A systematic literature review: how agile is agile project management?

Andy Behrens, *Dakota State University, Andrew.behrens@dsu.edu*
Martinson Ofori, *Dakota State University, Martinson.ofori@trojans.dsu.edu*
Cherie Noteboom, *Dakota State University, Cherie.noteboom@dsu.edu*
Dave Bishop, *Dakota State University, Dave.Bishop@dsu.edu*

Abstract

As disruptive technologies and innovations continue to develop, the resulting change forces organizations to consider adopting an agile mindset to move quickly. With an emphasis on an iterative and changing project approach characterized by daily reactivity, communication, and flexibility, the Agile Project Management (APM) approach is evolving to manage high uncertainty projects. A literature search was conducted on the following academic databases: ABI/Inform, ACM Digital Library, EBSCO Host, and IEEE Xplore. "Agile" and "project management" keywords were specified for the English language, peer-reviewed articles published between January 2015 and March 2021 to answer the research question "*How agile is agile project management?*" The findings of the study provide contributions to research and practice on the state of evolution of APM.

Keywords: agile, agile project management, systematic literature review, agile software development, and traditional project management

Introduction

As disruptive technologies and innovations continue, the resulting change forces organizations to consider adopting an agile mindset (Project Management Institute & Agile Alliance, 2017). Organizations adopting agile mindsets focus on an iterative and changing project approach characterized by daily reactivity, communication, and flexibility. In a business environment characterized by rapid change and increasing complexity, companies struggle to implement the strategies they need to generate and sustain a competitive advantage (Boston Consulting Group, 2016). Agility should not be seen as a lack of process; it provides the ability to adapt to diverse and unexpected situations (Santana Furtado Soares & de Lemos Meira, 2015).

Agile Project Management (APM) is defined as an iterative approach that promotes customer inclusion, adjusts to change, and develops a working product (Project Management Institute & Agile Alliance, 2017). This approach influences how high uncertainty projects which have high rates of change, complexity, and risk are managed. The aforementioned characteristics can present problems for the Traditional Project Management (TPM) approach. TPM is based on the sequential conception and is driven by fully defined requirements and deliverables (Project Management Institute, 2017a). The focus on the '*Iron Triangle Trap*' identifies time, cost, and scope issues, but does not identify the additional analysis required to identify the issues (Wiboonrat, 2016).

Consequently, as more definable work is automated, project teams are undertaking more high-uncertainty work projects that require agile methods (Sanchez et al., 2019). These methods explore feasibility in short cycles and quickly adapt based on evaluation and feedback. Therefore, the Agile Manifesto (http://agilemanifeso.org) was created and provides an approach for high uncertainty work. It utilizes 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 (Project Management Institute & Agile Alliance, 2017).

APM corresponds to a mindset driven by values and principles. Its popularity has increased due to its results on software quality and customer satisfaction. This has had an immediate impact on the job title of project managers. They exist on a significant number of agile projects, and they play the role of mentor, coordinator, negotiator, and process adapter (Shastri et al., 2021). Previous literature reviews have investigated improving business processes using an agile methodology (Schmitt & Hörner, 2021), the comparison of agile and waterfall project management methodologies (Thesing et al., 2021), and the adoption drivers and critical success factors of agile project management (Noteboom et al., 2021). However, previous reviews did not address the agility of APM.

This study uses the four values of agile to classify the literature to discover whether APM is truly agile. Therefore, this study contributes to the body of knowledge on APM by offering guidance to project practitioners and researchers on the current state of agility by investigating the extant literature on *'How agile is Agile Project Management?'* with comparison to the four Values of the Agile Manifesto. Theoretically, the study contributes to the evolution of APM to manage high-uncertainty projects by evaluating the literature for insight. The study also provides direction on the continued development of APM to support agile methods and high-uncertainty work for the practitioner. The study provides a theoretical background next, the research methodology is presented in the following section, the study results to follow, and a discussion of findings. The article will conclude with a summary of findings and implications for research and practice.

