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Research Article

Team Dynamics in Agile: A Qualitative Investigation into the Potential for an Evolving Principle

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ABSTRACT

Agile methodologies have become the cornerstone of software product management (SPM) and yet the original 12 Agile Principles, formulated over two decades ago, have not been systematically revisited to reflect contemporary industry practices. This research was conducted as part of a Master of Science in Project Management program at Liverpool John Moore's University. It investigates the current agile principles in software product management by using qualitative study with structured interviews of agile practitioners with over three years of experience. The study aims to lay the groundwork for future research to explore practitioners' insights on adding or removing elements from the 12 principles. The study found the principles to be comprehensive but suggests adding a new clause on 'psychological safety' under the domain of team dynamics. The study was also able to produce a definition of 'what a valuable software' means. Further research is recommended to gather more qualitative input from experienced professionals. Agile principles focus on fast software delivery, customer engagement, continuous delivery, and experimentation, making this study relevant as the world rapidly moves toward digitalization.

Keywords: agile, scrum, extreme programming, team management, software delivery, software product, product management, team well-being, psychological safety, valuable software

INTRODUCTION

This study focuses on investigating agile project management principles and practices currently being employed by practitioners on the field in software product development. Agile methodology originated in 2001, developed by a group of software programmers who found traditional project management methodology too limiting to deliver value to the customers. One of the major reasons being the abstract and intangible nature of software product development where something tangible must be created out of the invisible. Previous works of research have been focused on certain aspects of agile like effective team collaborations, challenges faced by a self-organizing team, continuous experimentation models and case studies associated with agile, customer validation, and comparing agile methods with lean startup methods. As can be seen in the article by Yaman et al. (2017) which is a multi-case study aiming to better understand the process of continuous experimentation in a company with an established development process. While the paper by Fagerholm et al. (2014) analyses the preconditions for setting up an experimentation system, in the form of blocks of the lean model that follows the 'build-measure-learn' loop. The article, Agility Hacks, published in the Harvard Business Review points out how the agile approach may not be suitable for all situations especially when it comes to running daily business operations, but large organizations may adopt agility hacks to bypass standard admin procedures without disrupting the overall system (Edmondson and Gulati, 2021). The article by Salameh (2014)

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compare agile project management with traditional methods discussing key management topics like change and risk management, scope, communications, and leadership. Article by Murugesan and Hoda (2016) attempts to explore high involvement of technical team in project activities and its impact. Another somewhat similar work tries to identify how teams manage themselves adopting various agile methods (Buragohain, Saikia and Baruah, 2016). The paper by Jaspers et al. (2011) is a case study in which agile principles have been implemented to a software product management process so other organizations can benefit from the lessons learnt. And most of the works by Bosch and his contemporaries focus on designing a continuous software development experimentation model and enablement of continuous experimentation (Stahla and Bosch, 2014) (Matenssona, Stahl and Bosch, 2018). Hence, once again it can be concluded that most of the studies are focused on themes of team management, continuous experimentation, different methods, and communications, and there is limited research primarily focused on tracking or proposing any changes in the exisitng agile principles.

RESEARCH PROBLEM

Agile project management consists of 12 agile principles that a project must fulfil in order to be considered fully agile. These principles are more than 20 years old which makes agile methodology a matured framework. As mentioned earlier, a lot of research has been conducted in establishing the effectiveness of the agile approach, adopting multiple research methods but there is limited study or works of research primarily focused on tracking any changes in these principles, which means there is a research gap. Both the fields of project management and information technology are evolving and so continuously studying practitioners experience with agile can help us discover any new principle that can be incorporated to the existing list of the 12 principles. Hence this study is a qualitative investigation of current practitioners' viewpoint of the agile principles in software product management and if they have any suggestions for the improvement of the existing principles. Due to the limited time frame, the scope of the research is limited to the first three principles of agile as follows:

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

RESEARCH AIMS

1. To identify agile practitioners' viewpoint of the existing principles of agile.
2. To qualitatively document the above and further discuss their point of view.
3. To identify and document any suggestions they may present for improving the principles.

RESEARCH OBJECTIVES

1. Conduct a qualitative inductive study of agile practitioners.
2. Conduct structured interviews of four experienced professionals focused on the first three principles of agile.
3. Analyse their responses and present the findings.

RESEARCH QUESTIONS

- RQ 1: what do current practitioners know about agile project management and its principles?
- RQ 2: what challenges do they face when implementing agile?
- RQ 3: any improvements or suggestions that they would want to add to the principles?

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Research Article

RESEARCH SIGNIFICANCE

Agile was introduced in 2001 by a group of software developers as an answer to the rigidity of the traditional project management methods which cannot be wholly implemented when it comes to software development projects. But almost two decades have passed which makes agile more than 20 years old, also as we all know, the field of project management is an evolving one hence, it is important to revisit the agile principles by interacting with contemporary practitioners of agile framework to educate us if they implement agile 100% like it was introduced in 2001 and if they have developed any new methods or principles in the process. A qualitative approach will help us in exploring this domain because not much research is available on how agile principles have evolved or if it has evolved. A similar kind of research in this domain was conducted in 2012, almost ten years ago, which focused on what practicing software engineers thought about agile principles. The research was published as an article, 'What Agile Teams Think of Agile Principles' by Laurie Williams, using a quantitative survey method, she tried to document engineers' responses against each agile principle. At the end she had merged similar content of agile principles forming one and suggested to reintroduce agile principles, which indicates that we must keep on tracking and document any possible changes based on field research on the agile principles. Current research is thematically related but different in terms of the research methodology implemented as this study was focused on qualitatively exploring what current agile practices are being followed by experienced professionals and if they would like to add or subtract from the ones introduced 20 years ago. Hence this research can significantly add to the body of knowledge of agile project management and lays the foundation for any future work(s) in this area.

