Problems in the Adoption of Agile-Scrum Methodologies: A Systematic Literature Review

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Abstract—**Agile methodologies are focused on the people and functional product delivery in short periods of time. There are methodologies that change considerably the work habits of software developers. Scrum is an agile methodology that involves an iterative, incremental, and empiric process. Besides it is designed to add value, focus, clarity and transparency to the activities and products of a project. Nowadays, most companies are interested in the adoption of agile methodologies. Although Scrum is a light process and easy to understand, its adoption sometimes is difficult. Agile methodologies are not obvious by themselves, so they are difficult to introduce in the culture of a company. In order to identify the problems presented during the adoption, a Systematic Literature Review is performed focusing in Scrum. We found several problems; these are categorized in four groups: people, process, project, and company (organization). The results represent a basis to propose a framework to support the agile adoption.**

Keywords: agile methodologies; adoption problems; Scrum; systematic literature review;

I. INTRODUCTION

Agile Software development is a relatively new paradigm, this approach gained industry's attention in recent years. Most organizations are moving toward the adoption of agile methodologies. So, this tendency is due the continuous necessity of producing best solutions, fast development, and profitable software. Agile methods assume that changes in requirements are inevitable, and thus the software development cycle has to adapt to this fact. Moreover, software teams have to deliver value product to the customer as quickly as possible with fewer concerns on extensive planning and documentation [1].

Agile methodologies have been especially useful in projects with the following characteristics [2]: small teams, short development calendars, constantly change in requirements, systems based on new technologies.

Successful agile adoption leads to produce higher quality software at a lower cost and enhance developer's moral than for example the traditional waterfall model approach.

Although most agile methodologies have been seen as a light process and easy to understand, the adoption sometimes is difficult. This difficulty is due that they are not obvious themselves, so it is hard to introduce agile methodologies in the culture of a company. Agile adoption always comes with special challenges and fundamental organizational changes that are necessary for successful outcome [1].

In literature many agile case studies were conducted to assess the merits and challenges of agile adoption. Some of the main problems reported are the following [37, 38, 39, 40]:

- Team members reveal limited knowledge of agile method during the implementation phase.
- At the beginning of adoption, organization learning of the enterprise is not aligned with agile process adoption.
- At the beginning of adoption, requirements present different levels of abstraction, which derives in ambiguity dealing with conflicts in product quality.
- Developer fear caused by transparency of skill deficiencies.
- The necessity for developers to be a "master of all trades" in order to get the desired product.
- Increased reliance on social skills.
- A lack of business knowledge among developers.
- The necessity to understand and learn values and principles of agile, not just the practices.
- Lack of developer's motivation to use agile methods.
- Implications of devolved decision-making.
- The necessity for agile compliant performance evaluation.
- The lack of Agile-specific recruitment policies and suitably trained information technologies graduates.
- The necessity of integrating each pilot project with the project environment's existing processes.
- The necessity of adding support for cross-team communication, especially in large teams that might be located in different geographical locations.
- Although Agile values code production is more than plan-driven processes, some developers tend to spend more time creating non-code artifacts and counting the number of meetings they attend than producing code.

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- Developers, who view agile as micromanagement, perceive project management as being about due dates and missed deadlines.
- When an overzealous team moves quickly to Agile without careful planning, it usually results a number of problems.
- Agile does not have separate coding and testing phases. Code written during iteration should be tested and debugged during the iteration.

Problems reported in each case study concern different aspects around the elements involved in the development process. There is not a clear pattern of problems presented in each case study. In order to integrate a guide for agile adoption, we propose a classification of those problems in the next four groups: people, process, project, company (organization).

In this paper we present a Systematic Literature Review (SLR) realized toward identifying a pattern of problems presented during agile methodologies adoption. In this way, we can correlate best practices extracted from another well-proved methodologies and process models such as CMMI, MoProSoft among others, trying to suggest solutions for agile problems.

This paper is organized as follows. Section 2 gives a brief description of agile methodologies, emphasizing Scrum. Section 3 describes the method used for the systematic literature review (SLR). Section 4 exposes the results of the SLR. Section 5 presents the conclusions and future work.