Background

The 14th Annual State of Agile Report (2020) reported the ability to manage changing priorities and project visibility as the top two capabilities of Agile implementation. However, there are still adoption challenges that continue to be related to organizational culture and resistance to change (14th Annual State of Agile Report, 2020). According to the report, the top reasons for adopting agile were accelerated software delivery, enhancing the ability to manage changing priorities, and increasing productivity. 84% of respondents indicated that they were below a high level of competency with Agile. This indicates an opportunity and the need for the improvement and development of APM.

Conboy (2009) provides a definition of agile that is widely cited, "the continual readiness of an information system development method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value (economy, quality, and simplicity), through its collective components and relationships with its environment." Organizations achieve greater agility through attention to people, processes, and culture (Project Management Institute, 2017b). In an agile approach, basic outcomes are defined, initial targets are established, and the project outcomes are consistently revisited and further refined using an adaptive process (Gemino et al., 2021). The traditional approach is defined by linear and predictable project planning practices designed to achieve a well-understood, achievable set of objectives (Gemino et al., 2021). There is also a third approach defined as a hybrid approach that combines both traditional and agile practices as described above (Gemino et al., 2021).
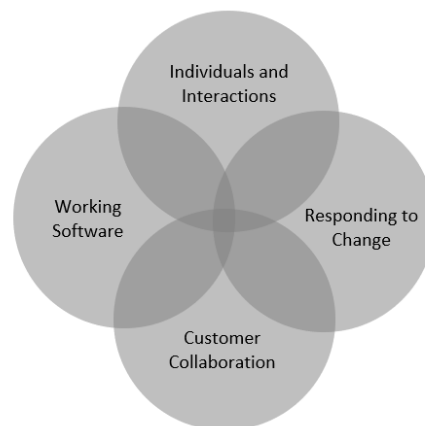
Figure 1: Four values of APM agility

The Agile Manifesto and mindset have four values: **Individuals and interactions** over processes and tools; **Working software** over comprehensive documentation; **Customer collaboration** over contract negotiation, and **Responding to change** over following a plan (Project Management Institute & Agile Alliance, 2017). The bolded areas are valued over the other items. The values shown in Figure 1 will be used to classify the literature.

Methodology

This review employs the software engineering guidelines for performing and reporting systematic literature reviews (SLRs). The guidelines, as proposed by Kitchenham and Charters (2007), are a common method for conducting SLRs in software engineering and IS research. It offers a standardized and replicable approach to evaluating and interpreting extant literature pertaining to the research question. The current review uses this approach to summarize existing literature to identify the current position and gaps on agile as a project management methodology. The ensuing section describes the three main phases of the current review in accordance with the guidelines: planning, conducting, and reporting the study.

Review Planning
This process involves identifying the need for the review, commissioning the review, and specifying the research question. The introduction and background sections establish these components.

Conducting the Review
The activities in this section include identifying the research, selecting the primary studies, performing quality assessment, as well as extracting and synthesizing the information from the selected studies.

Research identification
Following the formulation of the research questions, the current following search query was developed to gather relevant literature from ABI/Inform, ACM Digital Library, EBSCO Host, and IEEE Xplore databases: ***"Agile"* AND *"Project Management"***. In collating the relevant articles for the review, English language articles published in journals, books, or conference papers between January 2015 and March 2021 were sourced for the four values of the agile manifesto.

Study Selection and Quality

Using a predefined strategy established by all four authors, two authors assessed the titles and abstracts by independently evaluating a randomly selected study sample for inclusion or exclusion. This resulted in an 87.76% rate of agreement and a Cohen's kappa (Cohen, 2016) of 0.75, which represented substantial agreement. The full text of the selected studies was then consulted for the four values of the agile manifesto. The consensus method was used to solve any disagreements between the two researchers. Where a suitable compromise could not be achieved, all four authors discussed the merits of the study with reference to the study objective.

Data Extraction and Synthesis

An Excel sheet was created for extracting and synthesizing the literature. This assisted in reducing the chance of bias in the report. The data collected from each study included the title, publication avenue, study design, publication year, objectives, and the exact information relating to each of the four values. A summary of the data collected is presented in Table 1. The following section describes the results of the review which is the last activity specified by the SLR reporting guideline adapted from Kitchenham & Charters (2007).

