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Agile Project Management: A Systematic Literature Review of Adoption Drivers and Critical Success Factors

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Abstract

With an emphasis on adaptive processes that respond to uncertainties, the Agile Project Management (APM) approach has evolved the way projects are managed beyond the traditional processes. This study aims to investigate recent literature on APM to discover the adoption drivers and the critical success factors that influence APM success and provide recommendations for the development of APM best practices. The study conducted a literature search on academic databases ABI/Inform, ACM Digital Library, EBSCO Host, and IEEE Xplore with keywords 'agile' and 'project management' for peer-reviewed English language articles published between January 2015 and January 2020 to discover insights regarding adoption drivers and critical success factors. Eleven (11) drivers of adoption and thirteen (13) critical success factors related to the project dimensions of Project, Team, and Culture were discovered. The findings of this study outline the current state of APM adoption and use and is relevant to project management practitioners and researchers.

1. Introduction

The fundamental assumption of traditional project management is that system specifications are easily identified and built given exhaustive planning [1], [2]. However, even with meticulous planning, a high percentage of projects of all sizes have failed – some examples of such failures are highlighted in Serrador & Pinto's study [3]. Further, the need to meet changing business needs; and the pressure to promote, increase, and continually sustain efficiency in product development puts organizations under severe pressure.

Traditional project management supported organizations achieve goals defined by the triple constraints of cost, quality, and time to assess project success. Agile Project Management (APM) can be defined as an iterative approach that promotes direct customer inclusion, adjusts to change and develops a

working product [4]. APM supports projects in rapidly changing environments characterized by technology-driven innovation, global competition, accelerated lifecycles, and customer demands [5]. Thus, the focus changes from managing tasks and schedules to developing the best solutions with faster delivery under conditions of continuous change. The ability to embrace change is a determinant of success [2]. Even the best-planned projects may face unplanned deviations that require further actions to be taken within the project – but outside the scope of project parameters – to resolve [6].

The requirement for a better approach to high uncertainty work led to the development of the agile manifesto (<http://agilemanifesto.org/>) in 2001 [1], [3]. The premise of the agile approach is that everything is uncertain [1]. The capability of this approach to respond to change resulted in a widespread interest in the agile approach [7]. By contributing to rapid development and adaptive systems [1], [8], the agile approach has transcended to projects outside the confines of the software domain to marketing, management, or engineering [9], [10]. More aptly known as APM, this approach to managing projects reduces, or in the very least manages, complexities in projects [11]. Further, it has been found to have positive impacts on project efficiency and stakeholder satisfaction [3].

Since the agile approach is established as an information systems (IS) and software engineering methodology, an earlier review [12], focused on the use of agile methods for software and information systems development (ISD). This study complements prior research by offering some direction to project management practitioners and researchers on the current state of APM use by investigating agile project management adoption drivers and success factors from extant literature and organizing them according to the project dimensions of the Agile Practice Guide [4]. For the purpose of this study, we identify success factors as areas in which satisfactory results will ensure a competitive advantage [13] whereas adoption drivers

are factors influencing the decision to proceed with implementation of evidence based practices [14] – in this case, APM. Based on this research objective, the current study poses the following question: What are the adoption drivers and critical success factors of APM?

Theoretically, the current study contributes to project management by examining recent literature for lessons learned regarding the adoption and use of agile methods. Practically, the current study offers insights on how various industries could benefit from the use of APM and highlights the factors required to maintain stakeholder confidence.

The remainder of this study is organized in the following way: Section 2 discusses the theoretical background of the study; Section 3, the research methodology; Section 4 outlines the study results; Section 5 presents a comprehensive discussion of the research findings and concludes with a summary of the findings and implications for future research and practice.

2. Background

The Agile Manifesto is based on the four values of 1) Individuals and interactions over processes and tools, 2) Working software over comprehensive documentation, 3) Customer collaboration over contract negotiation, and 4) Responding to change over following a plan [4]. The usefulness of Agile methods has increased substantially in terms of use and methods. The Project Management Institute (PMI) has adapted to APM by collaborating with the Agile Alliance to create the Agile Practice Guide [4].

