results that obtain an ROI (Return on Investment) favorable and thus, that it can compete in a world of IT.

Some points that would pose challenges in an agile transformation and that were not considered at this time are billing models for an agile approach (taking into consideration that the requirements are constantly evolving), utilization of the company's resources, with the awareness that the "responsibility is everyone's", that the teams work on improving their relationships aware that this will lead to many successes in the developments, in the company the representative must have servant leadership and thus, allow the team to function, that the top management of the company is involved and that there is appreciation from the top management for an agile style, that there is awareness in the organization that it is not convenient to reprioritize the work to be developed when the iteration is being executed.

Ultimately, to get the best out of the agile approach, it must be adopted carefully and consider all the challenges that this implies, so that all the benefits are realized.

7. FUTURE WORK

As mentioned, this is part of a research project, therefore, it constitutes one of the baselines for the formulation of the model for detecting challenges in adopting the agile approach in development companies in Mexico, which is under development and considers, how it will affect its formulation, consider the challenges that are mentioned in the conclusions and that were not taken into account for

this part of the research.

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