Results

Study Selection

The identification process resulted in the selection of 376 records from the initial electronic database search. Duplicate records (36) were removed and 340 records were moved to the screening process. The exclusion criteria removed 235 records and 105 records met eligibility criteria for full record review. An additional 36 records were excluded during the full article review and 69 records were included for analysis in the study. A summary of search and study selection results is presented in Figure 2.
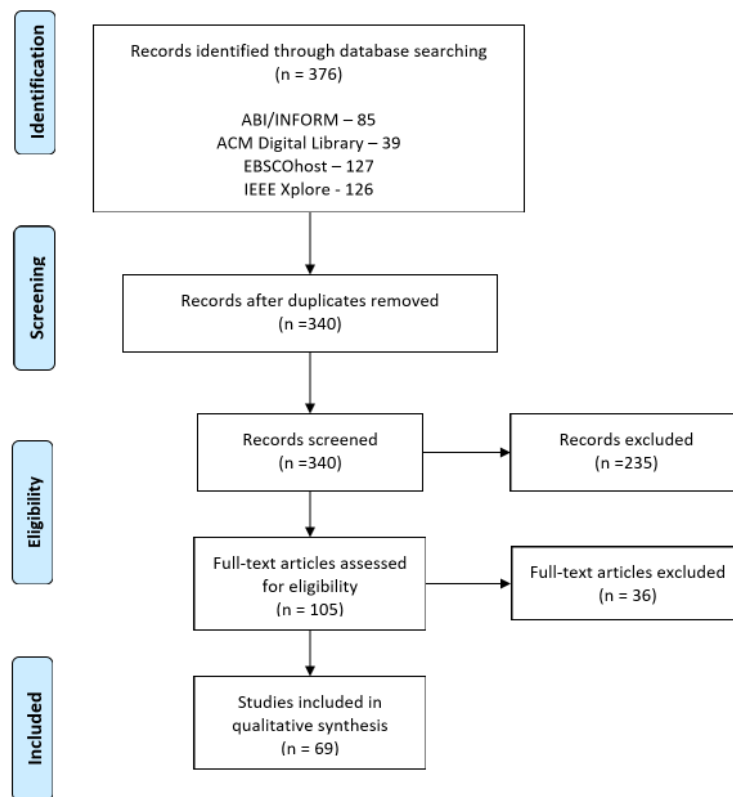
Figure 2: PRISMA flow chart for study selection

Publication Statistics

The APM paper distribution by year indicates peaks and valleys during the collection periods. The low occurrence of publications was in 2018 with six. The peak number of 16 articles occurred in 2019. As displayed in Figure 3, there does not appear to be a trend in the number of publications per year. Figure 4 demonstrates the publication statistics by type of publication. Journal articles account for 68% of the publications and peer-reviewed conference papers comprise 27.5% of the included results.

Case study and survey research were the most frequently mentioned study design components. The included articles provided insight into a variety of investigative approaches to understanding APM as shown in Figure 5.
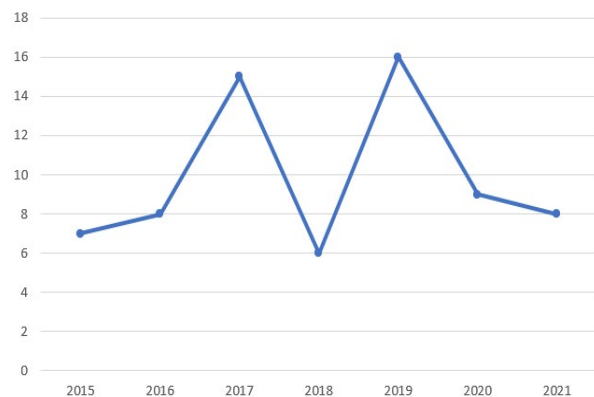