RESEARCH LIMITATIONS

The current research being conducted is qualitative inductive in nature in which structured interviews have been conducted of agile practitioners. Although the current research aims to contribute towards the academic database of agile project management, but it is still limited in scope of study and research methods adopted for data collection. Due to limited resources, the scope of the questionnaire being undertaken is focused on the first three principles of agile, hence it is not possible to fully document practitioners' point of view for the complete 12 principles of agile. It is hoped that the current research will lay the foundation for an extended study of the complete set of principles. Although qualitative research has a lot of pros like being able to collect raw data on the field in the form of interviews and case studies which gives us the opportunity to discover a new theory, technique or in this case a principle but this can be a lengthy and cumbersome effort. Because of the qualitative nature of the study, the scope of the entire study was limited because it was only possible to document practitioners' point of view on the first three principles of agile. The sample size has been kept to four practitioners with over 3 years of experience in agile methods due to the qualitative nature of the study and limited resources. This limited the ability to document more qualitative content and make connections between different themes and categories. If the sample size would have been larger, there would have been a possibility to reintroduce a newer version of agile principles.

LITERATURE REVIEW

This section will discuss previous works on agile project management starting with the status of agile in the industry of project management, how agile started, its advantages, challenges and limitations, its role in business transformation, and how it is different from traditional waterfall project management, at the end discussing the research gaps.

AGILE PROJECT MANAGEMENT

Project management is a very vast field and so with time it has created multiple frameworks or methodologies that a project manager may choose from to plan, execute and manage a project. One of them is the Agile Framework based on the agile principles published by a group of developers in 2001 at the height of dot com boom. Agile project management is operated based on the Agile Manifesto

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where the focus is to value: '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' (Beck et al., 2001). In short, agile is a mindset and a certain way of working on software development projects utilising the power of community and collaboration.

According to Stare (2013) agile approach as a project management methodology is the '21st most frequently mentioned' method with many experts claiming that it is becoming the project management approach of the century. Ambitious authors and supporters of agile predict that agile methods for project management will replace traditional approach but according to scholars this is yet to be proved because the comprehensive implementation of the approach has worked on a certain type of projects like 'the development of services and business process reengineering projects, but certainly not in construction and other engineering projects (excluding the projecting phase)' (Stare, 2013). Introduced more than two decades ago, the proponents of agile 'sought better ways to organize software development so that it would be able to meet the dynamic and unpredictable conditions that characterize the business environment for software intensive organizations' (Fagerholm et al., 2014). As rightly put by researchers, a project management methodology is chosen keeping in mind the scale of a project. With the recent rise for demand of digital products, agile methods are chosen due to its adaptive nature (Patil, Panicker and KV, 2016). Talking about mobile applications, demand for which has exponentially increased with the advent of smartphones and doing business online, scholars consider agile 'to be a natural fit for the development of mobile applications' (Patil, Panicker and KV, 2016).

According to scholars, agile faces challenges outside of the development/programmers' communities because it challenges the PMO (Project Management Office), a department where adherence to rigid systems and enterprise standards is important, hence their opinion about agile is biased (Paquette and Frankl, 2015). 'Organizations need to solve business problems rather than the traditional IT focus of deploying technology' (Paquette and Frankl, 2015 p. 7). Hence according to Tichy et al. (2015, p.993) companies need to address three aspects for them or their teams to be agile: '1) The technology for all different phases of software engineering like requirements engineering, architecture and design, implementation, and validation and verification must be adapted to support for parallel engineering of software. 2) The whole research and development organization must adapt to be compatible with the agile process in the development teams. 3) Approaches for live experimentation must be available and the results must be appropriately fed back into the artifacts of the different phases which are affected by the results of the live experimentation'.

Talking about business satisfaction when agile, referring to previous research, project managers who followed a traditional pathway to manage their projects were less satisfied as compared to agile project managers, 'while agile companies were also more satisfied with their client relationships than plan-based companies' (Stare, 2014 p.299). Furthermore, Stare (2014) highlighted that agile when implemented without structure created chaos in large complex projects which rely heavily on planning, coordination and control. 'Structure without agility can lead to rigidity, particularly when a project involves a great deal of learning, discovery, and changes' (Stare, 2014 p.299). Stare (2014, p.300) has pointed out three main indicators for project success as client satisfaction, product success in the market and financial success. From the above, one can conclude that agile may not suit all types of projects and for a business to be fully agile, they must checkmark if the prerequisites of agility are being fulfilled, which naturally drives us to ask if there are any wholly agile companies at all? And if yes, how many are they?

As reported by some scholars, agile development is an umbrella term pointing towards other agile methodologies. Some of the methods included when signing of the Agile Manifesto in 2001 include XP (Xtreme programming), Scrum, DSDM (Dynamic system development method), and FDD (Feature driven development) (Patil, Panicker and KV, 2016). 'Since then, lean practices have majorly merged as

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a valuable agile methodology and are included under the agile development umbrella. The most powerful technique amongst these is the Scrum which is rapidly being used in the mobile development applications' (Patil, Panicker and KV, 2016). Scrum challenges the traditional project management approach towards product development, enables teams to self-organize with flexibility towards physical co-location or online collaboration with daily face-to-face meetings with team members. It is an incremental, iterative software development approach (Padda et al., 2014). This moves us to the next topic that how agile and waterfall are differentiated?

When it comes to software development, scholars mostly have a consensus on agile being the best method of project management. In traditional waterfall method, 'a formal, sequential process of planning, analysing, designing, implementing and maintaining is followed' (Nkukwana & Terblanche, 2017). Compared to the above method, agile is different in a way that: software development is fast and iterative in nature, result oriented with the customer being constantly involved in giving feedback on the features being developed (Stettina & Horz, 2015).

As Stare (2014) mentions in his research, waterfall and agile project management can be differentiated in four domains, that is, requirements & specifications (the level of detail at the beginning of the project), project scheduling (iterations and a rough schedule at the planning phase), teamwork (self-organised teams, daily meetings), and the client collaboration (the representative of the client is a regular team member). Traditional requirements and solutions need to be vividly defined with the expectation that large scope changes will not happen, the projects will follow a set pattern repeatedly, as if using a successful template. While in agile, the requirements and possible solution is partially known, scope changes are expected, and new features may prop up during the project which the team might not know when starting the project.

