Antecedents of Preference for Agile Methods: A Project Manager Perspective

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Abstract

Using a Grounded Theory approach, this research reveals a view from a project manager's perspective on the factors influencing preference for agile methods. Fifteen managers were interviewed and theoretical constructs developed reflecting the factors influencing their preference. Positive, negative and contingent factors emerged from the data. The core category discovered is pragmatism. Project managers exercise pragmatic assessment when expressing their preference for agile methods. Seven factors that positively influence preference are identified and discussed, along with two negative factors and two contingent factors.

1. Introduction

The use of agile development methods in software development and project management is popular in a world demanding support for constant change and innovation. The use of agile methods is still on the rise. The 2016 VersionOne State of Agile™ survey shows that while 94% of respondents' organizations practice some agile, 60% of the teams in those organizations are not practicing agile [1]. The statistics indicate agile is widely used, but there is still significant opportunity for further adoption within organizations.

The variation in manager preferences for various development methodologies is significant. A portion of the preferences is attributed to several characteristics of methodologies. The fit of the solution, the circumstances of the problem, and the nature of the challenge, influence the effectiveness of a methodology. Agile development is defined as an excellent fit when circumstances require that the project is ambitious, there is a need for modifying deliverables with frequent input from the customer, and where rapid delivery is necessary [2]. In addition, the agile development method lends itself to iterative and incremental development, customer collaboration, and frequent delivery [3]. Speed, efficiency, collaboration and change management are considered key attributes of agile development [4].

There is a lack of understanding of manager preference for agile development methods. The goal of this study is to contribute to the literature by identifying factors that influence managerial preferences for agile

software development. The investigation will consider project manager preferences for development methodologies with an open lens to fully understand the influences and perceptions of the managers.

We will first provide initial background on the topic, then discuss the research design. Following this will be a detailed description of the findings. We will conclude with a discussion of the research and future directions.

2. Background

There have been theoretical developments to extend agile development principles to a variety of different contexts such as large and dynamic software development projects [5], distributed software development projects [6], data warehousing and business intelligence projects [7], and game development projects [8]. The literature on agile project management has focused on comparing traditional plan-driven approaches with incremental approaches [9-11]. These papers focus on the practices and processes emphasizing the benefits of the agile approach. The authors identify ways for managers to evaluate the use of agile method. It is unclear how project managers form their preference for or against agile methods. Research on understanding project managers' attitudes toward agile development methods is limited. The question of factors influencing project manager preference for agile methods has not been fully addressed in the literature. This is an important research question to study as managers rationalize their choice of methods seeking to improve project performance and team effectiveness.

Research suggests that the adoption of agile is driven by several influential factors such as project size, application criticality, complexity, employee skillset, and company culture [12-14]. The emphasis of agile development is on teams and team interactions and dynamics. Management is defined as a process of planning, organizing, leading, and controlling. Within agile development, the traditional role of the project manager changes from "command and control" to more of a "coach or facilitator" [14]. The project manager now has the responsibility of managing the collaborative efforts of the team without stifling their creativity. Managers need to be flexible to leverage each team member's expertise [15]. This focus is significantly different than traditional systems where the focus was

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on the process. Taylor's research focused on understanding how agile techniques shaped the practices of project managers, and how they dealt with conflict [16]. Her findings focused on how change in methods influence human experience and can cause some conflict. She also identified how project managers should relinquish some control when using agile.

Organizational cultures and management have an influence on development methods. Research has been extensively conducted on the tensions and trade-offs between stability and agility in organizational management [17-19]. The literature on organizational theory and learning gives solid reasoning for providing an organizational climate conducive to adapting to change. This adaptation is positively associated with superior performance [18, 19].

Vinekar, et al. summarized the opposing characteristics of agile and traditional development methods as related to management [14]. Table 1 shows this comparison.

