Organizational Factors Impacting Agile Software Development - A Systematic Literature

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Abstract

Since its inception, agile has received enormous response from practitioners and researchers alike. With the passage of time, many new tools, techniques and methodologies have evolved, and the field is expanding. A lot of work in the form of surveys and studies have been conducted to find out critical success factors (CSF), that either contribute to success or failure of agile projects. In this study we are aiming at finding and synthesizing the Organizational Factors which impacts the success or failure of software development projects which follow agile methodology. We have chosen 19 relevant studies to perform a Systematic Literature Review (SLR). The selected studies and method follows more a qualitative approach, then a quantitative approach. The data and results were extracted from these studies and were then analyzed. We have selected and explained twelve organizational factors which impacts the outcome of an agile based development methodology. The factors identified will help academic researchers as well as practitioners to devise ways and means to affect agile projects in a positive way, from the point of view of organizational factors.

Keywords: software development; agile development; organizational factors; success factors; failure factors; systematic review.

1. Introduction

For almost fifty years, traditional software development methodologies were the mainstay for the software development industry. They still serving good inadequate environments in its entirety or otherwise [14]. Although agility was not a new idea, but when it was introduced in 2001 in the form of Agile Manifesto [20] it was widely accepted. Traditional practitioners of software development were initially skeptical of agile working style as it directly negates many established activities that were being carried for years, but as time passed and agile proved its mettle, more acceptance grew among software developers and companies [14]. In principal the software development process is not as stable as other engineering principles.

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Due to this fact no matter what methodology you work on, a certain degree of instability will always be there. Stoics and his colleagues have also discussed the predisposition of issues in any development processes [24]. There exists praise as well as criticism for the agile technique. The basis of which is that we have many success stories as well as failure stories. This surely calls for some gap analysis to find out how to minimize the failure stories and critique, and improve the agile process [5], as also emphasized on the importance of empirical studies by Sjoberg and his colleagues [35]. We need to find out the CSFs that we can manage to improve our outcome positively, to minimize the inefficiency. We need to find out the category of these CSFs, as well as their impact on the betterment and process improvement [2]. Boehm and his colleagues discusses that traditional developers and managers express their concerns over the efficacy of agile methods. According to them agile is more in-tune with small projects, having small teams, and with ever-changing requirements. They admit that agile does provide a rapid development framework for relatively small projects and teams. Their main concern is that once the size of the project and/or teams starts to incase, then the methodology is not as successful as it is supposed to be. The main issue is the scalability of agile projects, both in terms of teams and project scope [15]. Based on the concerns by Boehm and his colleagues [15] it becomes evident that this scaling up requires more work in terms of organizational setup and working. Other factors like technology, product, and people are severely affected by organizational factors, especially when scalability is concerned. Organizations thus require more intuition and perception about their own setup, culture, and mindset while managing agile projects [4]. All this discussion has lead us to our research questions, as depicted in Table 1.

Table 1: Research Questions.

RQ	RQ Description
RQ1	What are the organizational factors that impact an agile software development project?
RQ2	What are the organizational challenges that limit the adoption or transition to agile software development?

RQ1 deals with the overall organizational factors that impact the agile development projects positively or negatively. RQ2 is a subset of RQ1 and it deals with the organizational factors that are challenging the migration or transformation from traditional to agile methodology. We have reviewed the procedures presented by Kitchenham and his colleagues [33] for our study.

This literature review follows the writing skills mentioned in [21], and is organized in the following manner.

- Introduction - Section 1
- Background and Related Work - Section 2
- Research Method - Section 3
- Results - Section 4
- Discussion - Section 5
- Conclusion - Section 6

2. Background & Related Work

Traditional software development methods have long been criticized for their lack of response to change in user requirements. As the business requirements become more demanding and dynamic, so does the need to incorporate the changes in software development method [23]. This calls for the incorporation of "agility" in the process of the development of software. According to Conby, Kiren [23] the agility of Information System Development (ISD) is defined as a state of readiness in a development process in which a continual, rapid, and inherent changes are incorporated, either be the case of reactive approach or proactive approach. Internal components of software development along with its interaction with the outside environment are used to accomplish this. An agile mindset is required to incorporate dynamic requirements and become proactive and reactive to changes in modern-day business environments. As per Mordi, Azuka [25] the agile mindset is based on trust, responsibility, ownership, continuous improvement, a willingness to learn, openness, and a willingness to continually adapt and grow. It is underpinned by specific personal attributes on the individual level and an enabling environment on the organizational level, which allows autonomy of people and teams, managing uncertainty, and a focus on customer value, to achieve a state of being agile instead of merely doing agile. A group of seventeen noted software process methodologists gathered in Snowbird Utah in February 2001. They devised and advocated a better approach to developing software. An alliance was formed by the name of Agile Alliance [26]. The official definition of Agile Software Development is provided by agile "manifesto" as, better ways and means of software development are being discovered, and it is also helping the development community. [20]: "We are uncovering better ways of developing software by doing it and helping others do it." Through this work we have come to value:

- Tools and processes are important but more importance is given to interactions between individuals
- Focusing more on actual functioning software, instead of extensive documentation
- Value customer relation more than negotiating contacts
- Incorporate change in place of a following a rigid plan

That is, while there is value in the items on the right, we value the items on the left more.

Agile principles ensure many priorities and milestones as compared to other traditional methods. It ensures customer satisfaction, early and frequent working software releases, extensive change incorporation, close collaboration between business and technical personnel, motivating environment and team members, encourage face to face communication, steady and continuous pace, promotes technical and design excellence, keeping it simple, self-organizing culture and a continuous focus on improvement of efficacy [20]. There are many software development methods that falls into the category of agile, but as per [22] and [31], the most popular are:

- Scrum
- Extreme Programming (XP)
- Lean Software Development
- Feature Driven Development - FDD

- Crystal
- Test Driven Development - TDD

Factors that affect the agile software development process's success or failure have been categorized into four factors by Aldahmash and his colleagues [1]. Figure 1 shows the taxonomy of factors having an impact on agile software development.

Figure 1: Agile development factors taxonomy [1].