According to Standish Group (2013), agile gives us an important paradigm shift, the techniques enhance 'technology project performance' by improving upon stakeholder feedback process, provide companies a competitive advantage while scaling down risk by providing business value sooner and frequently throughout the PDLC (project delivery life cycle). According to experts, agile techniques enhance an organization's competitive advantage through better teamwork, communications and change management (Paquette & Frankl, 2015). Although being 20 years old now, according to scholars, agile offers a new approach to delivering systems integration and challenges the status quo (Paquette & Frankl, 2015).

Agile is focused on creating organizational and business value throughout the project life cycle. It advocates efficiency, flexibility and speed, traits that are highly valued in the software development industry (Tichy et al., 2015). 'For instance, Amazon releases new software every 11 seconds and carefully measures the value that this software provides to customers' (Tichy et al., 2015 p.993). When implementing agile for business transformation, projects must efficiently align information and communication management systems according to stakeholders' expectations which may later lead to producing progressive business results. 'More than one-third of Enterprise Resource Planning (ERP) project failures happen because of organization and cultural issues' (Paquette & Frankl, 2015) which can be linked to inefficient information management and communications systems. Agile manifesto wants to overcome this roadblock through its defined principles. According to Olsson & Bosch (2015), agile methodology has gained wide recognition within the field of IT because it promises shorter time to market and a higher flexibility towards change requests that gives an organization the ability to proactively respond to changing customer needs. Also, they both point out that having close collaboration with the customers gives companies the opportunity to frequently validate functionalities which reduces the risk of developing unwanted features (Olsson & Bosch, 2015). We can also say, this in turn, helps reduce digital waste when it comes to time and cost management. Experts have reported that most companies follow agile in order to release new features and products fast to the market 'as a way to improve their software engineering efficiency' (Olsson & Bosch, 2015). Both also claim that

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Research Article

originally agile started out for small, collocated IT teams, but with time, the method has also attracted attention by companies working on large-scale software development 'and today there are several attempts such as Industrial XP and Scrum of Scrums aiming at scaling agile methods' (Olsson & Bosch, 2015).

Pointing towards the authors of the Agile Manifesto in 2001, Stare (2014) states that the creators of agile believed that the approach brings a lot of value for both the client and the project team. They also envisioned that the approach would prove beneficial 'for all types of projects' but Stare believes that this has yet to be proved. Despite some doubts on implementing agile at scale, Stare believes that agile practices can be used for projects of product development that would have previously been carried in a traditional method (2014). 'In an interview with Bowles Jackson, the manifesto's authors also stated that the agile approach is useful for all types of projects and beyond' (Stare, 2014). According to him in agile approach the stage of defining specifications, the last part of initiation, is moved to the execution stage. According to Stare (2014), this effects the accuracy of planning and there should be some rough plan or schedule for the whole project from the beginning while iterations may be planned in detail at the execution phase. Early execution and delivery mean early return on investment which can further be utilized on additional iterations or on newer projects (Stare, 2013) depending on organizational goals and priorities.

One of the best examples of agile being implemented at scale is that of Spotify, that even one of the manifesto authors, Alistair Cockburn, is said to have been impressed with Spotify's implementation of agile by stating 'that he was looking for someone to implement this matrix format since 1992' (Patil, Panicker and KV, 2016). Instead of a scrum master, Spotify has an agile coach while teams became squads, with extended organizational teams grouped as tribes and chapters. 'Squads are supposed to inform they depend on any other squads or vice versa. Guilds is a lightweight community where knowledge, tools, code and practices are shared. Squads are empowered and free to develop their own systems and practices' (Patil, Panicker and KV, 2016, p.75). The purpose of squads is to let team members know they depend on each other also one squad may depend on the other as well and vice versa. Each squad is empowered and is self-organized meaning they are 'free to develop their own systems and practices' (Patil, Panicker and KV, 2016, p.75).

According to Edmondson and Gulati (2021), agile 'has swept the business world'. It has encouraged organizations to create small teams that are cross-functional and empowered to solve problems, develop solutions, build consistently, collect customer feedback continuously and adapt. Although agile has roots in software development, but its functions have spread to other segments of organizations (Edmondson and Gulati, 2021). Conducting experiments help companies decide on which features to implement thus avoid producing development waste and features that may not be of use to the customers (Olsson and Bosch, 2015).

CHALLENGES AND LIMITATIONS OF AGILE

When talking about challenges and limitations in agile as a project management framework one can also face challenges in the form of organizational or management bias, where management expect project managers to command control of the development while the team looks towards them as more of a facilitator (Nkukwana & Terblanche, 2017). Apart from that, agile may not always be the solution to an IT project and so the project manager would have to decide keeping in mind the requirements of the project, to choose the right management framework which may bring in project success (Thesinga et al. 2021). Also, according to multiple scholars, human resource architectures appear to have an impact on the successful implementation of agile in an organization hence impacting performance of the framework (Zavyalova et al., 2019).

As Yaman et al., (2017, p.196) state in their research, 'companies have adopted agile from the start, but many established companies are based on a different approach and operating philosophy. Such

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companies must undergo a profound transformation if they wish to adopt an agile approach'. When transitioning towards agile development, companies undergo several steps of adaptation and builds on three basic principles: 'software is evolved or developed through frequent deployment of new versions, customer data is used throughout the development process, and new ideas are tested with the customers in order to drive the development process and increase customer satisfaction' (Yaman et al., 2017 p.196). Agile cannot be considered as a great methodology for all projects as every framework cannot be suitable to all projects hence, referring to a previous research Stare (2014) points towards problems with passive behaviour of stakeholders (team members) that may directly impact a project's performance even though they are empowered but they may be reluctant to take decisions outside of their positions.