	Agile	Traditional
	Leadership and collaboration	Command and control
	Cooperative	Autonomous
Management and organizational characteristics	Flexible	Disciplined
	Manager as facilitator	Manager as planner
	Tacit knowledge	Explicit knowledge
	Team reward system	Individual reward system

Table 1 - Agile and traditional methods comparison

Bishop, Deokar and Sarnikar have investigated preference from a software developer's perspective [20]. The current research seeks to extend that research into the area of management preference for agile software development methods. Consequently, our research seeks to identify influential factors in project manager's preference (or lack of preference) for the agile software development method. This desire led us to our research question: What are the factors that influence software development project managers' preference for or against agile methods?

3. Research design

Since the goal is to develop empirically based theory, we chose the grounded theory form of qualitative research. This method is well established in the field of Information Systems [21, 22].

Unlike quantitative methods, where a representative random sample of a population is critical, grounded theory uses theoretical sampling [23-25]. Theoretical sampling seeks data from sources that will provide rich information regarding the emerging categories and theory rather than sources strictly intended to be statistically representative of the target population [26].

We have performed a preliminary literature review to orient our research to the literature. In keeping with grounded theory principles, we have engaged the literature review while attempting to avoid theoretical expectations and bias [27].

3.1 Data collection

For data collection, we developed a list of semi-structured interview questions, as well as an initial list of managerial contacts. To develop our list of participants, we started with our own professional network of project managers who have agile experience. After interviewing a participant, we would ask them for additional contacts who might be able to contribute to our study. This technique of identifying participants is sometimes called the snowball technique or chain referral technique. Although this approach may have issues, if managed appropriately it can be useful for qualitative research [28].

We performed interviews of these contacts, digitally recorded the interviews, and transcribed the recordings into written documents. Fifteen participants were interviewed from across the Midwest and Western United States. Companies ranged from small to Fortune 50-sized organizations. The interviews resulted in 345 minutes of recordings which were transcribed into 132 pages of narrative. The participant demographics are summarized in Table 2.

	Company Size	Business Type	Gender
P1	55	Consulting	Female
P2	9	Services	Male
P3	97	Financial Services	Male
P4	50	Consultant	Female
P5	1,000	Financial Services	Female
P6	10,000	Education	Male
P7	130	Consulting	Male
P8	130	Consulting	Male
P9	75	Consulting	Female
P10	114,000	Multi-National Technology	Male

3.2 Data analysis

Next, we analyzed the transcripts using grounded theory coding techniques [24]. As part of a team of three researchers we initially coded the transcripts using Atlas.ti. We then compared our coding and developed a set of concepts to group and conceptualize the codes. Finally, we performed one more step of abstraction and formed categories.

As we analyzed the codes we summarized them into concepts, and then abstracted the concepts into categories. Table 3 shows the concepts that support the categories.

Category	Concept
Pragmatism	Not perfect, but better than the alternative (waterfall); Increased efficiency of developers; Improved quality; Better planning; Deliver features faster; Successful projects
Customer satisfaction	Customer engagement; Collaboration; Customer influence; Customer value focused
Risk management	Reduced team liability; Fast feedback; Increased predictability; Improved progress visibility
Communication	Improved communication; Fast feedback; Team engagement; Customer communication
Team satisfaction	Tech team likes agile; Increased dev efficiency; Team engagement; Increased accountability; Improved teamwork; Self-organizing teams; Training; Empowerment; Trust; People focused
Incremental work	Increased predictability; Iterative and time-boxed work; Small chunks of work; Better scope management
Adaptive	Adapts to change better; Increased flexibility
Desire for fixed outcomes	Some upper management/clients want defined deadline, cost and features
Change averse	Management are change averse
Fit	Work fit; Cultural fit; Team fit
Hybridization	Hybrid necessary; Hybridization leads to confusion

Table 3 - Categories and concepts

4. Findings

4.1 Pragmatism

When summarizing the philosophical foundations of agile methods, Nerur and Balijepally indicate the philosophical view of Pragmatism for agile methods [29]. Pragmatism, as a philosophy, views knowledge as "arising from an active adaptation of the human organism to its environment" [30]. This harmonizes well with agile values and principles. In more colloquial terms, Webster's Dictionary defines pragmatism as "a practical approach to problems and affairs" [31].