II. FUNDAMENTALS OF AGILE METHODOLOGIES

Software development methodologies have been the main focus of life cycle approaches to any project. Since 1940, there have been significant changes on software development paradigm, having approaches such as structured programming, object oriented programming, and more recently extreme programming and aspect oriented programming. Each evolutionary change introduces new ways of thinking and of analyzing problems, besides, it introduce strengths to the software development. In order to use these methodologies efficiently, it is important to follow defined process as they are formulated [3].

Agile methods have been developed as an effort to improve perceived and real debilities of the conventional Software Engineering. After decades of being utilized, agile methodologies provide important benefits to projects, however, they are not applicable to all projects, products, people and situations [4]. In an industry context, introducing agile methodologies enable considerable changes in people's work habits; this is due these methodologies establish intentionally an opposite side with respect to the traditional software development approaches [5].

Most agile methodologies have been proposed, and they are in use in industry until today; examples are Extreme Programming, Adaptive Software Development (ASD), Scrum, Cristal, and others. However, our main interest is on the Scrum adoption.

A. SCRUM

Scrum is the most popular agile methodology in the software industry. By using Scrum practices, several companies have improved their quality and productivity [13]. It is an agile method of development, which is defined as an iterative, incremental and empirical process to manage and control the development of a project.

A key principle in Scrum is that "customers can be present during the project and they can change the requirements at any moment." In this scenario, resulting challenges cannot be predicted and is difficult to face them in a predictive and planned way. Based on this, Scrum presents a pragmatic approximation, with this position: Accepting that the problem cannot be completely understood or defined and focusing on maximizing the ability of the team to deliver quickly and respond to emerging requirements [7].

Scrum has three main roles: Product Owner, Scrum Master and Scrum Team. The Product Owner represents the voice of the customer. His main responsibility is the creation of the product backlog, which is a list of requirements sorted in base of priority. The Scrum Master is responsible for the process of Scrum, teach it to each one of those involved in the project, and if is necessary, help the team with problems that arise during the project. More than a leader, the Scrum Master is considered as a guide. The Scrum team, which are characterized as a team self-organized and multifunctional; they bear the responsibility for the development of the product and the estimation of the tasks which each member of the team undertakes to perform during each Sprint.

A Sprint has duration of 2 to 4 weeks and is the heart of Scrum. Each Sprint starts with the planning meeting of the Sprint. The Product Owner and Team work together to know what we are going to do for the next Sprint [6] [8] [9].

In Fig. 1 we can observe the Scrum process, showing the most basic elements that characterize this methodology.

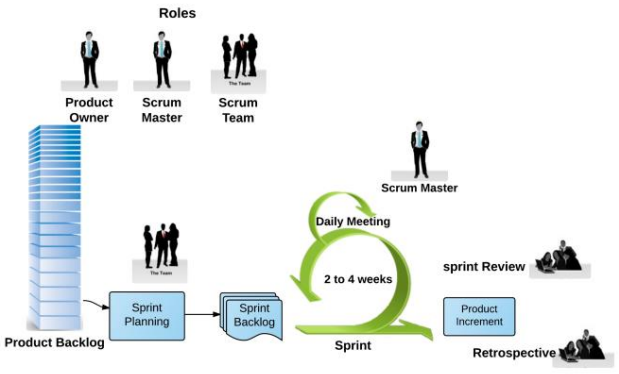

Figure 1. Scrum process, a light view.

Currently companies that adopt Scrum are benefited obtaining greater profitability, teamwork, communication, cooperation of the development team, productivity, confidence between the product management and development team, among others. However, the agile adoption is not always easy and without problems, because

these methods are difficult to introduce and non-obvious themselves. For this reason, we decided to conduct a systematic literature review to identify which are problems faced in adopting an agile methodology and specifically Scrum. Below the method used for the realization of such review is described.

III. METHODOLOGY FOR SRL

The present SRL was based on the methodology proposed by Kitchenham [10]. This methodology suggests three main phases: (1) Planning of review, (2) performing review, (3) publishing results from review.

The main steps described below were performed.

A. Formulating research questions

This study was focused on identifying problems in adopting agile methodologies such as Scrum. To do this review, we formulate the following research questions:

a) What are the main problems for adopting agile methodologies?
b) What are the main problems for adopting Scrum?