Chow, Tsun [2] has further extended the taxonomy into another fifth-factor category i.e. Project, which includes type, nature, schedules, etc. They also incorporated the perceived achievement of agile software development into four attributes (Table 2).

Table 2: Success Elements [2].

Measurement	Elements
Success Level Perception	**Quality**: Fit to use product / project
	Scope: Incorporating all objectives
	Time: Timely delivery
	Cost: Accomplishment within budget

Out of the five categories mentioned earlier, the easier ones to manage are Technical, Process & Project categories. These factors have evolved over the years in agile development, as well as in other areas of application. To make these three factors a science is a relatively easy task, as there are many proven tools and techniques available. However, to turn these factors to aid in the success of an agile project is no meager task by any means. Management sciences are still trying to improve to handle people-related factors. it is one of the most challenging factors, and will remain one in the future as well, due to the unpredictable nature of human beings. That is also a reason that we have a lot of work being done in software development as well as in other

areas related to project management. This existing work and practices can surely help us manage people-related factors. We can train the people on best practices that agile development methods provide. If somehow a team member is not suited for it, replacement with an experienced resource is always a possibility in extreme cases. Nonetheless, People factors remain one of the most challenging factors to handle. Organizational factors pose bigger challenges because these factors affect all the other factors we have mentioned already. Although empirical studies and case studies have been done to find out the effect of organizational factors on other factors, but a concrete qualitative study is desirable to strengthen the empirical hypotheses. But even without such study, the impact and importance of organizational factors are not difficult to apprehend. Bytheway, Andrew J. [27] concludes that "unless software systems address real organizational needs, they will not succeed".

3. Background & Related Work

To represent the gist of all referenced studies, a system way to review the literature is carried out. The method that we have used to achieved this is formulated by Budgen, David, and Pearl [28]. SLR is a way to identify the literature that is relevant the topic or areas of research, and then systematically understand and summarize it to fit our requirement. Table 3 shows major steps used to achieve this.

Table 3: SLR Characteristics [9, 10].

Characteristics	Description
Review Protocol	It is the starting point, and specified the research questions and methods of review process
Search Strategy	To search literature, a strategy is employed to ensure relevancy
Documentation	It enables the reader to assess the completeness and rigor SLR
Inclusion	Criteria to specify how a literature is included in the final list
Primary Study	Information obtained from primary study and quality criteria

3.1. Inclusion & exclusion criteria

While selecting literature for this review, the quality criteria are based on attributes mentioned in Table 6. Those studies were excluded which did not focus on the organizational factors or the factors which impact the organizational factors. The studies included were:

- Qualitative studies, quantitative studies, and mixed measurement studies
- Large, medium and small studies
- Professional as well as experimental projects
- Papers written only in English
- All agile-based literature e.g. Scrum, XP, Kanban, etc.

3.2. Data source & search strategies

To select relevant and quality material following well-reputed data sources were used to search and select articles.

- IEEE Xplore
- ACM Digital Library
- Elsevier ScienceDirect
- SpringerLink
- Google Scholar

These libraries provided enough and relevant literature for this study. Figure 2 shows the steps followed during the selection process.
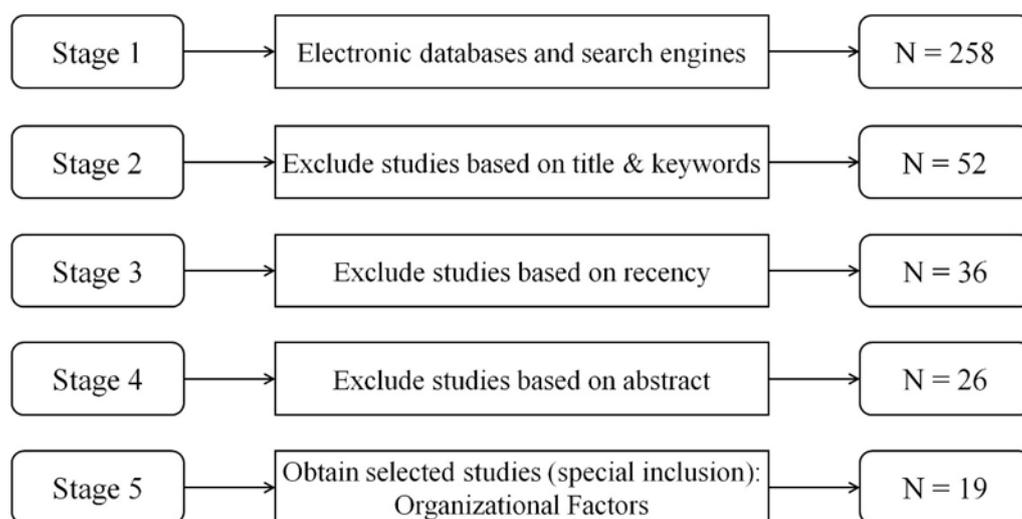
Stage 1	→	Electronic databases and search engines	→	N = 258
Stage 2	→	Exclude studies based on title & keywords	→	N = 52
Stage 3	→	Exclude studies based on recency	→	N = 36
Stage 4	→	Exclude studies based on abstract	→	N = 26
Stage 5	→	Obtain selected studies (special inclusion): Organizational Factors	→	N = 19

Figure 2: Process for selection of articles.

Table 4 shows search categories and respective keywords that have been used to search as well as to short list the study material.

Table 4: Search Terms.

Search Category	Keywords
Agile software development	Agile, agile methods, agile practice
Impacting factors	Success factors, failure factors, factors, CSF, critical success factors

3.3. Inclusion decision

The inclusion decision was made on the lines devised by Dyba, Tore, and Torgeir Dingsøyr [30]. Table 5 summarizes the stages and the criteria at each stage that was used for the inclusion decision. At the first stage overall review was done on the search results provided by the aforementioned digital libraries, and all the articles were included which have either titles or keywords matching our criteria. In the second stage, filtering was done based on title and keywords. as these two attributes prove to be a good filtration point. In the fourth stage, the articles were excluded based on recency. It was preferred that the article should be at least published after 2010. Very few exceptions were made regarding recency as some articles still hold validity as per our research topic. The next exclusion phase i.e. the fourth stage is based on the abstract. The abstract of all the selected studies was read and the decision was made to either include it or not. In the end, the fifth stage was carried. An initial review of all the articles was done. The number of articles at this stage was less than the final number of articles. After looking at the references of the selected list of articles, it was evident that there are some important articles where are cited multiple times and those can prove to be beneficial in our work. Those articles might have been filtered in the earlier four stages. After critically reviewing those articles, special inclusion was done and was added to the final list, to make our study stronger and relevant. The final decision was made on relevance, our intended research questions, and future work. The articles were then obtained and were critically appraised.