A theme of pragmatism emerged from the data. Project managers found agile useful. It is not perfect, but is often characterized as better than the alternatives. P6 says agile "fits the nature of the work better than the other methods we've used."

As noted in Table 3, participants find a variety of benefits when using agile approaches. They note characteristics like increased efficiency, improved quality, better planning, faster delivery of features and successful projects. These experiences highlight the practical value of agile methods leading to heightened preference among project managers for agile methods.

Pragmatism is identified as the grounded theory "core category" and is discussed further in Section 5 of this paper. It provides a unifying theme that is supported by each of the following categories.

4.2 Customer satisfaction

Project managers consider customer satisfaction a primary goal of software development. Managers indicate that agile allows more opportunity for contact with the customers enabling them to meet the needs of the customer throughout the project, thus increasing satisfaction. With agile software development, customers are involved throughout the project life cycle and interaction is much more frequent than in traditional methodologies [12, 32].

One aspect that contributes to participants' preference for agile in relation to customer satisfaction is customer engagement. As P14 says, "I think this really does help us because … the users are involved in our daily scrums. So we can bring questions to them, … they're right down there with us and they can look at it quick."

Another concept that leads to this category is collaboration. Customers share in the work and recognize the importance of their contribution to the success of the project. P5 says agile is "great for collaboration."

Customers also have the opportunity to influence the features and implementation through their feedback. This naturally leads to higher satisfaction on their part. P3 says that agile teams can, "use that feedback, make quick decisions, [and] influence the direction of the project."

Agile allows the project to focus on things of value to the customer leading to a product that satisfies their needs. Rather than focusing on intermediate milestones, approvals and non-software artifacts, agile focuses on delivering a product that brings benefit to the customer. As P10 states, agile gives "you the opportunity to work on the things that have the highest business value."

Additionally, customer engagement, collaboration, influence and value lead to customer satisfaction. Customer satisfaction positively influences project managers' preference for agile. Customer satisfaction increases the utility of agile in the eyes of project managers making it an effective, successful and pragmatic method of software development.

Participant P1's statement of why she prefers agile is a great summary for this category, "I just think … the opportunity to provide customer satisfaction is huge."

4.3 Risk management

Risk management is used to determine the risk exposure of a given course of action [33]. Software projects are high risk because of the number of variables that affect outcomes. Only about a quarter of software projects succeed outright and billions of dollars are lost annually to project failures [34].

Our risk management category emerged from several concepts in the data: reduced liability, fast feedback, predictability and progress visibility.

Participants from the services sector are particularly attracted by the ability of agile to manage risk. P8 says this about using agile methods with his projects: "It's all about liability, just mitigating or minimizing that liability for us." With regard to getting fast feedback P13 states, "with agile, bringing the customer in early on helps to alleviate that risk."

Regarding predictability, P12 says, "The promise is far more predictability in delivery. Agile teams tend to be extremely predictable in the amount of scope that they can deliver in a period of time, much more so than anything you get out of a waterfall approach."

We see progress visibility as an important concept that participants attribute to reducing risk. Due to the incremental delivery of working software customers (and team members) have visual and experiential validation of actual progress. This is much different than a traditional waterfall approach where progress is largely measured through document artifacts and associated milestones rather than working software. P1 makes this point, "I think that's what I like about it [agile] the most, is that you're showing that product to the customer. You have a deliverable result every sprint. … You're showing results for your work done, which I think is the difference – the big difference between that and Waterfall. Waterfall, you can't show results, and they wonder what you're doing for all that long time."