Further talking about challenges in agile, it can be noted that it is difficult in large-scale agile development for the product owner to represent and cater the needs of a bigger customer base (Olsson and Bosch, 2015). The researchers in their paper gave a conceptual model for B2B software companies to collect customer feedback in order to prioritize feature development (Olsson and Bosch, 2015). Scholars have pointed out that adopting an experimentation approach may not be suitable for every project for example, in case of a life-critical software but at the same time researchers say that more study needs to be done with reference to experimentation (Fagerholm et al., 2014). Further challenges lie in the integration of experiments results at the software development process and product development cycle (Fagerholm et al., 2014). With discovery of this ‘newfound flexibility’, the freedom and empowerment that it brings with it, the challenge for companies is no longer to ‘solve technical problems, but rather’ solve relevant problems that bring value to the customer (Fagerholm et al., 2014) hence it is pertinent to develop a skill to identify the right problems worthy of solving by a business and this can only be done if a business closely engages with customers and asks them the relevant questions.

While acknowledging the benefits of agile, scholars also point out that the approach is less effective for functions or operations that require consistency, examples may include high volume manufacturing and production of paper, chemicals or aluminium (Edmondson and Gulati, 2021). Kramer (2017) highlights in his article 'Beyond Agile: Why Agile has not fixed your problems', that the benefits of Scrum, Kanban and other agile methods plateau when they meet organizational constraints, meaning when innovation meets head-on with legacy systems, procedures, policies and culture. Bjork and others (2017) suggest that agile is majorly solution focused, meaning the approach can be applied where we know the problem but not the solution. So, their question is what happens in contexts of greater uncertainty like in a startup, where both the problem and the solution are unknown? According to them the agile approach is limited when it comes to software development in a startup where the developer is somewhat engaged in business alongside technical development (Björk, Ljungblad and Bosch, 2017).

RESEARCH GAPS

As can be seen in the above extended literature review, most of the research conducted in agile methodology focuses on management of continuous iteration, self-organizing teams, challenges of implementing agile, organizational case studies and benefits of agile in comparison to other project management methodologies. In the light of the above, it has been observed there is limited research on what practitioners’ have to say about agile manifesto and the principles and only one research, published in 2012, has been discovered titled, ‘What Agile Teams Think of Agile Principles’ by Laurie Williams, using a quantitative survey method, she tried to document engineers’ responses against each agile principle. Based on the responses collected, she introduced a revised version of agile principles in which principle 3 was made redundant and the content for principles 1, 9 and 10 remained unchanged while the remaining principles were updated (Williams, 2012). This indicates a significant gap in research because the above study is more than 10 years old, hence the current study aims to lay foundation for newer series of studies in this domain.

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RESEARCH STATEMENT AND METHODOLOGY

The research statement for the current thesis is qualitative investigation of the first three agile principles in current software product management. Nature of the research is qualitative exploratory and the reason for choosing this type of research design is to engage with current practitioners of agile methodology.

RESEARCH DESIGN

This section defends the reasons for choosing a qualitative approach while also sharing any similar work(s) that have been done previously. A similar kind of research in this domain was conducted in 2012, almost ten years ago, in an article, 'What Agile Teams Think of Agile Principles' by Laurie Williams. That research was purely quantitative using survey method and focused on what practicing software engineers thought about agile principles. The current research is related but somewhat different as the focus is on qualitatively exploring what current agile practices are and if they are different from the ones introduced 20 years ago. Four experienced agile practitioners with over 3 years of implementing agile in software companies have been interviewed as case studies. The duration of the interviews was around 40 minutes on average and the interview questionnaire was shared in advance.

There are very few qualitative research and publications in the current topic that helps us understand how agile principles have evolved or if it has evolved and if practitioners adopt 100% agile approach, also what challenges do they face when trying to implement agile or being agile in software development. Due to popularity of agile, many innocently believe that once the method is implemented then all their organizational problems will disappear, which as per Respondent 4 (R4) is not the case. Also, for an organization to qualify as agile, all 12 principles of agile must be followed by an organization which is a daunting task, also confirmed by Respondent 3 (R3). These are on-the-field insights that can only be provided by experienced practitioners, one-to-one, during an extended interview session following a qualitative approach.

Another reason for choosing a qualitative research approach was because most of the published works are either quantitative or mixed methods focused on a certain aspect of agility like teamwork, agile human resource frameworks, case studies focused on self-organizing teams, comparative studies between agile and waterfall, or agile requirements gathering, works related to current practitioners' recent feedback (specifically) on agile principles have not been found yet. Hence there are fewer qualitative pieces of work that document a practitioner's experience and viewpoint regarding agile project management. Quantitative research mainly focuses on objectively testing theories through examining relationship between multiple variables, which are measured quantitatively (Creswell, 2014). Whereas qualitative approach focuses on 'exploring and understanding the meaning individuals and groups ascribe to a social or human problem' following an inductive style which typically involves collecting data from the participants settings (Creswell, 2014). Mixed methods approach on the other hand is an amalgam of both the above, 'integrating the two forms of data and using distinct designs that may involve philosophical assumptions and theoretical frameworks' (Creswell, 2014). Hence, keeping in mind the limited time frame and scope of this study as part of Master's program, a qualitative interview case study approach deemed fit because as a researcher the data collection methods are more in one's control. In case, if for the current research a survey method has been adopted, the response of the respondents in terms of quality would have been out of control. Also, when going for a survey approach, one cannot be sure if a respondent will fill out the complete form, a situation that one dreads as a researcher because getting a hold of a respondent can be a challenge. In a structured interview setup, one has organized and setup the research environment in advance which helps the respondents get comfortable and be prepared for what is going to come next. Also, when opting to conduct an extended interview with experienced industry professionals, as a researcher one can be confident that the qualitative information being gathered will be of high academic value. Same applies for a mixed method approach, one needs to be experienced in mixed methods and have ample time to carry out

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such an ambitious endeavour. The qualitative exploratory approach was also selected keeping in mind long term academic endeavours as well, like a publishing an article and applying for a PhD, this qualitative study will prove to be a foundational work to be used as a steppingstone for future research ambitions.