Table 5: Inclusion Assessment [30].

Stage	Description	Criteria
Stage 1	Search relevant studies	Title & Keywords
Stage 2	Exclude based on titles and keywords	Title – Search term(s)
Stage 3	Exclude based on recency	Preferred recent studies
Stage 4	Exclude based on abstracts	Abstract = factors
Stage 5	Obtain and critically appraises studies	Addresses impacting factors, discusses empirical research

3.4. Quality Assessment

The simple inclusion criteria although proved very effective in shortlisting of papers up to stage five. In the fifth stage, the spreadsheet-based tools or EndNote were not very helping as because the final assessment could not have been possible with actually reading the articles or going through its conclusions and findings. This is because the title or abstract might either pass our given criteria or create ambiguity. In case of ambiguity, the article has to be further investigated for relevance and quality assessment. Table 6 was used to shortlist those articles where had to be manually filtered.

Table 6: Quality Criteria [30].

Stage	Criteria
1	Based on research
2	Clear aims available
3	Context description provided
4	Research strategy appropriate for attaining aims
5	Recruitment strategy good for achieving goals
6	Control groups availability
7	Data collection appropriation
8	Rigor of data analysis
9	Research and participants relationship is appropriate
10	Findings statement is clear
11	Study is of research value

3.5. Data extraction & synthesis

To derive, code, structure, and analyzing literature review results, we have used the Unified Model of ISD Success [32]. This method uses the Input, Process, and Output stages (Figure 3). Based on the literature review of selected studies, these models prove to be effective in synthesizing the results. Organizational factors were identified as a result of the literature review. These factors impact the efficiency and effectiveness of the agile practices. Different tools, strategies, and agile practices are used for managing these factors. Many industry-standard tools are available to address many of the mentioned organizational factors. If the process is tweaked and is designed in such a way that it aids these factors towards success rather than failure, then this culminates in successful agile practices.

4. Results

In this section we start with the overview of our studies. We have selected and reviewed 19 studies [1]–[19] related to organizational factors impacting agile development methodology, see Table 6. Overview section describes how the studies are segregated into year wise publication. Also most frequent journals / conferences are presented.

Quality of methodology is discussed to present the criteria on which it is measured. The studies selected are relevant to our goal, but they might present many other details as well. We have confined our scope of study strictly to our topic only.

Theoretical framework for and factors are discussed in the respective sub-section. In the final sub-section of our results we have actually discussed all the organizational factors that we have synthesized from our work. This section then provides the concrete answer to our research questions.
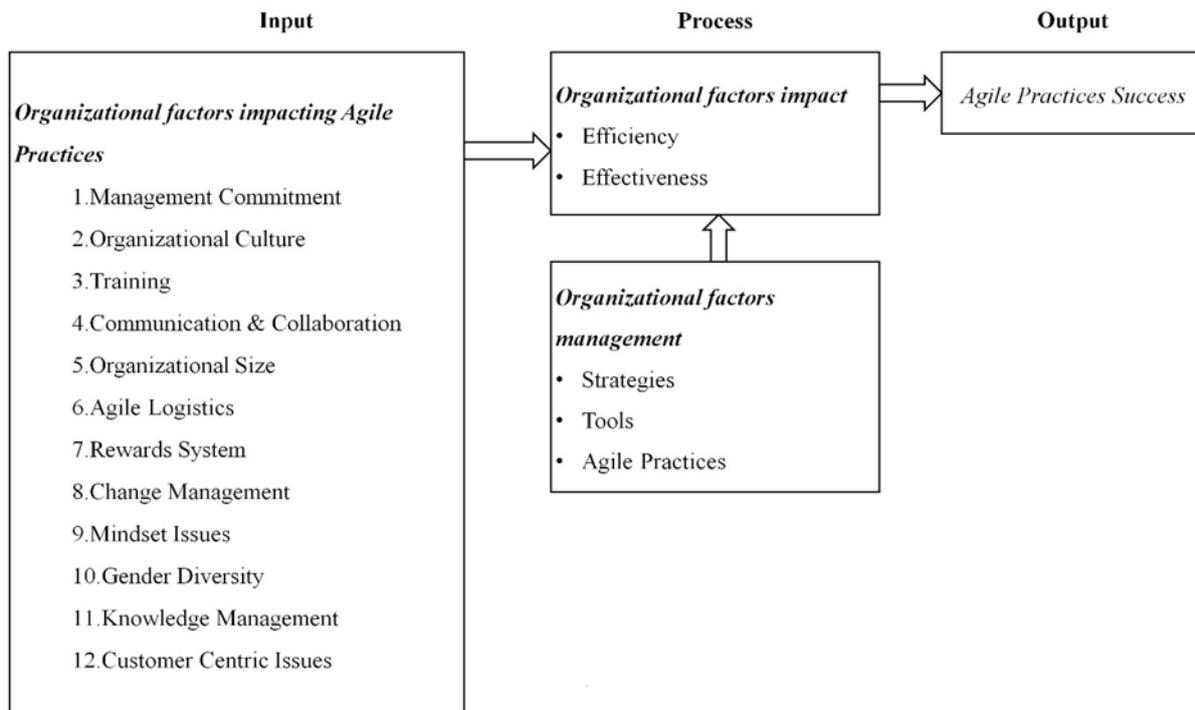
Figure 3: Theoretical framework and impacting factors.

4.1. Overview of studies

All the selected studies were conducted after the year 2005 and onwards. 75% of the studies were conducted after the year 2010 and 53% of studies were conducted from the year 2014 and onwards, see Table 7.

Table 7: Distribution of publication time.