The first question deals with identifying problems for adopting agile methodologies in general. The second question emphasizes on Scrum methodology.

B. Search strategy

We take into account the most popular scientific research libraries: IEEE Xplore, Science Direct, ACM DL, and Springer Link.

Our goal is to review the most recent publications from 2012 to 2015, trying for specialized journals and conferences.

We used a search structure based on keyword and logic connectors, dealing with the following search string:

(Agile Methodology OR Scrum) and (Adoption Problems OR Adoption Issues OR Adoption Challenges)

We look for this search string in three parts of a document: keywords, abstract, full text (body of the paper).

We used the following procedure to identify the most relevant studies for this SLR:

i. Choosing the keyword for research
ii. Looking in the digital library, trying with research keywords based on inclusion and exclusion criteria.
iii. Analyzing each paper through title and abstract.
iv. Downloading papers covering search criteria.
v. Reviewing introduction and conclusions conscientiously, and taking a fast view of the rest of the sections in a paper.

This process was applied to each electronic library.

C. Defining inclusion and exclusion criteria

Selected papers must be published between January 2012 and July 2015. We considered papers that included keywords such as: "Adoption problems," "Adoption challenges," "SCRUM," "Agile methodology." We take into account English and Spanish papers; these were extracted from Journals and Conferences. In some cases we found short and full versions of papers, but only full versions were reviewed.

D. Quality assessment of review strategy

Some questions were formulated to assess the quality of the review strategy. These cover aspects such as relevance and accuracy in the papers' contribution to our research goals. Next, some examples are shown:

QA1: Does the paper describe problems in Scrum's adoption?

QA2: Does the paper expose solutions to the problems identified?

Each paper was evaluated using the same quality questions.

IV. RESULTS FROM THE REVIEW

Table I shows the activities realized for the search. We searched for keywords "Adoption, Adoption Problems, Scrum, Agile Methodologies, Challenges", finding 269 papers in the most popular scientific research libraries. These papers were reviewed at the level of "Title", reducing the amount to 110. After that, we reviewed the "Abstract", reducing the amount to 85. Finally, taking a look at the general view of the full papers, reducing them to 27, which are relevant for our research.

TABLE I. SELECTED PAPERS

Database	Original search	Title	Abstract	Fast view	Selected
IEEE Xplore	20	26	19	13	11
Science Direct	77	40	28	12	5
ACM DL	11	21	18	5	5
Springer Link	52	23	20	17	6
Total	269	110	85	47	27

Table II shows the 27 papers selected for our research. The table details the data of each paper as ID of the paper, the name of paper, author's names, the electronic library where it was obtained and publication's year.