RESEARCH APPROACH JUSTIFICATION

Just to briefly iterate a justification for qualitative approach explained above:

- On-the-field insights that can only be provided by experienced practitioners, one-to-one.
- Qualitative approach helps in collecting raw data from professionals.
- Qualitative study here has helped in identifying a possible new principle to be incorporated in agile principles.
- The qualitative approach has helped extract 239 codes and 9 categories that have been discussed in this article.
- In a qualitative structured interview setup, gave the opportunity to setup the research environment in advance which helped the respondents get comfortable and be prepared for what is going to come next.

RESEARCH PROCESS

This section explains the research process for recruiting interview respondents through using email and social media templates, the questionnaire design, and the data collection and analysis process. Please find table RM-1 listing all the research steps, ingredients and tools, details of which will be explained in the respective section.

QUESTIONNAIRE DESIGN

After identifying the research statement, aims and objectives the next step was to design a questionnaire (see Table RM-2) and recruit relevant experienced industry professionals who have ample work experience in multiple project management methodologies especially in agile that puts them in a position to easily identify and differentiate between the pros and cons of multiple project management methodologies. The respondents needed to have at least 3 years of agile implementation experience in order to qualify for the interview. Because agile is still deemed as a new project management method hence it is understandable that someone having agile experience of around 3 years has project management experience exceeding this duration, meaning they are exposed to other project management methodologies. It is also important to point out that in order to contain the scope of the research, focus of this study has been on the first three principles of agile. Originally the scope was to cover all 12 principles which extended the questionnaire to cover around 57 questions. This would have taken the interview recordings to span over hours resulting in transcription of huge amount of content. It was deemed fit to limit the scope and focus on the first three agile principles which may later be extended when going for a publication or a higher qualification. Please find the final questionnaire template in the Appendices.

PARTICIPANT RECRUITMENT

For interviewee recruitment, an email and social media template was designed and shared within relevant groups and connections. Please see email and social media templates at the end of this chapter. Tools used to design these templates are MS Word and Canva (an online graphic designing platform). The recruitment advert was shared within the following groups, organizations and members within organizations (see table RM-3 in Appendices). Four industry professionals volunteered were interviewed for a duration of 30-40 minutes. These professionals have implemented both traditional and agile project management in software setups and have accumulated extensive experience. After they had accepted to volunteer, an interview invitation was emailed along with the questionnaire

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template reiterating the purpose of the interview, its duration, meeting link and the process of the session. For the purpose of confidentiality, respondents' names have been changed to 'Respondent n', hence list of the respondents with their professional experience can be found in table RM-4 in the Appendices.

DATA COLLECTION PROCESS

Once the time and date were setup as per a respondent's convenience, meeting started by first introducing myself, reiterating the purpose of the study and confidentiality policies as per the Masters program requirements set by Liverpool John Moores Univeristy. Recording of the meeting commenced after the respondent agreed to move ahead. MS Teams was used as a meeting tool and for recording and transcription later. Once a meeting had concluded, the recording was saved on the campus drive due to GDPR. The interviews were transcribed later, and colour coded for thematic references. Please view table RM-5 for list of transcribed data in the Appendices.

DATA ANALYSIS PROCESS

Based on the questionnaire, nine thematic areas were deduced for content analysis, coding and referencing, details of which are listed in table RM-6 along with colour codes. Deductive coding was implemented instead of inductive, because the purpose of the questionnaire and research purpose was vivid since the beginning. Over 25 thousand words have been transcribed using MS Teams recording feature and colour coded for references and content analysis in MS Excel. Please see table RM-6 in Appendices for categories and colour codes.

- **Step 1:** The collected interviews were organized for analysis. MS Teams recording feature automatically transcribed the qualitative interviews. The four interviews were proofread, and general sense of themes was organized. Nine categories were extracted for coding explained below.
- **Step 2:** All the proofread transcripts were hand coded in MS Word and organized in MS Excel against each category. A total of 239 codes were extracted and divided for analysis under the following:
  - **a.** Any references to 'agile methods' were documented under this rubric in yellow. A total of 26 codes were collected.
  - **b.** References to 'agile principles are valuable' were coded under this heading in turquoise which generated a total of 16 codes.
  - **c.** Category, 'satisfying the customer', generated 20 codes in bright green colour.
  - **d.** A total of 20 codes were generated for the category, 'defining valuable software', where the purpose was to document what practitioners considered to be a valuable software.
  - **e.** A total of 49 codes were collected under the category, 'step-by-step delivery process', where the purpose was to document each practitioner's software delivery mechanism.
  - **f.** Category, 'managing change requests' generated 15 codes and aimed at documenting how change requests are handled in the field.
  - **g.** Category, 'best practices', colour coded in dark grey generated 38 codes. The purpose here was to document the best practices implemented by the practitioners.
  - **h.** The second highest codes (47) were generated under the category, 'challenges and limitations' which helped document the issues faced when implementing agile.
  - **i.** One of the most important categories, 'suggestions/improvements in agile principles', generated 8 codes and purpose here was to discover any new suggestions that may improve upon the existing principles.
- **Step 3:** The next step was the interpretation of the collected data under each category. 'The most popular approach is to use a narrative passage to convey the findings of the analysis' (Creswell, 2014). Hence for the current research, narrative description and its analysis was undertaken but due to limited article space we'll focus on the summary generated from their

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Journal of Information Systems Engineering and Management
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responses. Inductive analysis of the data was undertaken to understand practitioner's viewpoint based on the categories; effort is made to find answers to research questions.

- **Step 4:** Based on the above conclusions were formed and suggestions for further research have been briefly discussed.

RESULTS AND DISCUSSIONS

This section focuses on the data collected during the study which includes summarised qualitative feedbacks of the four respondents. Their narrative responses have been divided under eight headings on agile methods, value of the principles, customer satisfaction, defining a valuable software, their step-by-step delivery process, agile best practices, challenges and limitations faced during implementation and any suggestions or improvements they might have for incorporating into existing agile methods. The discussion will start with agile methods followed by each respondent's answer succeeding which will be a feedback and discourse on the responses under each heading.