Study Count	Year	Percentage	Study IDs
10	2014-2021	53	1, 3, 4, 5, 6, 7, 8, 16, 18, 19
4	2010-2013	32	9, 10, 12, 14
5	2005-2009	27	2, 11, 13, 15, 17

The studies are independent of any specific agile methodology e.g. Scrum, XP, or Kanban.

Table 8 provides the distribution of studies according to publication platform. Following four platforms published two papers each. All the other platforms published one paper each.

- Advances in Intelligent Systems and Computing
- European Conference on Software Process Improvement
- International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE)
- Journal of Systems and Software

From the selected 19 studies 68 percent (13 in number) of the studies journals papers, while the remaining 32 percent (6 in number) are conference papers.

Table 8: Distribution of publication platform.

Publication platform	Article type	Study ID	Count
International Conference on Digital Economy	Conference	16	1
Advances in Intelligent Systems and Computing	Conference	5, 6	2
Computers in Human Behavior	Journal	7	1
European Conference on Software Process Improvement	Conference	1, 12	2
Human Capital without Border	Journal	3	1
International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE)	Conference	8, 18	2
IEEE Software	Journal	16	1
International Conference on Lean and Agile Software Development	Conference	19	1
International Journal of Project Management	Journal	10	1
International Journal of Software Engineering and its Applications	Journal	4	1
International Symposium on Empirical Software Engineering and Measurement	Conference	13	1
Journal of Computer Science	Journal	14	1
Journal of Systems and Software	Journal	2, 11	2
Software Engineering and Applications	Journal	9	1
Journal of Information Technology Management	Journal	17	1

4.2. Methodological quality

The articles selection process is based on methodological quality. The section 3.3 presents the criteria to decide to include or exclude a study. The main quality criteria assessed is mentioned in Table 6. Against each of the quality elements, value 1 or 0 was assigned to the study. After that all the scores were added to get the sum of quality criteria. Ideally the score for each study should be 11, but it is practically not possible to achieve that. The average of sum of quality criteria for selected studies were around 7 which seems satisfactory. It was intended that selected articles should pass most of the quality criteria mentioned, but as per our requirement serial number 1, 2, 3, 4, 7, 8, 10 and 11 were given more importance.

4.3. Scope of the selected studies

There is a lot of variation in the selected studies. Due to these variations, we have categorized it to simplify the overall study paradigm. The following list shows the categories of selected studies.

- Critical success factors affecting the agile software development.
- Factors impacting the adoption or transformation to agile software development.

- Challenges in accepting agile culture and practices.
- Organizational support to promote gender diversity in agile software development.

Our two research questions are related to factors impacting agile software development, and the challenges of adoption/transformation to agile methodology. The aforementioned categories of studies serve our purpose to find out the answers to our research questions.

4.4. Theoretical framework and factors

Section 3.5 (data extraction and synthesis) introduced the data extraction and synthesis method. We have used the Unified Model of Information Systems Development Success [32] for our purpose. After identifying the factors impacting the success or failure of agile development along with the challenges to agile transformation the theoretical framework was presented in Figure 3. The factors that we identified, whether it be impacting factors or transformational factors are selected on the basis of the factors in more than one selected study. If a factor has been identified by only one study as an outlier sort of factor, then it is ignored. This decision makes the list more authentic as two more researchers have to endorse it. Another reason for this inclusion criteria is that the purpose is to have a long list of factors that are overlapping or having the same base criteria. The result is a minimized number of factors with rigorous background and working.

4.5. Organizational factors

This section will discuss the organizational factors as per our two research questions i.e. impacting organizational factors on agile development, and transformational organizational challenges of agile adoption.

4.5.1 Management Commitment

Aldahmash and his colleagueshas presented that a strong relationship exists between successful agile projects and management commitment/support [1]. They argued that criticality of this factor in making an agile project a success or failure. Chow and his colleagues [2] also list lack of management support and commitment as a negative factor in an agile project, which leads to failure of projects. It was also supported by Tanner and his colleagues [3] and Hamdani and his colleagues [5] that the success rate increases in an agile project when there is strong support from an executive level. Top management's support and commitment are not only required for ongoing projects outcome, but the support also affects the software process improvement aspect, and if this factor is not present then with the passage of time the software process might deteriorate instead of improving [9]. As per Sheffield and his colleagues [10] only the existing management commitment is not sufficient, but consistency and targeted approach is also required, otherwise the impact might not be as fruitful as desired. Van Kelle and his colleaguesdiscussed the concept of leadership which is transformational in nature. It refers to the adaptability of the management style. Management should be able to motivate and inspire their workforce. A vision of the leadership should be clear to all and sundry so that they can share and engage people in it. It also demands long-term goals and the pavement for achieving them. To keep the employees motivated, expectations should be managed along with the rewards. Short-term activities to be taken into consideration according to their requirements. They argued that in the case of agile projects, this kind of transformational management is

very beneficial and appropriate, keeping in mind the agile demands and pre-requisites [8].