Risk management surfaces as an important category from the data. The practical value of improved risk management to project managers supports the core category of pragmatism as an antecedent for agile preference among managers.

4.4 Communication

Agile integrates effective communication within teams [35]. It enables diverse project teams to move through the cycle of 'thought-action-reflection' [13], which improves the process and enables learning and adaptation. Communication emerges from the data as a category. Communication has the power to improve transparency, understanding and interactions. The daily scrum or standup meeting appears as a key mediator of effective communication. As one participant, P15, notes, "I'm a big fan of the daily stand-up. This is a chance for the developers of different flavors [to] get heard and share their experience and opinion about working down the work for the iteration. I think this is highly useful and absolutely important." Another participant, P5, feels agile strongly influences the

communication, recognition and teamwork. "They meet daily in a scrum to talk about what they've accomplished, what they're working on, what's getting in their way. They brainstorm ideas. They get to talk to the users and hear what their needs are. They get to brag a little bit about their accomplishments and what they're doing. And they get to show off a little bit with look what I made for you. And they get to hear that immediate feedback" (P5).

The speed of communication is another aspect noted by a participant, "I would say early feedback, fast feedback is a key thing" (P8). Other participants say continuous communication positively influences the process. "What I like about it is that the team is continuously meeting and communicating and addressing issues as they occur, because it allows customer feedback quicker. So, what we try to do is we try to get the customer very involved" (P9).

One of the positive contributions from communication is improved experience and flow of information. P4 contributes this comment: "It's a quicker turnaround and quicker feedback from the customer. And so, it's a better experience all around for the customer as well as the engineer because we're just – we're touching base with them so often throughout the whole process" (P4).

Another comment indicates the timing of communication and interaction is a daily event, which influences the project insight and understanding. "We're still in the basement but now we have business users and sponsors who are with us almost daily. In some cases, daily. And in some cases, maybe weekly or monthly. But they have a lot more insight into what we do on a day to day basis. A lot more hands on with helping us drive our work efforts, our projects. And then they get to see all the other stuff that comes along that derails our projects" (P5).

The contribution of agile communication strategies appears to result in transparency and understanding, which contributes to achieving business strategy and goals. One participant states, "I like agile methods a lot. It's a lot easier. It's a lot better for us. It's a lot better for the business. It really lends itself to transparency. We're getting better in our communication between the business units and IT with them being able to express what they need and us being able to analyze better their requirements and help them figure out what works for them" (P5).

Some participants feel communication is the biggest adjustment when changing methodologies as indicated by this comment: "So I think the biggest difference between the methodologies isn't necessarily how my day-to-day of managing a project changes, it's more of that day-to-day how I communicate with the clients and even communicate with the team" (P11).

Participants' preference for agile is positively affected by their perception that agile enhances communication within the team and between the team and customers. We see that improved communication is an effective benefit arising from the data and supporting the pragmatic category of managerial preference for agile.

4.5 Team satisfaction

Agile methods not only increase customer satisfaction, but also increase the satisfaction of the development team. According to the literature, there are twice as many members of agile teams who are satisfied with their jobs verses members of non-agile teams [36]. Team members' satisfaction increases due to the ability to influence decisions, working on satisfying projects, and having relationships with the team and the users. Both individual and team morale increase with agile [37].

Project manager participants like the regular team communication. "What I like about it is that the team is continuously meeting and communicating and addressing issues as they occur" (P9). They find encouragement through the teamwork and commitment of the team. The following indicate project managers' views on team satisfaction: "That was encouraging just to get to see the developers work together like that" (P6); "Agile really lends itself to the team environment" (P5); Agile "really allows team members to kind of self-organize, and manage their work, and work together" (P1); "They can have a better sense of commitment to the end goal. I think you have – the morale is better with the project team" (P6).

Software development is a human endeavor. The data indicate that project managers recognize the significance of human factors and perceive their importance to team satisfaction. They recognize agile is a useful methodology to accommodate the human nature of teamwork.