Advocates of APM find that it provides and supports the increasing needs for business agility. The 14th Annual State of Agile Report [15] found the highest-ranked challenges to adopting and scaling Agile are related to organizational culture (p. 2). The percentage of Agile teams continues to grow with 18% of organizations reporting all of their development teams are Agile, 33% reporting they are more than half Agile, 44% are less than half Agile, and 5% do not have Agile teams (p. 14). The top two measures of success for agile projects remained business value delivered and customer/user satisfaction (p. 13).

Three dimensions to consider for agile project management are the organizational and project attributes of Project, Team, and Culture [4]. The Project dimension varies based on the degree of certainty, project life cycle, and degree of change required and are influenced by ‘*working software*’, ‘*customer collaboration*’, and ‘*responding to change*’. The Agile Team dimension is influenced by ‘*individuals and interactions*’ and tends to coach, foster collaboration, and align stakeholders' needs. The ideal is small, cross-functional, self-managed teams led with servant

leadership. The dimension of Culture considers the supportive environment required to successfully adapt the values of agile into the values of the existing environment.

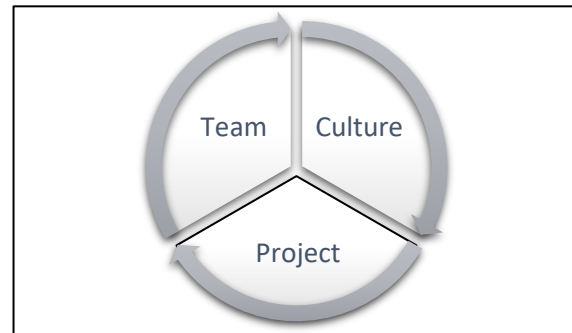


Figure 1. Project Dimensions adapted Agile Practice Guide [4]

3. Methods

The importance of employing an evidence-based approach to document and report evidence from extant literature has been emphasized in past research [16]. As such, this study answers the research questions posed by following the guidelines for software engineering systematic literature reviews (SLR) posited by Kitchenham & Charters [16]. Accordingly, the key activities for conducting systematic reviews are planning, conducting, and reporting the review and are described below.

3.1. Review Planning

The planning stage requires the authors to identify and define the different aspects of the research objective and includes conducting a preliminary search to confirm that the questions posed have not been answered in prior reviews. Therefore, an important part of this process was to define the research questions posed in the introduction. The search is conducted using academic databases ABI/Inform, ACM Digital Library, EBSCO Host, and IEEE Xplore. As mentioned earlier, the review targets the agile methodology from the perspective of project management. To this end, the specific search query used was:

“Agile” AND
“Project Management”

The literature search targeted peer-reviewed journals, books, or conferences published between 2015 and 2020 and written in the English language. For an article to be included in this study, it must focus on agile project management critical success factors, drivers,

and/or challenges. Hence, articles that solely focused on agile software development and/or processes were excluded from this study.

3.2. Review Process

The following steps were employed to select the relevant papers to be included:

- 1) All the returned studies were exported to library management software – Zotero and duplicates will be merged into a single study.
- 2) The resulting articles were screened based on title and abstract.
- 3) The remaining articles underwent full-text review for eligibility based on the inclusion and exclusion criteria.
- 4) The resulting articles were included in the study for synthesis.

Two authors independently screened titles and abstracts using the predefined eligibility criteria by independently evaluating a randomly selected sample of studies. This resulted in an 87.5% rate of agreement and a Cohen's kappa [17] of 0.74 representing substantial agreement. The consensus method was used to solve debates between the two researchers. In cases of disagreements, all four authors discussed with reference to the eligibility criteria, and, where applicable, the full text was retrieved to facilitate decision making.

3.3 Data Extraction and Synthesis

To aid the data synthesis, a data extraction process was established that sought to gather all relevant information needed to address the research questions. A pre-designed data extraction form in Excel was used to retrieve primary information on each study including title, study type, publisher, and citation. The study design, objectives, and relevant details on adoption or success factors were also retrieved.