4.5.2 Organizational Culture

The single most discussed factor, which has been discussed in almost all the selected studies is the organizational culture. There are two reasons for this factor's repetition. One is that it is very important in agile projects as it impacts many other factors. Secondly, its spectrum is very broad and thus it comes into discussion due to one reason or the other. Aldahmash and his colleagues has defined organizational culture as not a single factor, but a set of factors/variables. It not only affects the agile projects in a stable agile environment but also affects drastically the transformation to agile methodology [1]. Organizational culture affects different factors directly or indirectly. Those factors are also discussed in the coming sections. Due to the involvement of many other factors, we have restricted our discussion hierarchical or structural aspects of organizational culture, for brevity. Agile projects tend to fail if the organizational structure is too hierarchical or there is a lot of political influence present in it [2]. The cooperative nature of organizational culture is important in the success of agile projects, as generally, agile team members are not very good at collaborating at hierarchical steps [3]. A narrow culture of the organization leads to failure [6] and managing this culture is a huge challenge [13]. Gandomani and his colleagues have presented that sometimes culture is tagged with the people or team members, but most of the time the issues are not with people but with the culture of the organization as the organization's culture dictates many people behavior [4]. The organizational culture may be problems due to misunderstood agile requirements. The organizational culture must be formulated by keeping in mind agile requirements and a mindset which demands cooperation and a trusting attitude [9]. People must be given an environment in which they should be allowed to take initiative and take calculated risks. Power culture and distance should not be a hurdle [10]. Bureaucratic culture is not welcomed in an agile setup [11], but a democratic culture is desired [16]. [5] and [11] emphasize that people should be allowed to collaborate and learn the societal cultural differences on their own. This will help the organization to develop a culture having multifaceted attributes, thus inculcating flexibility and owner amongst team members. In the case of a large and distributed organization the multi-cultural issues may arise, but again by allowing people to learn from every culture in the organization to formulate a culture based on mutual respect and learning [11]. This also demands the management commitment which we discussed in the previous section. Othman and his colleagues and Quinn and his colleagues have discussed an established framework of an organizational culture, which has competing values tradeoff issues. The culture of an organization will either be focused on internally or externally, with either a stable or changing environment. In these given competing values, either there will evolve a hierarchical culture or a group culture. In the same manner, a rational vs development culture will make its way [16]. Boehm and his colleagues discussed the cases in which an organization is migrating from traditional to agile development, there is a strong tendency to carry some unwanted cultural values that will be detrimental to agile projects, especially if the organization is a large one. Change of roles is generally not accepted easily [15].

4.5.3 Training

Agile development is heavily based on motivated and self-organizational individuals. Cockburn and his colleagues discussed the importance of a trained workforce for proper implementation of agile practices [34].

The knowledge of the individuals should be up to the mark as per project requirements. The organization should put a great effort into training its personnel throughout the whole development project. This will help to reap the benefits in the form of talent and capability enhancement [1]. [5] noticed that according to agile development's 9th annual survey has suggested that if the team members are not adequately trained then they might contribute up to 44 percent to the failure of agile projects. [9] advocates that training and education not only contributes to a positive impact in successful agile project implements but also is effective in continuous process improvement of agile development. [10] and [17] also consider training a strong organizational factor impacting agile development. Misra and his colleagues pointed out many factors that need to be considered regarding training [11].

- Amount of appropriate training •
- Continuous learning •
- Guidance through discussions •
- Learning through information sharing
- Formal vs informal training
- Honest collaboration
- Mentoring

4.5.4 Communication & Collaboration

Agile culture and mindset dictate that communication should be face to face and as direct as it can be. Face-to-face communication nurtures the whole process of communication and leads to the success of agile projects eventually [1]. Chow and his colleagues also emphasized the importance of face-to-face communication and its impact on success [2]. This approach also strengthens the ties between client and development organization [4]. If direct communication occurs between client and development organization, then it minimizes the changes required a subsequent development phase [7]. Van Kelle and his colleagues attribute the failure of agile projects to misunderstandings and deficient communication as a major reason. Communication that is informal in nature is better suited for agile projects as it concludes with a trusted relationship. Informal communication is also better at brainstorming during the ever-changing environment. All in all, informal communications fit right in the agile culture and values. The argument is then made to choose the proper communication style as per your company and project needs [8]. Stelzmann and his colleagues also discusses multiple factors that affect collaboration and communication [12].

- Organizational structure
- Project nature
- Team composition
- Communication form
- Team attrition impact

Although agile projects demand the colocation of teams, but it is not possible in the ever-changing environment and global nature of development projects. Now we must find ways and means to improve communication and

collaboration in the case of distributed agile teams. Distributed environment not only poses geographical challenges but also cultural issues [4]. Begel and his colleagues and Gandomani and his colleagues also discussed challenges that are posed while we are communicating between different teams that are culturally and globally different [13], [14]. Communication and collaboration in a distributed team environment will however remain a challenge that needs to be managed [6].

4.5.5 Organizational Size

The larger the organizational size, the higher are the chances of failure of an agile project [2]. Smaller teams seem to be more appropriate and are more culturally aligned with agile projects. The success rates are increase if the team members are focused on single project instead of doing work on multiple projects [3]. Misra and his colleagues discussed the team size with regard to its effect on communication as well. When team size is large then it is difficult to have informal communication. Also large size makes it difficult to have higher frequency meetings amongst team members. In case of small teams, the informal communication is not only easier, but its affect is far greater. As large teams have more communication challenges, it eventually impacts decision making and compliance [11].

4.5.6 Agile Logistics

The whole agile culture is based on active collaboration and communication. This requires appropriate tools and techniques and all the related environment and logistics. [2] argues that if one does not have a proper working facility for agile style working, or inappropriate logistics are provided to team members, then that will contribute to the failure of a project. [5] has also attributed the under-provided facilities and logistics to the failure of a project. [3] suggests that if you let the teams adapt and choose their workspace according to their preference and give them enough empowerment regarding logistics and environment then this will have a positive outlook on the project. Appropriate agile logistics leads to project success [6]. [15] and [17] has discussed some of the logistics related issues that will have either positive or negative impacts on outcome of an agile project.

- Co-location [15]
- Status chart walls and assignment boards [15].
- Lack of pair programming accommodation [17].
- Agile specific meeting environment [15].
- Communication and collaboration layout [15].
- Integration and testing equipment [15].
- Sharing and conversation tools [15].

4.5.7 Rewards System

To be rewarded well on good performance is a natural human desire. Agile projects also need to have a reward system, but that system too should be as per agile practices and guidelines. Chow and his colleagues advocate

that an appropriate agile compliant reward system paves the way for a successful agile project [2]. This concept has also been verified by Vijayasarathy and his colleagues [17]. Gandomani and his colleagues discussed that there will be many people in the organization who either do not have profound knowledge about agile or are not that much interested in learning these. This lack of knowledge is mostly during transformation to agile methodology. One way to help these people understand agile culture is motivation through a proper reward system. Studies have shown that this brings a positive change. Some case studies have shown that people who had insufficient agile knowledge were improved and made more productive by rewarding and motivating via various incentives programs [4].