TABLE II. SELECTED PAPERS

Title	Author	Database	Year
Agile Practice in Practice: A Mapping Study [11]	M. Dahlem	ACM	2014
Agile Methods, Organizational Culture and Agility: Some Insights [12]	Lakshminarayana Kompeya	ACM	2014
How to Make Agile UX Work More Efficient: Management and Sale Perspectives [13]	Kati Kuusinen / Kaisa VaananenVainio Mattila	ACM	2012
Adopting Agile Software Development: Issues and Challenges [1]	Hassan Hajjdiab and Al Shaima Taleb	ACM	2011
Agile Beyond Software Development [14]	Dan X. Houston	ACM	2014
A multi-faceted Roadmap of Requirements Traceability Types Adoption in SCRUM: An Empirical Study [15]	Ghada Alaa / Zeinab Samir	IEEE	2014
Influences on Agile Practice Tailoring in Enterprise Software Development [16]	Julian M. Bass	IEEE	2012
Scrum Anti-patterns – An Empirical Study [17]	Veli-Pekka Eloranta, Kai Koskimies,Tommi Mikkonen and Jyri Vuorinen	IEEE	2013
ScrumBut, but Does It Matter? [18]	Ville T. Heikkila, Maria Paasivaara and Casper Lassenius	IEEE	2013
Where Is Scrum in the Current Agile World? [19]	Georgia M. Kapitsaki and Marios Christou	IEEE	2014
An Empirical Study into Social Success Factors for Agile Software Development [20]	Evelyn van Kelle, Per van der Wijst. Aske Plaat. Joost Visser	IEEE	2015
Agile Adoption Story from NHN [21]	Eunha Kim and Seokmoon Ryoo	IEEE	2012
Beyond Mainstream Adoption: From Agile Software Development to Agile Organizational Change [22]	David Bustard	IEEE	2012
How We Successfully Adapted Agile for a Research Heavy Engineering Software Team [23]	Alfred A. Lobber , Kyran D. Mish	IEEE	2013
The Maturation of Agile Software Development Principles and Practice: Observations on Successive Industrial Studies in 2010 and 2012 [24]	David Bustard, George Wilkie, Des Greer	Science Direct	2013
Operational release planning in large-scale scrum with multiple stakeholders — A longitudinal case study at F-Secure corporation [18]	Ville T. Heikkilä, Maria Paasivaara, et al	Science Direct	2014
Obstacles to decision making in Agile software development teams [25]	Meghann Drurya, Kieran Conboyb, Ken Power	Science Direct	2012
Agile Principles and Achievement of Success in Software Development: A Quantitative Study in Brazilian Organizations [3]	Paulo de Souza B., André Luiz Zambaldea et al	Science Direct	2014
The impact of inadequate and dysfunctional training on Agile transformation process: A Grounded Theory study [26]	Taghi Javdani Gandomania, et al	Science Direct	2014
Towards optimal software engineering: Learning from agile practice [24]	David Bustard GeorgeWilkie Des Greer	Springer Link	2013
The evolution of agile software development in Brazil [27]	Claudia de O. Melo et al	Springer Link	2013
The Role of Communication in Agile Systems Development: An Analysis of the State of the Art [28]	Markus Hummel, Dr. Christoph Rosenkranz. Dr. Roland Holten	Springer Link	2012
Scrum adoption and architectural extensions in developing new service applications of large financial IT systems [29]	Toumas Ihme	Springer Link	2013
Evaluating the impact of an agile transformation: A longitudinal case study in a distributed context [30]	Kirsi Korhonen	Springer Link	2013
Strengths and barriers behind the successful agile deployment-insights from the three software intensive companies in Finland [31]	Minna Pikkarainen Outi Salo Raija Kuusela Pekka Abrahamsson	Springer Link	2012
Necessary Skills and Attitudes for Development Team Members in Scrum [32]	Penprapa Bootla et al,	IEEE	2015
Obstacles to efficient daily meetings in agile development projects: A case study [33]	Viktoria Gulliksen Stray, Yngve Lindsjørn and Dag I.K. Sjøberg	IEEE	2013

The results were organized into four categories, taking as reference the factors model of agile methodologies adoption proposed by Shahane et al. in [34]: people, processes, project, and organization aspects in the company. This model was adapted by M. Shuhuay et al in [35] categorizing the factors of the agile method adoption, which are shown in Fig. 2.

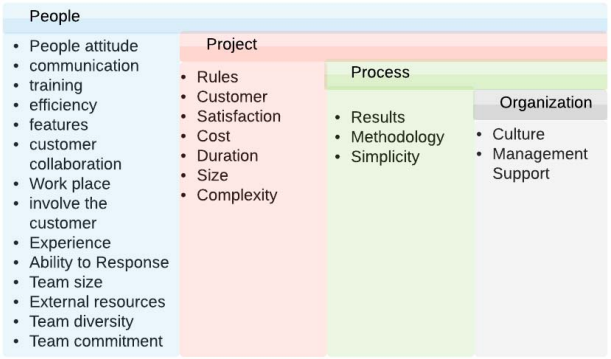

Figure 2. Factors for Agile Methods' adoption

Table III shows the problems encountered in the SLR, focusing on the adoption of agile methodologies and Scrum.