In the next step, two authors independently examined the extracted data and classified the extracted details according to the APM project dimensions. An additional qualitative analysis was conducted by transferring the data into a different Excel sheet for thematic analysis [18]. Accordingly, the following procedures were conducted:

- 1) Familiarization with the data by reading through the excel summary.
- 2) Generating an initial independent set of codes by and re-reading the summary and often the full text to understand the full context of the paper.
- 3) Searching for themes by collating the independent set of codes into potential themes.

- 4) Reviewing, defining, and naming themes in a manner that combined Braun & Clarke's [18] fourth and fifth steps into a process of iteratively reviewing and reallocating themes where necessary
- 5) Producing a report that is presented in the result below.

4. Results

4.1. Study Selection

The initial search of electronic databases yielded 225 records, of which 180 records remained after removing duplicates. The remaining studies underwent careful evaluation of titles and abstracts. Out of the remaining 65 titles, 32 met the eligibility criteria.

The excluded articles were 8 reviews, 1 editorial, 15 studies based on agile software development, and 9 articles that did not meet the current study's minimum quality requirements. The search and study selection results are presented in Figure 2.

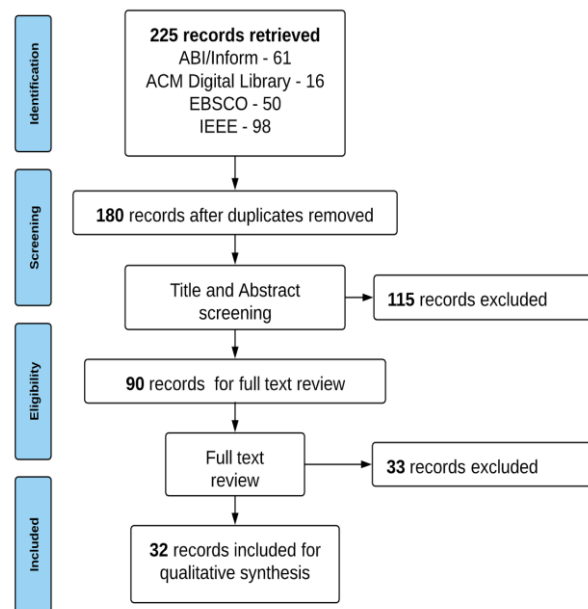


Figure 2. Study selection procedure

4.2. Publication statistics

The distribution of papers per publication year shows that most selected studies (10) were published in 2017. As displayed in Figure 3, there has been a gradual decline in the number of publications on APM since peaking in 2017. However, it must also be noted that 2020 figures only represent the first half of the year (i.e. January to June).

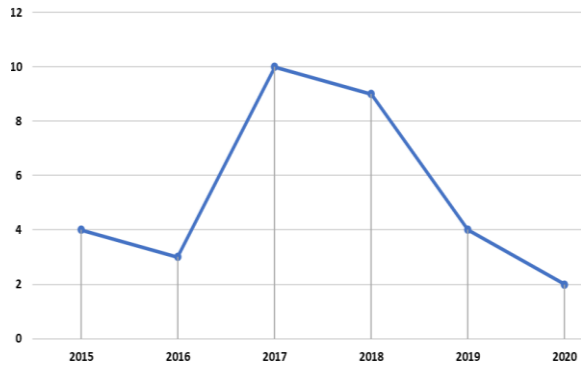


Figure 3. Study distribution by year

Figure 4 also shows statistics on the study designs used in the selected studies. Several of the studies (10) employed survey instruments such as questionnaires; other most prevalent study designs preferred by researchers were case study (8) or grounded theory (8) usually through semi-structured interviews. Four studies applied more than one study design. The selected studies included conferences (19) (59.38%) and journal articles (13) (40.62%). No book chapters were included in this study. Even though most papers were published in conferences, only the Project Management Journal had more than one publication. As shown in Appendix Table I, however, several of the conference papers were published in conference proceedings hosted by the Institute of Electrical and Electronics Engineers (IEEE).