For the purpose of iteration, the study is looking into current practitioners know how of agile principles; whether agile is being implemented by their organization and clients a hundred percent; what challenges they face; and any suggestions or points of improvement they might have stumbled upon over the course of their experience in agile. The following tables (also available under Appendices) illustrates the respondents overall project management experience alongside their exposure with agile implementation and categories for analysis which have been colour coded in MS Excel, a total of 239 codes were generated.

Respondents	Career Experience	Agile Experience	Experience Type
R1	12 years +	5 years +	Corporate
R2	10 years +	4 years +	Corporate + Startup
R3	10 years +	10 years +	Corporate
R4	18 years +	12 years +	Corporate + Startup

Table RM-4: Recruited respondents professional experience

Interview	Respondent (Rn)	Transcribed Words
Interview 1	R1	5257
Interview 2	R2	5408
Interview 3	R3	9235
Interview 4	R4	5995

Table RM-5: Details of transcribed data

	Categories for Analysis	Colour Code	References
1	Agile Methods	Yellow	26
2	Agile Principles are valuable	Turquoise	16
3	Satisfying the customer	Bright Green	20
4	Defining valuable software	Grey	20
5	Step-by-step practitioner process	Red	49
6	Managing change requests	Dark Yellow	15
7	Best practices	Grey	38
8	Challenges and limitations of implementing agile	Yellow	47
9	Improvement in agile principles	Teal	8

Table RM-6: Details of themes for analysis colour coded in MS Excel and Word

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1. Agile Methods

In this section we will cover what prior knowledge respondents' have about agile. The purpose here is to document their own personal understanding and definition of agile. As we all know, agile has further sub-divisions, so this section also helps us in documenting what agile methods they follow in the field.

After reviewing the responses, we can say that each practitioner has their own generic understanding of agile methods. For R1, agile is not only a project management method but a certain way of thinking, while R2 emphasizes on fast and iterative delivery. Due to R3 and R4's extensive work experience in agile, we can say that their responses are extended and comprehensive pointing towards their field work in implementing agile projects. R3's understanding of agile methods revolves around customer value, fast and iterative delivery, and an empowered and self-organizing team. While R4 thinks of agility as a form of learning which is a natural conclusion for having an iterative approach towards learning. While referring to the questionnaire, the responses to this section come from Q3 and Q4. Although the responses are self-evident and on surface it appears to be pointless to ask practitioners about what they already know regarding agile but sometimes simple questions like these can give deeper insights into what they as professionals think and how they approach a certain project methodology and that was the intention of this section. The key words to take away based on the responses are agile mindset, iterative approach, fast delivery, customer value, team flexibility and autonomy, and learning.

2. Value of Agile Principles

In this section we investigate practitioners' point of view regarding the value they see in agile principles. The purpose is to document their understanding of the principles and what they find most valuable about them in the field.

Referring to the questionnaire, the responses for this section have been collected under Q5 and Q6 and the purpose was to document if the respondents found the agile principles valuable. The objective here was to indirectly look for clues where they may point towards some limitations in agile principles or methods. Overall, they find the agile principles valuable. R1 points out that the principles are valuable because they are based on human psychology where teams feel safe to design, change and deliver while being customer focused, while R2 considers them valuable because of its focus on creating customer value, delivering features in increments and building responsible teams, although also pointing out that convincing and negotiating with clients as a stakeholder can sometimes be a challenge. While giving a waterfall project example and highlighting its limitations, R3 finds agile principles valuable because of a team's ability to develop and export a feature as soon as it is complete. Customer value delivered by happy empowered people is what R4 thinks makes agile principles valuable. Although all the project methods are valuable and hence these questions are generic in nature, but they give insight in to how a practitioner views a certain method and what they find more valuable in agile principles. This helps in narrowing down the value proposition offered by a method and if one can revisit these responses, we can see that each practitioner has their own feedback of they find most valuable when it comes to agile principles.

3. Customer Satisfaction

This section points towards the first agile principle that talks about customer satisfaction and states that, 'highest priority is to satisfy the customer through early and continuous delivery of valuable software'. Hence, we can conclude that the focus of this principle is on customer satisfaction. This section lists the practitioners' emphasis and feedback on customer satisfaction and their viewpoint on the first principle. Also, the theme customer satisfaction has been recurring throughout all the interviews.

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Research Article

As mentioned earlier, this section covers the respondent's viewpoint on the first principle of agile focused on creating customer value and the responses for this section were covered under Q2 of the questionnaire. Extensive in-depth response was garnered by the respondents with examples. According to R1 customer satisfaction lies in expedited or value delivery which when following a waterfall method cannot be accomplished. Fast delivery also ensures business agility and right to market which, correctly pointed out by R1, when following a waterfall cannot be achieved and hence the customer would have missed an opportunity. But then identifying the right customer is also very important, as put by R2, who points out that in order to satisfy the customer identifying who the end user is, what they need, and the priority of a certain feature can help developers and project managers. Giving an extensive case study example, R3 explains that the first principle of agile basically talks about customer value in a way that features are delivered in an expedited manner but without disrupting the existing smooth experience. This is a valid point when delivering software functionalities because doing work fast may also lead to creating waste or clash with other business priorities. Another point to consider when ensuring customer satisfaction is to deliver on one's commitments as soon as possible. On the other hand, R4 points towards lack of knowledge on part of the customers because when developing software features, clients need help in visualizing what exactly they require to be developed and an iterative approach is helpful in this respect.

4. Defining Valuable Software

This section illustrates how valuable software is defined by the respondents. The purpose here is to assess and document this definition because if we refer to the first principle, one of the focuses is on delivering valuable software, hence defining what that means is essential to understand from practitioners on the field.