4.5.8 Change Management

Resistance to change is a universal hurdle to any transformation and adaptability process. Agile is no exception to this. [7] has attributed it to be a challenge that a significant enough to derail agile projects. The reasons for resistance is due to the following reasons:

- People are afraid that if they made certain changes, then their job would be redundant and they will eventually lose their job [4].
- Jealousy to early adopters is also a factor. Early adopters or change champions are always in a limelight and to undermine their efforts, people gather and make an alliance to an extent of even sabotaging the projects [15].
- Some employees just show their inability to learn in demanding and changing agile environment [15].
- Presence of non-player is another reason. This will have a bad impact on any scenario, but especially in agile it is detrimental because agile is based on trust and mutual ownership [15].

[4] and [17] has also discussed that it might people's personal choice or thinking to resist the change, but organizational policy should make it easier for people to make this tough decision. It is not only the team members whose change requirements need to be managed by the organization. All the stakeholders are affected by the change requirements. It also includes customers and ends users. The working change is going to affect all people to be more involved, active, and share the responsibility along with the ownership [15].

4.5.9 Mindset Issues

Agile mindset is a lot different than the traditional one. Many roles need to relinquish their powers or assume new responsibilities. It is not easy to change the mindset of people of an organization, especially while there is migration from traditional organizations [14]. Managers and team members mostly do not transform to an agile mindset due to one of the following reasons:

- Some team members are workhorses and they need a controlling leader to get the most out of them. They are fairly successful in traditional approaches, but not appropriate for agile methodology [4].
- Managers do not get aligned with agile mindset due to either lack of interest in getting themselves aware of agile working, or they just do not want to let go of the powers they already have [4].

- A natural resistance to change attitude is another factor in this regard. Changing mindset is a long and painful process, and requires a lot of mentoring [14]. Gregory and his colleagues also emphasized that no matter how much effort is required, the purpose and alignment of an organization and its personnel should be aligned as per agile manifesto [18].

4.5.10   Gender Diversity

An interesting organizational aspect was presented by Aksekili and his colleagues regarding the support at the organizational level for women's advancement in an agile team [19]. They studied the impact on the performance of an agile team and teamwork quality concerning gender diversity. The inclusion of women i.e. equal opportunity employment has a positive impact on the quality of teamwork and performance. Females inherently are good at many traits that aid in agile development. Some of these traits include aesthetics, finishing touches, and communication to name a few. With the inclusion of women in the development team many team performance and quality factors are improved. The following list summarizes it [19].

- Quality of communication
- Balance of contributors
- Cohesion
- Mutual support
- Coordination

4.5.11 Knowledge Management

As the agile manifesto directs for only essential documentation [20], it becomes a challenge to manage the level and means of documentation to be handled. Gandomani and his colleagues has discussed critically that how important it is. As the agile documentation is not heavy, as compared to other methods, it becomes much more important to decide on the amount and retrieval strategy of structured and unstructured documentation as a knowledge base. If information is freely available to individuals, then knowledge becomes a power for team members not only metaphorically but practically. This shifts the balance of power from managers to team members. The managers need to let go of their inhibitions and let the agile mindset take care of this power issue. If the organization becomes aware of this challenge and defines a proper knowledge management policy, then this transition can be done smoothly [14].

4.5.12 Customer Centric Issues

Misra and his colleagues has discussed the customer-centric issues. This is not a single issue, but rather a category of issues that involves the customer. It falls under the organization's working umbrella to address those issues. The customer-related issues are attributed to the following three points [11].

- Satisfaction: How the organization's working ensures customer satisfaction.
- Collaboration: How the organization provided tools and techniques for effective collaboration with the

customer.

- Commitment: How much is the organization committed to the customer. This is important in the transition or migration from traditional development methodologies, which inherently might not be that much committed to the customer.

5. Discussion

5.1. Interpretations

Our systematic study has discussed the answer to our two research questions (Table 1). As an answer to our first research question, all the twelve factors we have discussed (Figure 3) are the organizational factors that impact an agile development project. The factors have been carefully chosen from the selected empirical studies and already done literature review studies. Our second question is specifically for migrating or transforming agile organizations. Out of the twelve factors, the ones which affect the transformational activities are summarized in Table 9. The ordering of the factors does not depict the priority or weightage related to the factors. Depending upon the given scenario every situation/organization has its own set of challenges and impacting factors. Having said that, we found out that the single most discussed factor in all the selected studies was the "Organizational Culture". This factor alone is broad and effective enough to bring about a positive or negative outcome.

Table 9: Organizational factors affecting agile transformation.

Sr.	Factor
1	Management Commitment
2	Organizational Culture
3	Training
4	Communication & Collaboration
5	Change Management
6	Mindset Issues

5.2. Implications

The reason this study was undertook was that an initial search on the subject disclosed that although there have been studies conducted on organizational factors, not much work was done solely on the subject. Many studies discussed the taxonomy of organizational factors, but detailed empirical studies were scarce. This literature review encourages the researchers to further work on the organizational factors and enhance the findings and outcomes of this study and related research. It also implicates the practitioners to work on the findings and devise better organizational policies and culture and benefit from the findings of this study, as we have reaped the benefits of building upon the studies relevant to the topic under discussion.

5.3. Limitations

No research can be considered as perfect, or to be considered the last word on the subject. Our effort is also no exception to this. As far as following the best practices of systematic literature review is concerned we have not

compromised on it, but still some factors are worth mentioning regarding the limitations of this work.

- Due to the fact we cannot have unlimited time and space, to discuss all the recent and relevant studies, we have limited our research to whatever work is presented in the selected studies.
- We have very carefully chosen the literature in an unbiased way, still, we cannot guarantee that we might have missed some relevant work on the subject.
- As our research was based on generic agile methodology, some researches which have been done on specific frameworks might have been unable to make their way into the final selection list.
- Human error and mistakes cannot be taken out from consideration, especially when the research work has been carried out by a smaller group of researchers. Having said that, the utmost care has been taken to make it as authentic as possible.
- We have performed many reviews in different phases, right from search keywords, study selection, and exclusion criteria result in the formulation and conclusion phases.
- As far as selection of organizational factors is concerned, we have taken only those factors into consideration which have been discussed by at least two of the studies. The only two exceptions to these rule are:
o Gender Diversity
o Knowledge Management

5.4. Recommendations

We recommend that more empirical studies should be followed specifically on the organizational factors and their impact on agile projects. The organizational factors become more and more critical as we scale up either the organization, team size, or project scope. In addition to the already recommended research area, we also recommend the following sub-areas of research for further strengthening the body of knowledge.