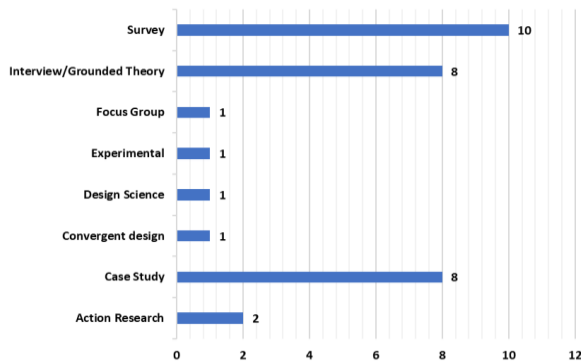


Figure 4. Study design of selected publications

4.3. APM Adoption Drivers

Thematically, this study organized the drivers of APM into the project dimensions as outlined in Table 1. Overall, eleven (11) drivers were found relating to different project dimensions as discussed below.

4.3.1 Project. A number of adoption drivers were identified in the literature that related to project-specific

contexts. These drivers were related to the fluidity of product definitions as reflected in dynamic product definition and effort estimations (19%). additionally, the ability to make frequent changes to products themselves (11%), or at least the product delivery parameters (11%) such as the ability for incremental delivery in agile environments were essential in moving to an agile environment.

4.3.2 Team. The agile methodology emphasizes individuals and interactions over processes and tools. This was a major driver in the literature as a move to agile was often premised by the need for better collaboration within teams, stakeholders, and customers. Consequently, we found that some studies mentioned communication and collaboration (19%), team availability (8%), and expertise (8%).

4.3.3 Culture. As outlined in Table 1, the cultural dimension was not discussed a great deal in the literature as a driver; however, management buy-in and the prevailing climate were mentioned in one study each as a driver for the adoption of APM.

Table 1. APM Adoption Drivers

Dimensions	Adoption driver themes	Articles	Study Count
Project	Dynamic product definition and effort estimation	[15],[20],[21],[22],[23]	5
	Frequent changes	[24],[19],[25]	3
	Product delivery parameters	[19],[20],[26]	3
	Product quality	[27],[25]	2
Team	Communication and Collaboration	[28],[26],[23],[21],[22]	5
	Dedicated and available teams	[21],[29]	2
	Team expertise	[21],[29]	2
	Team size	[19]	1
	Leadership	[23]	1
Culture	Management buy-in	[28]	1
	Organizational setup and climate	[23]	1

4.4. APM Critical Success Factors

The APM critical success factors discovered in the literature fit/supported the project dimensions themes of Project, Team and Culture. The results, thirteen (13) critical success factors relating to different project dimensions, are presented in Table 2 and are discussed below.

4.4.1. Project. In agile environments, it is important to break projects into smaller more manageable tasks. Thus, product definition and effort estimation (28%), frequent changes (9%); and clear criteria for product acceptance (6%) were the most highlighted project-related factors for ensuring success.

4.4.2. Team. Collaboration is an important driver for APM and 15% of the studies found it critical to project success. Other success factors mentioned related to the team were work distribution (8%) and team expertise (6%).

4.4.3. Culture. Management buy-in was found to be the most important success factor related to culture. Employee training was also highlighted as a success factor.

Table 2. APM Critical Success Factors

Dimensions	CSF themes	Articles	Study Count
Project	Dynamic product definition and effort estimation	[30],[31],[32],[33],[34],[35],[36],[37],[38],[39],[40],[41],[42],[32],[43]	15
	Frequent changes	[32],[33],[43][37],[41],	5
	Acceptance criteria	[37],[40], [28]	3
	Product delivery parameters	[37],[44]	2
	Customer satisfaction	[30],[45]	2
Team	Collaboration and communication	[45],[44],[46],[43],[42],[39],[41], [34]	8
	Work distribution amongst team members	[33],[42],[21],[39]	4
	Team expertise	[32],[43],[39]	3
	Dedicated and available teams	[31],[25]	2
	Leadership	[44],[21]	2
	Team Size	[28]	1
Culture	Management buy-in	[31],[46],[37][39],[47]	5
	Employee training	[28]	1

5. Discussion

Modern project management approaches like APM aim to create a product, service, or result using a dynamic and adaptable approach rather than the traditional plan-heavy attitude to project management. This approach has worked well in the software industry and has subsequently been co-opted to other industries.