One of the four Agile Manifesto's values emphasizes the human side of software development stating, "We have come to value: Individuals and interactions over processes and tools" [32]. Recent research has also focused on the human aspects of software development in an agile environment [38, 39].

Our participants discuss a variety of teamwork aspects to agile software development including self-organizing teams, empowerment, ownership and trust. P15 states, "I think … a key component that the software development team has responsibility in organizing when they do what is asked of them, and manage this process and prioritization themselves." He goes on to say, "Agile has to do a lot with trust" (P15).

From the perspective of the project manager, the technical team enjoys benefits of agile through increased efficiency, team engagement, accountability, self-organization, empowerment and trust. Project managers recognize that team satisfaction makes for a better and more productive work environment, making agile an attractive approach to project management.

4.6 Incremental work

Another category that emerges from the data is summarized as incremental work. This encompasses a range of concepts such as increased flexibility-- the ability and freedom to adapt to change. It also includes the notion of short delivery cycles that provide features faster to customers, which enables faster feedback from them. Incremental work also captures the idea of time-boxed iterations, which managers viewed as providing a better planning approach and producing higher degrees of schedule predictability.

Incremental work resonates with the literature. It has been shown to reduce complexity and demonstrates compatibility with the way software is developed [40].

Regarding small units of work, one participant says, "It makes it simpler for people in a way because you're working on a limited number of items, so you're focused" (P3). When it comes to incremental work and delivering features faster, P3 says, "I can do a lot more, be much more aggressive, make faster changes, and make a better product."

Delivering features faster lays the groundwork for obtaining quicker customer feedback and adapting to their emerging needs. P13 states the issue with waterfall from the customer's perspective: "They're not happy with what they got, and part of the problem is they don't know what they want until they see it. So, with agile, bringing the customer in early on helps to alleviate that risk." Agile "allows customer feedback quicker" (P4). And P8 states, "I would say early feedback, fast feedback is a key thing."

With respect to time-boxing P1 says, "What you do is you take a time-box and you determine an amount of work that you can do in that time-box, that can actually, from start to finish, deliver … useable, working product." It is critical that the scope is also fixed within an iteration, not just the time. P15 says, "A key principle … that is important to me … which goes into process, beyond principle … is the idea that you work in iterations where inside the iteration there is a fixed commitment that doesn't get changed during the iteration."

Incremental time-boxed small chunks of work lead to higher predictability. P5 says, "As a team we can see how much work we can take on every three weeks … When you can say this is what we can do in three weeks

and you can deliver something to the users and they go, oh, you know what? That's enough."

The category of incremental work contributes to a pragmatic preference for agile. Working in time-boxed iterations leads to many benefits and project managers are drawn to an effective methodology.

4.7 Adaptive

The adaptive category emerges with two facets from the data. One facet covers the ability to adapt the agile process to best fit the situation, such as corporate culture, stakeholder needs or team dynamics. The second facet deals with the ability of an agile project to adapt to the changing functional requirements of the product.

According to Masood and Farooqi, "The iteration approach that defines agile project management emphasizes the need to reconsider each of the completed project cycle before moving to the next. This implies that the project specifications, plans and designs may keep changing in line with changes in the project environment" [38].

The opportunity to change quickly and adapt to business needs is indicated with participant comments like "It's agility. It's the ability to change very quickly" (P4) and "The nice thing about agile is you can customize it to fit your business need" (P5). One participant feels individualization of methodology is possible. "There's part of it that you like and parts of it you don't, you can draw from different pieces and make it your own" (P5).

The second facet of adaptation is responding to changing requirements. As P13 notes about traditional waterfall methods, "We've had enough experience here at [Large Corporate Entity] … where we've built huge technical systems that were great engineering feats, but the market changed during that time of the development and we didn't respond to the market."

Participants find that agile is better able to adapt to changing requirements. Project managers appreciate a methodology that allows them to respond to ever changing functional requirements. This also resonates with the values and principles found in the Agile Manifesto [32].