- We need further studies on how the organizational factors affect other categories of factors e.g. technical, people, process, or product factors. Although it seems natural that organizational factors have an impact on all of the aforementioned factors, this needs to be worked on empirically [1].
- Knowledge management is considered as a power in organizations. This power needs to be disseminated to lower down the hierarchy of teams. Policies, frameworks, and their implications need further research [11].
- We have identified and summarize the impact of organizational factors on agile projects. What logically should follow is to dig deep and find out that "how" these factors impact the agile projects and even further, "how" to improve the efficiency of these factors [10].
- From the collaboration and communications point of view, agile teams do not necessarily are communicate with other agile teams only. In an up-scaled environment, they might be working along with many non-agile teams as well. Further work can be done on how agile teams can work efficiently with other non-agile teams [4].

6. Conclusion

Agile culture has gained popularity in the past two decades or so. It has answered many questions that old

methodologies were unable to answer. But agile is not a silver bullet that removes all inherent problems that exist in the software development process. There are many success stories, as well as many failures as well. We must continually strive to find out the critical success factors that either result in success or failure. In this study we have discussed the findings of our literature review study to find out that what are the factors that are pertinent to the success or failure of an agile project. Also, we have presented a subset of critical success factors that are specifically related to the challenges of transformation or migration from traditional to agile-based methodologies. We have reviewed nineteen studies for this purpose, which were related to our main research question and sub-research question. Our study has concluded the twelve organizational factors that affect successful agile projects. We have argued that the importance of all the twelve factors is in line with the research studies selected. Better organization of these factors is expected to yield a better outcome of agile projects. With the help of already available tools factors the success of agile projects can surely be improved. We encourage fellow researchers to further work on finding the impact of organizational factors or a subset of organizational factors and do follow-up research in the future to either come out with new findings to help out an industry or to strengthen the outcome of this study.

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7. Appendix

A. Review Matrix Fields

Table 10 summarizes the fields/columns which were maintained during the review of the selected studies. This review matrix was maintained for two purposes.

The first purpose is to keep track of information that which articles hold what relevant information and how to access the required information when revisiting the article after a while. The second purpose is to keep a structure of theliterature review activity for audit or verification purposes as and when required by the concerning bodies.

The most important fields are 10, 11, and 12, as these fields provide the gist of relevant information and remarks on how to extract the information in the best possible way, especially when reading the article after some time. The structure of the table has been influenced by Dyba and his colleagues [30].

Table 10: Review Matrix Fields.

Sr.	Factor	Details
1	Identifier	Article's unique ID
2	Author	Article's authors
3	Title	Title of article
4	Year	Publication year
5	Published venue	Venue, conference, journal of publication
6	Type	Journal article, conference article, book, section, other
7	Domain	Main domain of research
8	Sub-domain	Sub-domain of research
9	Keywords (1..5)	Keywords of the article reviewed
10	Major contribution	Summary of major contribution of the article
11	Review	Key points of the article which are related to our topic
12	Remarks	Any remarks worth mentioning or memory note to revisit or emphasize points
13	Source link	Web address to access the article

Appendix B. Aim of Selected Studies

As a part of systematic literature review, each article was selected for fulfilling a specific purpose. After review of an article, its aim was logged for two purposes. First to understand the author's take on the subject material, and secondly how it relates to our study. The articles were critically apprised to relate to our two research questions, and find the appropriate answers. Table 11 details the aim of selected studies.

Appendix C. Aim of Selected Studies

Table 11: Aim of selected studies.

Study ID	Aim
1	Critical success factors were categorized in to four categories. Perceptive quality elements were also discussed and linked. A total of twelve critical success factors were tested against given hypotheses.
2	Based on existing literature, the critical success factors have been classified into a taxonomy of Technical, Organizational, Process and People categories.
3	Survey studies the matter at various organization levels. Organization's hierarchical culture and agile logistics were discussed in detail.
4	People factor importance was highlighted in the study, while one makes a transition or adoption from a traditional methodology to agile methodology.
5	Qualitative study was carried keeping in view of both success and failure factors, regarding agile methodology. Survey was conducted to accomplish this.
6	Using experimental teams of students, it was concluded that in terms of efficiency, accuracy, time management, risk analysis and product quality, scrum is better than spiral and waterfall model
7	The study provides insight on requirement engineering while practicing agile methodologies, and produced study of seventeen elements that affect agile methodology's requirements engineering.
8	A conceptual model was presented, in which it was presented that project success is associated with leadership style, perceived agility, project size and communication style.
9	Critical success factors were established with taxonomy of Leadership, Organization, Tools, Techniques, Technology, Import, Training, Control Measures and then Success Measurement.
10	Factors identified related to Project environment, Project, Development agility. Also identified extended list of success criteria.

11	Study presented the factors that lead to success of agile development. Survey and interview questions also discovered additional factors with the help of open ended questions.
12	The paper focused on system engineering in agile methodology. Factors impacting the success were identified while doing system engineering.
13	In large industries agile development methodology was studies with respect of major agile practices. Issues and advantages of agile methodologies were discussed.
14	The study mainly focused in organization's culture, style of management, process and people areas. Challenges regarding aforementioned areas were discussed.
15	Different conflicts were identified which include process, people and business related conflicts. Its impact and solutions were also devised.
16	The study takes organizational culture and acceptance of agile methodology as main element and then presents the impact of former on later. Importance of agile development methodology and its efficacy was also discussed.
17	Early adopters of agile methodology were surveyed. Methodology, project domain and impacting factors were presented while transforming to agile methodology.
18	Agile culture development was reviewed, with a take on collaborative working. Collaboration model used was inter disciplinary. Related artifacts were produced and analyzed.
19	Gender equality and gender diversity was discussed in the study. Organization's support in promoting equal opportunity for genders and its impact was discussed.