This type of project management aims to create customer value through an incremental approach to product delivery. Each iteration of a product is created to act as a prototype, of sorts, for the next iteration and elicit requirements for later stages. The specific drivers that push organizations to adopt APM and the ensuing lessons learned from those that have used the approach are discussed in the next section.

5.1. APM Adoption Drivers

5.1.1 Project. Insights from this systematic literature review on APM suggest that the company's decision to adopt APM is usually consistent with the values and principles of agile [4]. Often, the need to move to agile is driven by context-related factors such as responding to a frequently changing environment [24] and the dynamic product requirements that prevail in small-to-medium scale enterprises (SME) [19], [25]. Additionally, the fluidity of product definitions – which are often tailored to specific settings regardless of whether agility is implemented in a software development environment [20], engineering [21], [22], or even the previously mentioned SMEs [19] – makes APM attractive to practitioners.

In most cases, the ability to deliver products incrementally coupled with constant client feedback and collaboration fits the profile of the problems that APM aims to solve. For instance, a vendor might not be in a position to deliver a fully functional product [19], the client might develop emergent needs that have to be factored into the project [20], or the nature of the tasks may simply be too intensive [26]. APM, in such instances, is regarded as a preferred way to achieve client goals and ensure project satisfaction [25], [27].

5.1.2 Team. Overall, the team related factors that drive the adoption of APM is heavily influenced by the need for better communication and collaboration within projects. A few of the problems that moving to APM seeks to solve include ambiguous communication channels [22], [26], ignorance of the work progress of team members [26], a general lack of collaboration within the team [22], [23] or collaboration between the project team and clients [21], [23]. Further, the setup of APM teams which stresses cross-functionality results in the formation of dedicated teams that are willing to adapt to changes. For adoption purposes, such team formation can help avoid burnout while making use of the teams' expertise [21], [29]. The smaller team sizes [19] and the servant leadership style of agile [23] are also effective drivers of APM. It can be effective in battling a lack of ownership, ensuring project transparency, and participatory decision making [22].

5.1.3 Culture. While culture is often referred to as a success factor for APM, the two studies that discussed culture highlighted how moving to APM is driven by management. Cram [28] emphasized the need for APM adoption to be advocated from both top-down and bottom-up initiatives. Further, it is imperative to utilize change management processes to influence a smooth transition to agile and reduce the initial confusion, uncertainty, and resistance. Hobbs and Petit [23] in their case study on agile adoption in large organizations for large projects discovered that one of the objectives for adopting APM was, in fact, the need for a better organizational climate.

5.2. APM Critical Success Factors

5.2.1 Project. Identifying the elements that are essential for ensuring progress toward strategic goals and completion of an APM project is important. For instance, the very nature of the agile methodology emphasizes adapting to change over following a fixed plan, and incremental delivery of projects over single delivery. However, it is important to define what *success* means in specific contexts as the traditional definition of a sprint success may not always be appropriate for all industries or contexts. In engineering [32], for example, the strict standards and safety requirements that call for authorization and approval of all changes are difficult to by-pass with dynamic changes. Similarly, manufacturers [31], [33] have highlighted this issue with fluid versus fixed product definitions as it is difficult to instrumentalize products such as medical equipment and motor engines. While some have preferred to define which projects will fit an agile environment and tailored specific projects to APM [32], Cooper and Sommer [31] mention that even if a concrete prototype can be built in a given sprint, it often takes longer to build the physical product. In their case study, they found that this problem had been addressed by redefining the meaning of *done* in a sprint to not necessarily mean a working product but rather a business case, a working experiment, or even voice-of-customer study.

Similarly, product delivery, acceptance, and subsequent client satisfaction are important to the success of all projects. In theory, requirement elicitation in agile environments should be done with customer involvement, prioritization, modeling, interviews, and various approaches, and practice has found evidence of project success through these approaches [41]. It is often important to form a common product vision with the customer right from the onset of a project to prevent in-sprint changes. Such changes may cause difficulty for the project team [37] and should be managed with project cycles and task lists [44].