TABLE III. PROBLEMS IN THE AGILE MIGRATION

Key issues in the agile migration	Category	Papers
Organizational culture does not support agile ways of working	Organization	[17], [19],[27]
Lacks of capacity to change the organizational culture	Organization	[12], [17]
Organizational problems	Organization	[17], [19]
Lack of management support	Organization	[3]
External pressure to use traditional practices	Organization	[17], [27]
Lack of collaboration and communication with the customer	People	[19], [26]
Lack of training of the Product Owner and the customer	People	[27]
Team size	People	[12], [19], [24], [29]
Team unaligned	People	[20]
Equipment capacity	People	[3]
Rotating team members	People	[27], [29]
Lack of experience with agile methods	People	[17], [27]
Availability of trained personnel	People	[20], [32]
Lack of effective communication	People	[20], [26], [27]
Lack of understanding of agile values	People	[26]
Inadequate and dysfunctional training	People	[17]
General resistance to change	People	[20], [27]
Lack of commitment to decisions	People	[32]
Continued involvement with the client	People	[20]
Project size	Project	[12], [19], 29]
Agility degree	Process	[20]
Anti-patterns	Process	[17]

Fig. 3 summarizes the classification of the problems found in SLR. Considering our findings, we can state that the literature reports more *people* problems.

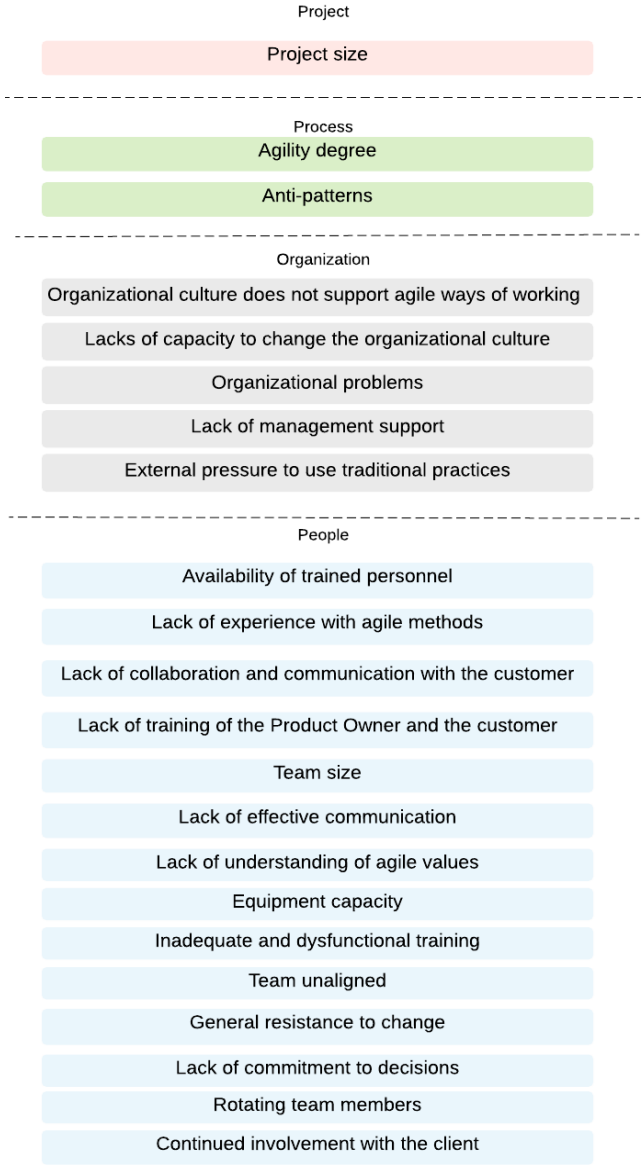

Figure 3. SLR problems classification.

In the following sections we analyze each of the problem categories.

A. Organizational aspects

The successful adoption of agile methodologies depends on several factors; organizational culture is one of them and it has great importance in the adoption of Scrum. We reviewed which the problems are presented in this category, having the followings: the organizational culture does not support forms of agile work [17], [19], [27], [3]; it lacks the capacity to change the organizational culture [17], [3], [26], [36]; organizational problems [24], [20] [3], [26]; lack of support from the heads of companies [17], [19]; and external pressure to use traditional practices [17], [27]. The Agile methodologies must be used within an agile culture that is characterized by a broad support for the negotiations, a capacity for change, the collaboration and the continuous exchange of experiences and knowledge. It is important to identify if the organization supports the change toward an agile culture.