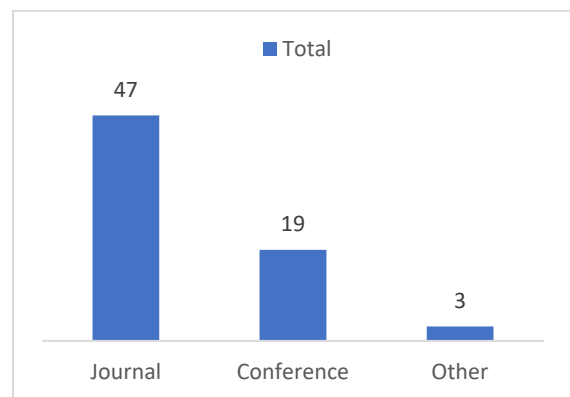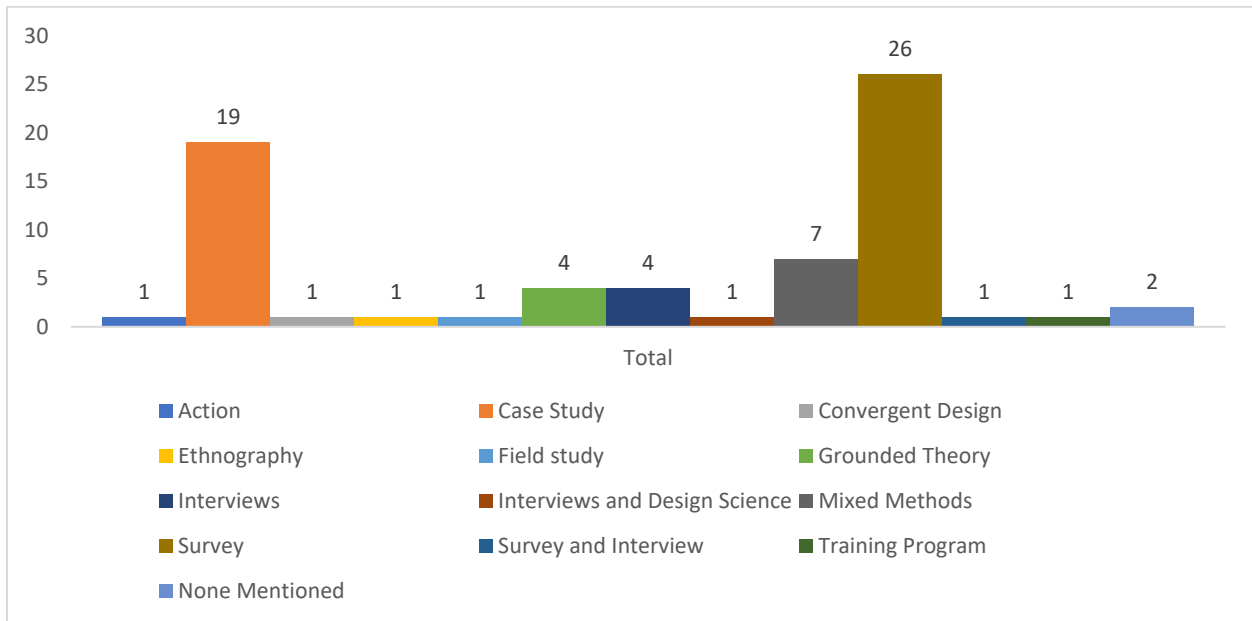**Figure 3: Included publication by year**

Figure 4: Included publication by type

Figure 5: Study design of included publications

The articles that discussed APM were the highest at 74%. There were much fewer articles discussing a hybrid PM approach at 25%. These statistics are shown in Figure 6.
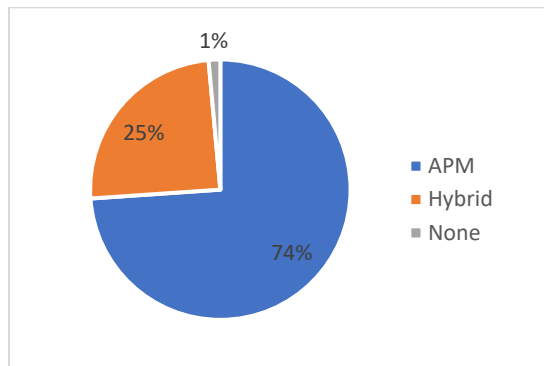
Figure 6: Percentage of PM approaches used in included articles

Table 1 lists the fully categorized articles with their respective PM style, and which agile value they have met. All articles listed below were the included articles of our study. The citations list the authors and the year each article was published. The PM style discusses which type of approach each author studied. The following four columns focus on whether each article met one or more of the four agile values. Each x details whether that value was met in the study. At the bottom of Table 1, the count of each agile value is displayed.