Software that fulfils customer requirements, successfully passes quality assurance and has space for improvement are, according to R1, the defining features of a valuable software. While the definition of a valuable software, according to R2, is software that is in alignment with the product, vision for the product, revenue and customers. On the other hand, R3 has pointed out multiple elements that may define a valuable software like resolving bugs or issues quickly, over delivering software that may be requested by the customer out of scope and which may not be planned, and software that enhances user engagement are the definition of a valuable software. Explanation provided by R4 has a unique perspective when comparing with others, where he has pointed out that there are only two elements that define valuable software, one if the customer is willing to pay for it and second if users continuously use it.

So, if we summarise and build a definition of a valuable software based on the responses above, it will be something like this: **valuable software is something that fulfils the customers' needs, aligns with the current product and its future vision, generates revenue, successfully passes quality assurance, enhances user experience, and creates user engagement in a way that they keep on coming back.**

5. Software Delivery Process

This section illustrates a summary of the delivery flow and the elements associated with it from the responses of the respondents to assess if there are any similarities. The purpose here is to conclude a comprehensive software flow based on the data collected in this respect.

When going through the responses individually, we can see that practitioners follow a process. In the beginning, there are a series of client workshops setup to understand their problems held together with your team in order to come up with a proposed solution or plan. Next, step is to divide this plan into deliverables of 30, 60 and 90 days. After which we pick up the 30-day deliverable(s) and divide it into total number of iterations which can be a big iteration or two small iterations of two weeks each. For

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each iteration, the product owner sits with the team and works on the user stories, the team gives an estimate, which is taken to the client for approval. Once we have a go-ahead, development starts and during that time they are attending regular cadences like daily stand-up meetings (in other words huddle mentioned above) in which they discuss what they are doing on a day and what they plan to deliver the next day along with any blockers. The Scrum master ensures that the team feels safe, and the blockers are removed on the path to delivery. By the mid of the two weeks, there is a sprint review which includes a short demo cycle with the client for quick feedback on what has been delivered and note any amendments that need to make after the sprint. Also, right after this Sprint you would have a retrospective where the teams would be discussing what went well in that Sprint, what did not go well and what are the action items and if there were any major problems that need a resolution, and this process moves forward in a spiral cycle.

6. Agile Best Practices

This section covers best practices adopted by the current practitioners of agile project management. The purpose here is to document any unique approach adopted. The responses to this section were collected under the questionnaire segment Q12 and Q13.

Based on respondent feedback, we can conclude that the best agile practices being followed by the current practitioners are a reiteration of what the agile principles have already taught us, for instance, frequent delivery in the form of sprints, planning a sprint, engaging with the customer for requirement gathering and not being afraid to adapt and release unplanned software if it can enhance customer experience. One point to note is R1's emphasis on planning an iteration comprehensively in order to avoid delivering unvaluable software.

7. Challenges and Limitations

Implementing a certain framework can be challenging as practitioners might face certain limitations, hence this section documents the problems that exist during agile project implementations. The response for this section were collected under questionnaire section Q7, Q16 and Q17.

The most common challenge faced by current practitioners is resistance or lack of understanding of agile principle by the senior management. As R4 correctly points out, agile transformation can only happen from top down and not the other way round. Other elements that contribute to these challenges are the cost associated with either hiring of the right skill-based professionals or training of existing staff members.

8. Suggestions for improving agile principles

One of the research objectives is to document if the current practitioners have any suggestions for the current agile principles, they have been working with over 5 years. The purpose here is to utilize these recommendations and may be later propose amendments to the existing agile principles. These responses can also be compared with responses in section 2 and 6 above where value of agile principles and best practices when implementing in agile is discussed.

According to R1, the quality of agile principles is that they are constantly evolving and so the authors of the principles and supporters of the methodology continuously come up with new concepts. And because we live in a disruptive environment so following one set of (static) principles will not suffice. **We will have to be more innovative with the way we operate in an agile setup**.

According to R2, the principles are already comprehensive rather we have not been able to implement them wholly hence I cannot suggest any improvements but there is always space for improvement, experts would know more. **As a practitioner I do not feel these principles need improvement**.

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Research Article

As per R3 experience the existing agile principles do not need any improvements themselves but suggests that **the principles are most effective when the team applying them has come to some agreement or has at least had open dialogue about what those principles mean** when applied to their project. If you are on different ends of the spectrum with some of these definitions, then it will be a challenge to work together and collaborate.

In contrast to others, R4's criterion for agility is how easy it is for an organization to deliver a bad piece of news; make a change in a plan; and talk to people at every level. R4 does suggests **adding another principle around psychological safety** because for innovation to happen, it is very important to cultivate an environment where you have people laughing, having fun, working together. Such a group of individuals are productive, happy, and creative people.

Overall, the respondents are satisfied with the existing agile principles, and consider it to be comprehensive enough to cater to multiple scenarios and projects. Their suggestions mostly revolve around designing a better strategy of working with agile and amongst team members which indicates that on field, challenges are faced at the team level when working in agile, hence this also gives us an explanation of why more research work has been conducted on agile team coordination.

CONCLUSION

The current study was conducted as part of a Master of Science in Project Management program with Faculty of Engineering and Technology, Liverpool John Moore's University. It is an effort to investigate the current agile principles in software product management. It is a qualitative inductive study in which structured interviews were conducted of agile practitioners with over 3 years of experience. The existing agile principles are more than 20 years old and there has been limited work on reintroducing a newer version of these principles. Hence, the aim of the study is to lay the foundation for future extensive research to document practitioners' viewpoint as per their professional on-the-field experience in order to discover either newer elements to add or eliminate that which is not needed in the 12 agile principles. In the process of the study, it was discovered that the overall agile principles are comprehensive but a new clause surrounding 'psychological safety' can be constructed. Hence, further studies can should be undertaken to document a larger number of experienced professionals' qualitative responses and update the existing agile principles.

The agile manifesto consists of 12 principles focused on fast delivery of software, proactively engaging with customers, continuous delivery of software, and continuous experimentation to improve the current customer experience. It was important to conduct this study because agile project management is followed majorly for software product management and currently the world is moving at a very fast pace towards becoming more digital every day.

The research statement for the current thesis was qualitative investigation of the first three agile principles in current software product management. Nature of the research is qualitative exploratory and the reason for choosing this type of research design is to engage with current practitioners of agile methodology. Ask them about their knowledge in the domain.