B. People

Changing from a traditional development process to an agile method involves a big change to people thinking and of their behavior, which means that people are a critical factor in the implementation of Scrum [32], [26]. This is due to the fact that this methodology believes in self-organization of the members of the development team. The majority of projects fail due to the lack of effective communication; the communication style is more important than the frequency of the communication, and the informal communication can improve the success of the project.

There are several studies on the role of the people in the agile adoption. Problems found are as follows: Lack of cooperation and constant communication with the client [27], [29], [19]; lack of training of the Product Owner and the client [27]; size of the team [19] [19],[29] [12]; teams not aligned [20]; the abilities of the teams [3]; rotation of members of the team [29]; lack of experience with the agile methods [17] [27]; availability of trained personnel[17] [19]; lack of effective communication and misunderstandings [20] [32]; lack of comprehension of the Agile values [20] [32] [26]; inadequate and dysfunctional training [26]; overall resistance to change [17]; lack of commitment to the decisions [20] [27]; and lack of constant participation with the customer [32].

C. Project

This category comprises the customer satisfaction, cost, duration, size, and complexity [35]. However, few studies were found in the literature on this category since the majority of the papers found are focused on organizational aspects and people. Among the issues identified in this group, we can mention the size of the project, the difficulty to scale in large projects [19].

D. Process

In a study presented by Lober and Mish [23], some problems that appear in the early stages of the Scrum adoption are identified, such as following: lack of delivery of user stories, lack of confidence, as well as the times in the planning meetings, daily meetings and retrospectives can be too long with little value to the attendees.

Some specific situations are:

- The larger the team the larger meetings are, and it is harder to provide value to all participants.
- A medium speed and the points for user stories are insufficient to plan a sprint because of the size of the big team, the fluctuating participation and the specialization of people.
- Writing concrete user stories can be difficult due to the inherent uncertainty.
- Moving the adoption forward to an adequate pace requires transparency, inspection and adaptation.

Everyone involved with the Scrum process must understand what is expected from everyone. It is very effective to explain why these expectations are set in terms of other people who are relying on the information.

V. Eloranta, K. Koskimies, T. Mikkonen, and J. Vuorinen. [17] refer to some specific problems in adopting Scrum: (1) The harmful deviations from recommended Scrum practices and; (2) recommended Scrum practices that are for some reason unsuitable in a particular context. V. Eloranta, K. Koskimies, T. Mikkonen, and J. Vuorinen made some recommendations for Scrum's adoption:

- For the first type of problem, a company starting in Scrum should be aware of common deviations that may seem reasonable, but which are actually harmful.
- For the second type, the understanding of deviations from the norm, Scrum books provide information for improving the methodology to suit the purposes of the companies that develop software.

The two types of deviations represent harmful consequences for projects. These deviations are named Anti-patterns.

V. Conclusions and Future Work

In this paper, we presented a Systematic Literature Review about agile methodologies adoption, with a principal focus on Scrum.

We found that agile adoption always comes with special challenges; consequently, changes in the organization are critical to a successful outcome. The organization's culture is one of the causes of resistance to change likewise other factors in making agile methodologies such as people, which is the largest existing impediment to the adoption. These problems must be addressed to improve the adoption of agile methodologies and changing traditional development process to agile methods.

Taking into account our experience working with traditional life cycle models and process models, we find

some best practices that can be a complement to Scrum. In previous publications [41] we presented a first proposal to adapt documenting practices into the agile process for mobile applications, specifically in the requirements gathering and analysis and design stages.

As future work, we are preparing a framework in which we will establish our own values and practices for Scrum and some complementary practices not explicit in the methodology but considered as necessary to make an easy adoption.

REFERENCES

[1] H. Hajjdiab and Al Shaima Taleb, "Adopting Agile Software Development: Issues and Challenges," International Journal of Managing Value and Supply Chains, vol. 2, no. 3, pp. 1–10, 2011.

[2] P. Letelier, "Metodologías Ágiles en el Desarrollo de Software," in de Valencia, Valencia, 2009.

[3] P. H. D. S. Bermejo, A. L. Zambalde, A. O. Tonelli, S. A. Souza, L. A. Zuppo, and P. L. Rosa, "Agile Principles and Achievement of Success in Software Development: A Quantitative Study in Brazilian Organizations," Procedia Technology,vol. 16, pp. 718–727, 2014.