Table 1: Study design of included publications

Citation	PM Style	Interactions and Individuals	Working Software	Customer Collaboration	Response to Change
(Sanchez et al., 2019)	Hybrid	x		x	x
(Andrei et al., 2019)	Hybrid	x	x		x
(Şarlak, 2020)	APM	x	x	x	x
(Stormi et al., 2019)	APM	x	x	x	x
(Gemino et al., 2021)	Hybrid	x	x	x	x
(Lill et al., 2020)	APM	x	x	x	x
(Salman et al., 2021)	APM	x	x	x	
(Khomyakov et al., 2020)	APM	x	x	x	x
(Perlak, 2019)	APM	x			x
(Mkoba & Marnewick, 2020)	APM	x	x	x	x
(Luong et al., 2021)	APM	x		x	
(Bhatnagar & Grosse, 2019)	APM	x	x	x	x
(Pareliya, 2019)	APM	x	x	x	x
(Olteanu, 2018)	APM	x	x	x	x
(Fitriani et al., 2021)	APM	x	x	x	x
(Zasa et al., 2021)	Hybrid	x	x	x	x
(Hussien et al., 2019)	APM	x		x	x
(Kurniawan, Adler, et al., 2020)	APM	x	x	x	
(Marinho et al., 2019)	Hybrid	x	x	x	x
(Ismat Soueid & Corá Martins, 2021)	APM	x	x	x	x
(Ereiz & Mušić, 2019)	APM	x	x	x	x
(Kerscher & Günzel, 2019)	APM	x		x	x
(Kurniawan, Budiastuti, et al., 2020)	APM	x	x	x	x
(Hayat et al., 2019)	APM	x			x
(Copola Azenha Flávio et al., 2021)	Hybrid	x	x	x	x
(Thorgren & Caiman, 2019)	APM				
(Vahanvati & Mulligan, 2017)	Hybrid				
(Pool et al., 2019)	APM	x		x	x
(Lei et al., 2017)	APM				
(Jørgensen, 2016)	None	x		x	
(Gaudenzi & Christopher, 2016)	APM				x
(Batra, 2017)	Hybrid		x	x	x
(Taylor, 2016)	Hybrid	x			
(Gheorghe et al., 2017)	Hybrid				x
(Higuchi & Nakano, 2017)	Hybrid	x		x	
(Alsari et al., 2020)	Hybrid	x	x	x	x
(Hobbs & Petit, 2017)	APM	x	x	x	
(Mirzaei & Mabin, 2017)	Hybrid			x	
(Conforto & Amaral, 2016)	Hybrid	x		x	x
(Azanha et al., 2017)	APM	x	x	x	x

(Paterek, 2019)	APM	x		x	
(Cooper & Sommer, 2018)	Hybrid	x	x	x	x
(Baham et al., 2017)	APM	x	x	x	x
(Kassab et al., 2018)	APM	x	x	x	
(Nerurkar & Das, 2017)	APM	x	x	x	x
(Wiboonrat, 2016)	APM	x	x	x	x
(Salaou et al., 2021)	APM	x	x	x	x
(Lehnen et al., 2016)	APM	x	x	x	x
(Dingsøyr et al., 2018)	APM	x	x	x	x
(Serrador & Pinto, 2015)	APM	x	x	x	x
(Meding, 2017)	APM	x	x	x	x
(Siddique & Hussein, 2019)	APM	x	x	x	x
(Cvetković et al., 2017)	APM	x	x	x	x
(Friess, 2018)	APM	x			
(Zhang et al., 2020)	APM	x	x	x	x
(Sievi-Korte et al., 2015)	APM	x			x
(Siddique & Hussein, 2016)	Hybrid			x	
(Hoda & Murugesan, 2016)	APM	x	x		x
(Mishra et al., 2017)	APM		x		x
(Tanner & Mackinnon, 2015)	APM	x	x	x	x
(Lindsjørn et al., 2016)	APM	x			
(Sampietro, 2016)	APM	x	x	x	x
(Wells et al., 2015)	APM	x	x	x	x
(Gablas et al., 2018)	APM				x
(Kaczorowska, 2015)	APM	x	x	x	x
(Shastri et al., 2017)	Hybrid	x	x	x	x
(Alahyari et al., 2018)	APM	x	x	x	x
(Koch & Schermuly, 2020)	APM	x	x	x	x
(Law & Lárusdóttir, 2015)	APM	x	x	x	x
Count of the Four Agile Values:		**59**	**46**	**54**	**53**