Adaptability, both in process and product, often makes agile more attractive than the alternatives.

4.8 Desire for fixed outcomes (negative factor)

Traditional software development methodologies, such as waterfall, are based on a sequential series of steps [41]. These traditional methodologies define and document a set of requirements. The success of the

project depends on knowing all the requirements before development begins. Making any changes during the development life cycle can be difficult. The benefit of detailed planning lies in determining the cost of the project, the schedule, and allocating the needed resources [42].

When stakeholders request fixed cost, schedule or resources, the agile software methodology is challenged. Project manager P12 states, "Predominantly their [middle management's] objection is I won't have an end date with fixed scope, fixed quality, fixed resources that I can present to upper management and they're not going to buy-in, because middle management tends, with few exceptions, to not recognize that upper management got there by understanding that there is no such thing as a 100% predictable project. They think their job is on the line if they're not 100% predictable, whereas upper-management would probably make some tradeoffs."

Stakeholders may have expectations that cannot be met by agile: "Agile usually runs into problems when it comes to stakeholder expectations" (P8). With smaller projects, agile is certainly advantageous, but with large projects it is difficult to estimate the time and effort needed to complete the software project using agile.

The perception and reality of stakeholders' desire for fixed outcomes diminishes some project managers' preference for agile methods.

4.9 Change Averse (negative factor)

Upper management is known to resist change and prefer maintaining the status quo [42]. Adopting agile in an organization that is accustomed to more traditional Systems Development Life Cycle brings change throughout the organization. Astute project managers recognize that key management stakeholders may be change averse and we observe that this negatively affects project managers' preference for agile methods.

Participants mention the importance of management support and buy-in for successful agile usage. However, potential upper management concerns related to agile methodology appear to reduce project managers' preference for agile. The importance of management support was indicated with participant comments like, "First, [we] need management buy-in" (P8) or "We had to get the executive level buy-in before it took off. They really had to see the advantages. They had to become engaged. They really needed to support it from that level down. And then we saw it really take hold" (P5).

The change averse nature of some stakeholders influences project managers as indicated by one participant, P9, "You have to have the organizational buy-in and support that this is going to work. If the

organization does not believe in the concept of agile development, then it's not going to work."

If an organization's top management is resistant to change, it will negatively affect the desirability of agile methods by the project manager.

One of the characteristics of being change averse appears to be a sense of loss of safety found in the information provided in the traditional project management triangle of time, cost and scope. P12's comments indicate this: "Predominantly their objection is I won't have an end date with fixed scope, fixed quality, fixed resources that I can present to upper-management and they're not going to buy-in" (P12).

Some participants note ways of dealing with the managements being change averse with comments like, "Upper management, I think you try and balance the flexibility of the agile approach with the certainty of kind of the deterministic outcomes and kind of push as much as you can to let them know the risks involved with the approach while still trying to provide confidence in your abilities to execute on the project" (P7). The upper management perception of agile appears to be fear of losing control of the budget, the deliverable and the schedule.

The comments in the change averse category materialize as having power to negatively influence the preference for agile among project managers. A comment demonstrating the power of the culture change is: "If a client does not have agile instituted in their corporate culture already we can very rarely walk in there and be successful in an agile method" (P11).

The project managers indicate a need to engage and educate managers to understand the benefits of agile prior to making a transition. P1 says, "I think that the – if you're able to get your buy-in from your stakeholders – your sponsors, and you are able to have a true product owner that can speak for the requirements and communicate those to the team, I think you can be very successful at agile. The problem is IT departments try to implement an agile methodology, but if they don't have their sponsors and their business stakeholders on board with that and able to operate in that same methodology, then they have a real difficult time" (P1).

In some situations, the perceived change averse nature of management negatively influences project managers' preference for agile methods.

4.10 Contingent factors

In addition to the positive and negative factors, a few factors surface that, depending on the project context, could be either positive or negative.