[4] R. Pressman, Ingenieria de Software Un Enfoque Práctico. Mc Graw Hill, 6ta ed., 2008.

[5] S. Overhage and S. Schlauderer, "Investigating the Long-Term Acceptance of Agile Methodologies: An Empirical Study of Developer Perceptions in Scrum Projects," in 2012 45th Hawaii International Conference on System Sciences, pp. 5452–5461, IEEE, jan 2012.

[6] M. Davila Muñoz, Desarrollo de una especialización de moprosoft basada en el método ágil scrum. PhD thesis, Universidad Nacional Autonoma de México, 2008.

[7] D. Pauly and D. Basten, "Do Daily Scrums Have to Take Place Each Day? A Case Study of Customized Scrum Principles at an E-Commerce Company," Hawaii International Conference on System Sciences, pp. 5074–5083, 2015.

[8] K. Schwaber and J. Sutherland, "The scrum guide," Scrum. Org, October, vol. 2, no. July, p. 17, 2011.

[9] M. Gannon, "An Agile Implementation of SCRUM," Proceedings of the IEEE Aerospace Conference, Big Sky (MT), USA, 2-9 March, 2013, pp. 1–7, 2013.

[10] B. Kitchenham, O. Pearl Brereton, D. Budgen, M. Turner, J. Bailey, and S. Linkman, "Systematic literature reviews in J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

[11] M. Dahlem, "Agile Practices in Practice - A Mapping Study," 2014.

[12] L. Kompella, "Agile methods, organizational culture and agility: some insights," Proceedings of the 7th International Workshop on Cooperative and Human Aspects of Software Engineering -CHASE 2014, pp. 40–47, 2014.

[13] K. Kuusinen and K. Väänänen-Vainio-Mattila, "How to make agile UX work more efficient: management and sales perspectives," Proceeding NordiCHI '12 Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design, pp. 139–148, 2012.

[14] D. X. Houston, "Agility beyond Software Development," pp. 65–69, 2014.

[15] G. Alaa, "A multi-faceted Roadmap of Requirements Traceability Types Adoption in SCRUM: An Empirical Study," pp. 1–9, 2014.

[16] J. M. Bass, "Influences on agile practice tailoring in enterprise software development," Proceedings - Agile India 2012, AgileIndia 2012, pp. 1–9, 2012.

[17] V. Eloranta, K. Koskimies, T. Mikkonen, and J. Vuorinen, "Scrum Anti-Patterns – An Empirical Study," 2013 20th Asia- Pacific Software Engineering Conference (APSEC), vol. 1, pp. 503–510, 2013.

[18] V. T. Heikkilä, M. Paasivaara, K. Rautiainen, C. Lassenius, T. Toivola, and J. Järvinen, "Operational release planning in large-scale scrum with multiple stakeholders — A longitudinal case study at F-Secure corporation," Information and Software Technology, vol. 57, pp. 116–140, 2014.

[19] G. M. Kapitsaki and M. Christou, "Where Is Scrum in the Current Agile World?" Proceedings of the 9th International Conference on Evaluation of Novel Approaches to Software Engineering, pp. 101–108, 2014.

[20] E. V. Kelle, J. Visser, A. Plaat, and P. V. D. Wijst, "An Empirical Study into Social Success Factors for Agile Software Development," 2015 IEEE/ACM 8th International Workshop on Cooperative and Human Aspects of Software Engineering, pp. 77–80, 2015.

[21] E. Kim and S. Ryoo, "Agile adoption story from NHN," Proceedings - International Computer Software and Applications Conference, pp. 476–481, 2012.

[22] D. Bustard, "Beyond mainstream adoption: From agile software development to agile organizational change," Proceedings -2012 IEEE 19th International Conference and Workshops on Engineering of Computer-Based Systems, ECBS 2012, pp. 90– 97, 2012.

[23] A. A. Lorber and K. D. Mish, "How We Successfully Adapted Agile for a Research-Heavy Engineering Software Team," in 2013 Agile Conference, pp. 156–163, IEEE, aug 2013.

[24] D. Bustard, G. Wilkie, and D. Greer, "The maturation of agile software development principles and practice: Observations on successive industrial studies in 2010 and 2012," Proceedings of the International Symposium and Workshop on Engineering of Computer Based Systems, pp. 139–146, 2013.