Discussion

To answer our research question, *how agile is agile project management?* Our study indicates APM is agile as defined by the classification scheme shown in Figure 1. The four values of APM agility were present in 38 of the 69 articles. 11 articles contained three of the values and 13 articles referenced two of the values. One value was present in eight articles and one article failed to mention any value. In the following section, we discuss the findings on APM agility from the literature review with a discussion on each value.

APM Agile Values

Individuals and Interactions

The role of the project manager in APM is servant leadership which focuses on coaching anyone who needs assistance, fostering collaboration, and aligning stakeholder needs (Project Management Institute & Agile Alliance, 2017). This leadership enables a more in-depth focus on individuals and interactions that results in a greater flow of values (Copola Azenha Flávio et al., 2021; Fitriani et al., 2021; Olteanu, 2018), emphasis on rapid feature delivery to the customer (Nerurkar & Das, 2017; Pool et al., 2019) and self-managed teams (Serrador & Pinto, 2015). The role of the project manager also extends to APM and the interactions and individuals of the teams. It was found in teams to also improve collaboration, communication, team dynamics, iterative planning, and multiple releases of usable projects (Pool et al., 2019). Serrador & Pinto (2015) also found that neither the project complexity nor experience of the project team limited the project success.

However, there are areas for improvement for APM. A trade-off between the short-term benefit of rapid delivery and an increase in unplanned technical debt from quick agile responses may result in major consequences if that the debt is forgotten and grows up to become a liability for the system maintainability and scalability (Salaou et al., 2021). This also can cause teams to focus less on tools and processes. This can consequently cause teams to neglect or minimize the importance of documentation.

Responding to Change

This systematic literature review suggested that 77% of research projects used adaptiveness to change in their studies. Companies are faced with spontaneous market changes and they often have to shorten the software product delivery and be more responsive to the customers' demands (Olteanu, 2018). Customer's changing opinions on features increase the cost of updating artifacts under TPM and the impact on each phase of the project as well as drive down customer satisfaction (Andrei et al., 2019). Understanding and being adaptive to change enables managing agile projects more effectively and allowing for flexible requirements. An exploratory study was completed by Pareilya (2019) showing that 41% of agile users thought being adaptive to change was extremely important. 45% claimed in the Pareilya study that adaptiveness to change is very important. In sum, 86% of the users thought that being adaptive to change is important. 76.8% of the articles reviewed in this study implemented the response to change principle.

Adapting to change as an agility principle enables project management teams to react to or mitigate risks that may cause going over budget, delays in implementation, and producing a different solution than expected (Kaczorowska, 2015; Serrador & Pinto, 2015). In most cases, being adaptive to change helps mitigate many barriers associated with the traditional project management style. For example, a project team could benefit from continuous discussion (Andrei et al., 2019), maintain flow during the transformation process (Fitriani et al., 2021), and understanding the importance of an agile project manager (Hoda & Murugesan, 2016).

One of the key areas that responding to change comes into play is in regard to requirements. Agility is defined by adapting to new conditions (Şarlak, 2020). Agile is a preferred approach when project stakeholders expect significant changes in requirements (Gemino et al., 2021). Requirements change in Performance Management Systems, like all systems, is inevitable, and agile is a methodological way to respond to that change (Stormi et al., 2019). Another key to responding to change identified by Stormi, Lain & Korhonen (2019) is adopting iterative and incremental work practices which support resilience in the face of dynamic requirements. Finally, Gemino et al. (2021) point out that the team attitude toward change is an important success indicator for projects embracing agile practices.