Referring to Literature Review chapter, the existing works of research have focused on management of continuous iteration, self-organizing teams, challenges of implementing agile, organizational case studies and benefits of agile in comparison to other project management methodologies. Considering this, it has been observed there is limited research on what practitioners' have to say about agile principles. It was also found that only one research, published in 2012 titled, 'What Agile Teams Think of Agile Principles' by Laurie Williams, using a quantitative survey method, she tried to document engineers' responses against each agile principle. Based on the responses collected, she introduced a revised version of agile principles in which principle 3 was made redundant and the content for principles 1, 9 and 10 remained unchanged while the remaining principles were updated (Williams,

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2012). This indicated a significant gap in research because the above study is more than 10 years old, hence the current study aimed to lay foundation for newer series of studies in this domain.

With reference to the above, structured qualitative interviews of four industry professionals with over 3 years of experience was conducted. Based on the data collected, the following definition of a valuable software was designed: a valuable software is something that fulfils the customers' needs, aligns with the current product and its future vision, generates revenue, successfully passes quality assurance, enhances user experience, and creates user engagement in a way that they keep on coming back.

The research questions mentioned above were successfully answered and a new qualitative discovery was made, that is, one of the respondents suggested to add a new principle around 'psychological safety'. Reference to research question one (RQ1), it was found that agile is not only a project management method but a mindset of self-organizing oneself, delivering value quickly, failing fast and learning from mistakes. In terms of software product management, the focus is to deliver a product in a shorter span of time by a self-organizing team, operating at a certain level of autonomy to take decisions. Customer satisfaction is ensured through demonstrating business agility which means, try to be the first in the market or deliver a product that will not disrupt the existing customer experience. In other words, deliver on one's commitments because at the end it is about creating customer value by happy, healthy and empowered group of individuals. In this reference, understanding the customer and identifying the right customer is very important.

Reference to research question two (RQ2) regarding challenges when trying to implement agile, it was understood that practitioners mostly face resistance from the senior management due to their lack of education regarding agile methods and what it really means to be agile. Other challenges include, training, hiring and retention of skilled workers in agile and the cost associated with it. All the respondents iteratively mentioned similar challenges.

Reference to research question three (RQ3) regarding any suggestions or improvements to be incorporated in the existing agile method it was understood that over all the current version appears to be satisfactory and hence there is no need of eliminating any principle now. The suggestions mostly revolve around designing a better strategy of working with agile and amongst team members which indicates that challenges are faced at a team level when working in agile, hence this also gives us an explanation of why more research work has been conducted on agile team coordination. A small discovery was made in which one of the respondents suggested to upgrade the existing version of agile principles by adding a clause around 'psychological safety'. Due to the limited scope and nature of the study, it was not possible to discover any further clauses that can be suggested to add to the existing principles. If this were extended research like a PhD following a mixed methods approach, there would have been a possibility to revise the existing principles and suggest a newer version of agile principles.

Overall, the study appears to have achieved its goals and objectives but in terms of the topic of research, it would be interesting to see more work in this domain. It is hoped this study will lay the foundation to periodically revisit and revise the agile principles. It is also understandable that agile is a mindset and the existing principles do offer space to evolve existing software management practices hence there has never been a need to update the existing principles. But because the world is moving more towards being digital and agile, it will be valuable to further investigate these principles. Also as indicated by the authors of agile manifesto that these principles can be part of any project, hence limiting their scope to software products means, other industries are not able to make the most of what this mindset can offer. In conclusion, just revisiting practitioners' point of view with reference to agile principles may further open interesting topics of how agile can be implemented in other fields as well.

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Appendices

Table RM-1: Research design process

	Research Design Process	Tools
1	Identify research statement and questions	
2	Design questionnaire	MS Excel
3	Design participant recruitment template (email/social media)	MS Word, Canva
4	Launch recruitment template	Email, Facebook Groups
5	Interview Invitation Email template	Email
6	Conduct Interview with recording	MS Teams
7	Transcribe Interviews	MS Word
8	Add thematic coding	MS Excel, Colour Coding
9	Extract list of references based on coding	MS Excel
10	Conduct content analysis under identified themes (results & discussion)	
11	Conclude	

Table RM-2: Interview questionnaire template

	Questionnaire
Q1	Introduce myself and the purpose of this meeting
Q2	Inform respondent regarding privacy and confidentiality
Q3	What do you know about agile?
Q4	What other forms of software project management have you implemented or are aware of apart from agile?
Q5	Do you think agile principles are valuable?
Q6	Do you think agile principles are error free?
Q7	What are the limitations of agile methods?
	There are 12 agile principles that must be integrated in a project in order for the project to qualify as agile. We will now look into those and have a discussion on those principles.
Q8	P1: The first principle of agile focuses on giving 'highest priority is to satisfy the customer through early and continuous delivery of valuable software', what is your takeaway from this principle?
Q9	How do define valuable software?
Q10	How do you close the scope and gather requirements in order to ensure early delivery? Can you help us go through the step-by-step process that you as a practitioner follow?
	P2: Welcome changing requirements even late in development; agile processes harness change for the customer's competitive advantage.
Q11	How do you manage frequent change requests in terms of time, cost and quality?
	P3: as agile practitioners we have to make sure to 'deliver working software frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale.'
Q12	What best practices do you follow and why?
Q13	How do you make sure frequent delivery?
Q14	What is your delivery flow/process? OR can you share your process of software/feature delivery?

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Research Article

Q15	Would you call yourself (organization) fully agile?
Q16	What challenges do you face when implementing agile practices?
Q17	Why do you think you face these challenges?
Q18	Are there any improvements that you would like to suggest to these principles?

Table RM-3: List of participant recruitment email/posts

Group/Organization	Template	Type
IBM (Middle East)	Email	Professional Connection
Khudi Ventures	Email	Professional Connection
Techwomen	Social Media	Facebook
Agile Project Management	Social Media	Facebook

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