5.2.2 Team. Issues regarding the project team may also contribute to the success, or failure, of the project. Table 1, for example, highlights the importance of collaboration and communication to APM given the sheer number of studies that mentioned this as a success factor. Collaboration, specifically, is essential to project success [42], [45], [46], and requires maintaining group stability, commitment, and frequent communication [44]. In this case, communication is important not only in the context of the project but also in the client [41] and the vendor's project team [39]. Maintaining client-vendor communication is also crucial to their security in the face of the Agile manifesto's *collaboration over contract negotiation* [34].

In the face of a dynamic project that delivers incremental changes, an important factor to consider also relates to the work distribution amongst team members. Complex sprint items with interdependencies and even incomplete tasks from previous sprints have been found to cause overload amongst certain teams [21], [33], [42]. For a project to succeed, it is important not to underestimate the complexities and interdependencies between certain tasks. One way to address these issues is to ensure team members are knowledgeable and have expertise in the project area [21], [39], [43], and that there is effective leadership provided by the work cycle or project manager [21], [39], [44].

5.2.3 Culture. The need for speed without compromising quality, flexibility while still meeting timelines, and satisfying customer requirements are often highlighted when assessing current project management settings [4]. The most important success factor in safeguarding APM acceptance over the more predictive traditional project management is to ensure that there is management buy-in. In principle, this may be more difficult in certain industries [31]–[33]. However, some situations found some agile practices like Kanban to guarantee situation awareness, project transparency, and visibility which are important to leadership [46]. Others have also discovered that abstracting the project away from specific agile processes encourages C-level executives to be more comfortable signing onto agile projects [31].

5.3. Limitations of the study

Limitations of this research relate to the thematization and coding of the result from literature as systematic reviews are threatened by misclassification. This was however addressed by having two authors code the studies with input from the other two authors to resolve any issues with the classification. Another

limitation is the exclusive use of academic subscription databases. Since project management is practical, including only peer-reviewed articles may have unintentionally biased the study towards academic settings by ignoring periodicals and briefings from project management bodies like the PMI. However, given the nature of the most prevalent studies (surveys, case studies, and interviews), we believe the current study has captured a representative cross-section of APM issues.

6. Conclusion and Future Research

Due to the vast interest in APM as an approach to managing environments characterized by frequent changes, this study sought to investigate extant literature for APM adoption drivers and critical success factors for use. The study synthesized the result of 32 studies that employed surveys, interviews, case studies, and other research designs to investigate various dimensions of agile and found the following results.

In the context of projects, adoption of agile is driven by the fluidity of product definitions, the ability to make frequent changes to products, and the incremental approach to product delivery. Similarly, the team and cultural dimension play a role in adoption as they tend to solve issues of ambiguous communication channels and a general lack of team collaboration.

Our result demonstrates that critical success factors of APM relate project-wise to ensuring a proper product definition, effort estimation, and a clear criterion for product acceptance. Similarly, effective communication and collaboration within teams and between vendor and client ensure the success of projects. While culturally, APM success is defined by management support and buy-in. Future empirical research should investigate how to optimize APM for high-risk environments like manufacturing especially through further hybridization of approaches like an agile-stage gate.

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APPENDIX Table 1. Summary of selected studies