References

[1] Aldahmash, Abdullah, Andy M. Gravell, and Yvonne Howard. "A review on the critical success factors of agile software development." European conference on software process improvement. Springer, Cham, 2017.

[2] Chow, Tsun, and Dac-Buu Cao. "A survey study of critical success factors in agile software projects." Journal of systems and software 81.6 (2008): 961-971.

[3] Tanner, Maureen, and Ulrich von Willingh. "Factors leading to the success and failure of agile projects implemented in traditionally waterfall environments." Human Capital without Borders: Knowledge and Learning for the Quality of Life. Portoroz, Slovenia: Make Learn (2014): 693-701.

[4] Gandomani, Taghi Javdani, et al. "How human aspects impress Agile software development transition and adoption." International Journal of Software Engineering and its Applications 8.1 (2014): 129-148.

[5] Hamdani, Maryum, andWasi Haider Butt. "Success and Failure Factors in Agile Development." 2017 International Conference on Computational Science and Computational Intelligence (CSCI). IEEE, 2017.

[6] Dhir, Saru, Deepak Kumar, and V. B. Singh. "Success and failure factors that impact on project implementation using agile software development methodology." Software engineering. Springer, Singapore, 2019. 647-654.

[7] Inayat, Irum, Siti Salwah Salim, Sabrina Marczak, Maya Daneva, and Shahaboddin Shamshirband. "A systematic literature review on agile requirements engineering practices and challenges." Computers in human behavior 51 (2015): 915-929.

[8] Van Kelle, Evelyn, et al. "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.

IEEE, 2015.

[9] Wan, Jiangping, and Ruoting Wang. "Empirical research on critical success factors of agile software process improvement." Journal of Software Engineering and Applications 3.12 (2010): 1131.

[10] Sheffield, Jim, and Julien Lem´etayer. "Factors associated with the software development agility of successful projects." International Journal of Project Management 31.3 (2013): 459-472.

[11] Misra, Subhas Chandra, Vinod Kumar, and Uma Kumar. "Identifying some important success factors in adopting agile software development practices." Journal of Systems and Software 82.11 (2009): 1869-1890.

[12] Stelzmann, Ernst, et al. "Agility meets systems engineering: a catalogue of success factors from industry practice." European Conference on Software Process Improvement. Springer, Berlin, Heidelberg, 2010.

[13] Begel, Andrew, and Nachiappan Nagappan "Usage and perceptions of agile software development in an industrial context: An exploratory study." First International Symposium on Empirical Software Engineering and Measurement (ESEM 2007). IEEE, 2007.

[14] Gandomani, Taghi Javdani, et al. "Obstacles in moving to agile software development methods; at a glance." Journal of Computer Science 9.5 (2013): 620.

[15] Boehm, Barry, and Richard Turner. "Management challenges to implementing agile processes in traditional development organizations." IEEE software 22.5 (2005): 30-39.

[16] Othman, Hanen Ben, Mahmoud Zouaoui, and Mohamed Hamdoun. "Organizational culture and the acceptance of agile methodology." 2016 International Conference on Digital Economy (ICDEc). IEEE, 2016.

[17] Vijayasarathy, L. E. O. R., and Dan Turk. "Agile software development: A survey of early adopters." Journal of Information Technology Management 19.2 (2008): 1-8.

[18] Gregory, Peggy, and Katie Taylor. "Defining agile culture: a collaborative and practitioner-led approach." 2019 IEEE/ACM 12th International Workshop on Cooperative and Human Aspects of Software Engineering (CHASE). IEEE, 2019.

[19] Aksekili, Asli Y¨uksel, and Christoph Johann Stettina. "Women in Agile: The Impact of Organizational Support for Women's Advancement on Teamwork Quality and Performance in Agile Software Development Teams." International Conference on Lean and Agile Software Development. Springer, Cham, 2021.

[20] Beck, K., Beedle, M., Van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R. and Kern, J., 2001. Manifesto for agile software development.

[21] Murray, Royce, ed. "Skillful writing of an awful research paper." (2011): 633-633.

[22] Cohn, Mike. Succeeding with agile: software development using Scrum. Pearson Education, 2010.

[23] Conboy, Kieran. "Agility from first principles: Reconstructing the concept of agility in information systems development." Information systems research 20.3 (2009): 329-354.

[24] Stoica, M., Mircea, M., & Ghilic-Micu, B. (2013). Software development: Agile vs. traditional. Informatica Economica, 17(4).

[25] Mordi, Azuka, and Mareike Schoop. "Making IT tangible – Creating a Definition of Agile mindset." ECIS. 2020.

[26] Alliance, Agile Online at https://www.agilealliance.org/.

[27] Bytheway, Andrew J. "Guest Editor's Introduction: Successful Software Projects and How to Achieve Them." IEEE software 16.3 (1999): 15.

[28] Budgen, David, and Pearl Brereton. "Performing systematic literature reviews in software engineering." Proceedings of the 28th international conference on Software engineering. 2006.

[29] Alzoubi, Yehia Ibrahim, Asif Qumer Gill, and Ahmed Al-Ani. "Empirical studies of geographically distributed agile development communication challenges: A systematic review." Information & Management 53.1 (2016): 22-37.

[30] Dyb°a, Tore, and Torgeir Dingsøyr. "Empirical studies of agile software development: A systematic review." Information and software technology 50.9-10 (2008): 833-859.

[31] Dingsøyr, Torgeir, et al. "A decade of agile methodologies: Towards explaining agile software development." (2012): 1213- 1221.

[32] Siau, Keng, Yoanna Long, and Min Ling. "Toward a unified model of information systems development success." Journal of Database Management (JDM) 21.1 (2010): 80-101.

[33] Kitchenham, Barbara. "Procedures for performing systematic reviews." Keele, UK, Keele University 33.2004 (2004): 1-26.

[34] Cockburn, Alistair, and Jim Highsmith. "Agile software development, the people factor." Computer 34.11 (2001): 131-133.

[35] Sjoberg, Dag IK, Tore Dyba, and Magne Jorgensen. "The future of empirical methods in software engineering research." Future of Software Engineering (FOSE'07). IEEE, 2007.