Customer Collaboration

Law and Larusdottir (2015) summarize the definition of a customer as someone, company, or individual that receives a product or service. Khomyakov et al. (2020) note that both plan-based and agile organizations place a high priority on customer collaboration and customer satisfaction. In agile practices, such as Scrum, the Product Owner is the representative of the customer and may pull in customers as needed throughout the life of the project (Schwaber & Sutherland, 2011). Shastri et al. (2017) describe the traditional project manager's role with customers as one of negotiating requirements. Consequently, in a hybrid approach, to gain the maximum benefit, it will be necessary to expand the traditional role to enhance customer collaboration.

Working Software

Generally, it is accepted that APM evolved from software development practices and is predicated upon incremental product delivery which grew from a rising need for faster yet adaptable software release cycles (Highsmith & Cockburn, 2001). Rather than the top-heavy comprehensive documentation that characterizes traditional project management, Zhang et al., (2020) found that reduced communication overheads, increased concurrency, and increased personal ability created the right conditions for small self-organizing teams to realize increased productivity and innovation towards systems creation. This effect was not limited to small-scale software development teams. In large multiteam development where documentation is generally required and advised, the literature demonstrated that upfront documentation came in the form of intra- and cross-team expectations written in wikis. Additional documentation during and at the end of the project was ensured through the iterative unit, functional, and integration tests (Marinho et al., 2019). Further, progress towards working software was often achieved through multi-level coordination of resources from impersonal modes, such as through instant messaging, to group modes, such as scrum of scrums and frequent demos (Dingsøyr et al., 2018; Hobbs & Petit, 2017; Sievi-Korte et al., 2015).

Instinctively, APM as a project management practice is popular in software development cycles. The current study found that in the context of APM, the idea of working software over comprehensive documentation – as enshrined in the Agile Manifesto – transcends its literal meaning. Several studies found ways to implement APM outside of software development cycles. Mirzaei & Mabin (2017) demonstrated that achieving cadence and delivering incremental value through APM was viable for public sector policy development. The current study found several such applications of APM resulted in the iterative delivery of "working software" in various non-software industries such as real estate, electrical engineering, and even disaster management (Baham et al., 2017; Fitriani et al., 2021; Gheorghe et al., 2017; Pareliya, 2019; Vahanvati & Mulligan, 2017). From APM's starting point in 2001, there has been constant hope and support for the move to agility. As the pace of technology adoption continues to increase, the need to respond quickly becomes paramount. APM will continue to evolve to meet additional demand.

Limitations

One of the limitations of this research is that more breadth than depth was covered. This study considered four agile values that are broad in nature. There are twelve principles of agile studies that could be applied to a similar research project to get a more in-depth view of the current state of research. We also cannot claim that this was an exhaustive search of research articles. The coding of the results from the literature as system reviews is also threatened by misclassification. This was minimized 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 use of academic subscription databases as our only source. Since APM is practical, including only peer-reviewed articles may have unintentionally biased this study toward the academic settings by ignoring periodicals and professional publications such as PMI.

Although 74% of articles were classified as agile we do recognize that some papers and studies were single value-focused. Although they do not touch on all four values, we felt they contributed to the agility of APM overall.

Conclusion and Future Research

As technology innovation is expected to accelerate, our study investigated the literature to determine how agile is APM? The evidence shows that APM is making strides towards becoming agile. There is still some work to do before APM becomes truly agile. Authors must continue to address agility using the four principles to ensure they are using APM and not claiming agility through a hybrid style. The study analyzed and evaluated 69 articles to assess the agility of APM as measured by the existence of the four agile values. The need for APM to continue to evolve and contribute to the success of high-uncertainty work will continue to grow.

Future research could focus on a more in-depth review of the twelve principles of agile studies. This would provide a more granular view on APM research to analyze how rigorous the agile methodology is being applied. Researchers could also conduct a qualitative or quantitative study on APM implementing the four values. From a qualitative perspective, a researcher could better understand APM and its application in information systems projects. A quantitative study could analyze relationships and investigate how each value could impact project success in an agile information systems project. Further, a framework could be developed by researchers to guide project management practitioners to make sure they are addressing each agile value when applying an agile methodology. Finally, researchers could investigate ways to optimize APM for high-uncertainty work within high-growth technologies. Examples include but are not limited to artificial intelligence, cloud technologies, big data, and analytics.

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