Reference	Publication Year	Journal/Conference/Book Publisher	Study Design	Objective
[30]	2020	Project Management Journal	Focus Group, Interview/Grounded Theory	Explore the role of PM in the product development of new technology-based firms (NTBFs)
[45]	2020	Annual ACM Symposium on Applied Computing	Survey	Investigates how Agile companies implement PM compared to the ones adopting plan-based approaches
[27]	2019	IEEE International Conference on Computer Sciences and Information Technologies (CSIT)	Action Research	Describe the agile methods of organizing process-stochastic PM
[28]	2019	Information Systems Management	Interview/Grounded Theory	Develop lessons learned that highlight potential pitfalls and areas of risk associated with agile
[44]	2018	Computers & Education	Survey	Analyze the usefulness of agile strategies for team regulation and PM in online higher education
[42]	2015	IEEE Frontiers in Education Conference (FIE)	Interview/Grounded Theory, Survey	Compare local and agile distributed teams
[19]	2018	Saudi Computer Society National Computer Conference (NCC)	Survey	Investigate the extent the SMEs in Saudi Arabia apply Agile Development Method in their project
[36]	2017	IEEE Global Engineering Education Conference (EDUCON)	Survey	Determine whether course design helps undergraduate students to learn and correctly apply Scrum
[21]	2017	IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications (IDAACS)	Case Study	Address challenges faced by innovation projects by proposing an adaptive PM approach based on agile thinking
[37]	2016	The Journal of Systems and Software	Interview/Grounded Theory	Illustrate how PM challenges arise because of self-organizing teams and influence the team
[22]	2019	International Conference on Developments in eSystems Engineering (DeSE)	Convergent design	To determine the benefits of augmented reality and agile PM methodologies
[25]	2015	International Conference on Information Technology - New Generations	Case Study	Tackles the use of the Scrum agile method within a Brazilian small business enterprise
[38]	2017	IEEE Transactions on Engineering Management	Survey	Sheds light on the issues related to performance implications of offshore efforts vs those that are executed within country
[29]	2018	International Arab Conference on Information Technology (ACIT)	Case Study	Analyzed a real case study for an IT organization to understand all issues facing the WPMO
[48]	2018	IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)	Case Study	Investigates how scrum works in the management of work routines in a case study
[49]	2016	International Conference on Computing for Sustainable Global Development (INDIACom)	Experimental	Aim to show in theory that scrum can be applied to teams that contain human and intelligent units as members
[39]	2015	Electronic Journal of Information Systems Evaluation	Case Study	Investigate the primary sources of interference in the middle of a sprint
[20]	2015	Hawaii International Conference on System Sciences (HICSS)	Case Study	Reports on the findings of research on why large organizations select agile approaches
[47]	2018	Journal of Competitiveness	Survey	Test the possibility of changing management style during a project and to determine its possibility
[40]	2019	IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD)	Survey	Use scrum framework to find out the impact of agile methodology on software PM
[41]	2017	IEEE/ACM International Conference on Software Engineering Companion (ICSE-C)	Interview/Grounded Theory	Examines a case on how to increase the benefit and success rate of investments in IT-development
[50]	2018	Asia-Pacific Software Engineering Conference (APSEC)	Survey	Investigate agile success factors, particularly from the viewpoint of teams
[51]	2018	International Conference on Agile Software Development	Interview/Grounded Theory	Identify effectiveness of applying agile methods in music industry companies
[24]	2018	Tertiary Education and Management	Design Science, Case Study	Develop and implements an agile management approach in higher education
[31]	2018	Research Technology Management	Case Study	Present case studies from major firms experimenting with Agile-Stage-Gate hybrids.
[23]	2017	Project Management Journal	Case Study, Survey	Investigate the adoption and adaptation of agile methods for use on large projects in large organizations
[32]	2017	Conference on Economic and Social Development	Interview/Grounded Theory	Outlines the level of knowledge and implementation of AGILE in Electrical Engineering in Romania
[33]	2017	DAAAM International Symposium	Interview/Grounded Theory	Introduce the adjusted Lean principles to an Agile software development project and test if changes result in improved project team performances
[34]	2017	Journal of Database Management	Survey	Investigates how agile practices can be adapted for DW/BI development
[46]	2017	Journal of Management Information Systems	Action Research	Introduce agile approach to disaster recovery and tested using an action research approach to study the IT DR practice of a large enterprise
[43]	2017	Journal of Enterprise Information Management	Survey	Develop and test a contingency fit model comparing the differences between Critical Success Factors (CSFs) for agile vs traditional software development projects
[35]	2016	Management and Innovation Technology International Conference (MITicon)	Interview/Grounded Theory	Proposes a new management framework of agile approach for data center project management (DCPM)