[25] M. Drury, K. Conboy, and K. Power, "Obstacles to decision making in Agile software development teams," Journal of Systems and Software, vol. 85, no. 6, pp. 1239–1254, 2012.

[26] T. J. Gandomani, H. Zulzalil, A. Azim, and A. Ghani, "How Human Aspects Impress Agile Software Development Transition and Adoption," International Journal of Software Engineering and Its Applications, vol. 8, no. 1, pp. 129–148, 2014.

[27] C. de O. Melo, V. Santos, E. Katayama, H. Corbucci, R. Prikladnicki, A. Goldman, and F. Kon, "The evolution of agile software development in Brazil," Journal of the Brazilian Computer Society, vol. 19, no. 4, pp. 523–552, 2013.

[28] M. Hummel, C. Rosenkranz, and R. Holten, "The Role of Communication in Agile Systems Development: An Analysis of the State of the Art," Business and Information Systems Engineering, vol. 5, no. 5, pp. 343–355, 2012.

[29] T. Ihme, "Scrum adoption and architectural extensions in developing new service applications of large financial IT systems," Journal of the Brazilian Computer Society, vol. 19, no. 3, pp. 257–274, 2013.

[30] K. Korhonen, "Evaluating the impact of an agile transformation: A longitudinal case study in a distributed context," Software Quality Journal, vol. 21, no. 4, pp. 599–624, 2013.

[31] M. Pikkarainen, O. Salo, R. Kuusela, and P. Abrahamsson, "Strengths and barriers behind the successful agile deploymentinsights from the three software intensive companies in Finland," Empirical Software Engineering, vol. 17, no. 6, pp. 675– 702, 2012.

[32] P. Bootla, O. Rojanapornpun, P. Mongkolnam, T. Dingsoyr, and T. Dyba, "Necessary Skills and Attitudes for Development Team Members in Scrum:" pp. 184–189, 2015.

[33] V. G. Stray, Y. Lindsjorn, and D. I. K. Sjoberg, "Obstacles to efficient daily meetings in agile development projects: A case study," International Symposium on Empirical Software Engineering and Measurement, pp. 95–102, 2013.

[34] D. Shahane, P. Jamsandekar, and D. Shahane, "Factors Influencing the Agile Methods in Practice-Literature Survey & Review," pp. 556–560, 2014.

[35] M. Sihuay, A. Dávila, M. Pessoa, E. D. Posgrado, U. Nacional, and M. D. San, "Factores en la Adopción de Métodos Ágiles en el

Proceso de Desarrollo de Software : Revisión Sistemática de la Literatura,"

[36] T. J. Gandomani and M. Z. Nafchi, "An empirically-developed framework for Agile transition and adoption: A Grounded Theory approach," Journal of Systems and Software, vol. 107, pp. 204–219, 2015.

[37] S. Nerur, R. Mahapatra, and G. Mangalaraj, "Challenges of Migrating to Agile Methodologies", COMMUNICATIONS OF THE ACM May 2005/Vol. 48, No. 5, pp. 73-78

[38] J. Freeman. Common Problems Experienced When Adopting Agile Development, on line August 5th, 2015, retrieved from: http://www.seguetech.com/blog/2015/08/05/CommonProblemsadoptingagiledevelopment, on January 31, 2016.

[39] K. Jammalamadaka, R. Krishna, "AGILE SOFTWARE DEVELOPMENT AND CHALLENGES", International Journal of Research in Engineering and Technology, Volume: 02, Issue: 08, Aug-2013, pp. 125-129.

[40] A. Mahanti, Challenges in Enterprise Adoptionof Agile Methods – A Survey, Journal of Computing and Information Technology - CIT 14, 2006, 3, 197–206.

[41] R. Juárez-Ramírez, G. Licea, I. Barriba, V. Izquierdo, A. Angeles. (2011). "Engineering the development process for user interfaces: Toward improving usability of Mobile applications"; In Communications in Computer and Information Science Vol. 167, Springer. ISBN 978-3-642-22026-5, pp. 65-79. DOI: 10.1007/978-3-642-22027-2.