We recognize fit as one of these factors. We identify three dimensions of the fit factor. First, there needs to be

a cultural fit, in addition there has to be a fit with the work, and finally there needs to be a team fit.

Another contingent factor we term hybridization. This has to do with the participants' experiences with combining agile with waterfall methods. In some cases, the project manager could integrate these disparate approaches effectively, providing the desired fixed outcome information upward toward higher management while allowing the team to operate in an agile manner. In other cases, this dichotomy causes confusion on the team, as P8 says, "You have a scope, a budget, and a schedule. If you do, it's not agile, even though we borrow the [agile] ceremonies … Just 'cause we're using these ceremonies does not mean it's an agile project, and sometimes our own employees get that confused" (P8).

Consequently, contingent on the context of a specific project and organization, fit and hybridization can either be a positive or a negative influence on a project manager's preference for agile.

5. Limitations and discussion

5.1 Limitations

The study depends on a limited group of participants. Although there are representatives from diverse industries and company sizes, expanding the size and diversity of the sample could help amplify the findings and possibly expand to new concepts and categories. We do sense from the data that the core category discussed below is a significant and relevant finding.

5.2 Core category

Grounded theory employs the idea of a core category that relates all the categories [43]. We chose pragmatism as the core category for the data. Pragmatism evaluates the veracity of theories based on their practical utility. The sentiment of practicality resonates with each of the categories. Project managers consistently relate their preference for agile in terms of the value of agile in their practical experience. They contrast the utility of agile with the problems they experienced with traditional waterfall. For example, P12 says, "I gave up waterfall as soon as I had control over my own destiny, so I have plenty of experience, but it's all been – I mean I would never impose that on a development team."

Agile is effective from an interpersonal relationship perspective (customer satisfaction, communication, and team satisfaction) and it is effective from a project perspective (risk management, incremental work, and adaptivity).

The negative factors arise because of unfavorable experiences or perceptions. When a project manager perceives she cannot meet stakeholder expectations for fixed outcomes, there is a decrease in her preference for agile because, from her perspective, it does not work. Likewise, if the organizational culture is change averse, then moving to agile may be an inappropriate choice, not because it isn't a good methodology, but because it may not be practical in that environment. Finally, if customers are not willing to engage throughout the project in a timely manner, project managers are reticent to employ agile methods because they will be ineffective. The factors leading to preference for agile among project managers are pragmatic in nature.

Our findings do not imply that agile is the best methodology for all projects. The negative and contingent factors point out circumstances where other methods may be preferred. Regulatory requirements and cultural fit may indicate that alternative software development methodologies may be more appropriate. But, in a wide variety of circumstances, project managers find value in agile methods over other methods for pragmatic reasons.

5.3 Future research

The results from this grounded theory research can be strengthened by enlisting additional participants from a variety of experiences [35]. One participant, P10, suggested expanding the sample to include project managers practicing outside of the United States. Expanding to a more diverse set of project managers' experiences offers the opportunity to enhance, expand and solidify these findings.

Using the factors identified in this research, follow-up opportunities exist to develop survey instruments to measure these factors as constructs. With one or more survey instruments, quantitative research could also be performed to validate and explore the realtionships between the constructs.

Finally, to develop a 360-degree view of agile preference in software development, the authors will be engaging in a grounded theory study of agile preference from the customers' perspective. The study will focus on factors from the product owner, user and other business stakeholders' perspectives that influence their preference for agile methods on software development projects.

6. References

[1] VersionOne. (2017, April 6). *11th Annual State of Agile Development Survey*. Available: http://www.agile247.pl/wp-

content/uploads/2017/04/versionone-11th-annual-state-of-agile-report.pdf

[2] E. C. Conforto, F. Salum, D. C. Amaral, S. L. da Silva, and L. F. M. de Almeida, "Can agile project management be adopted by industries other than software development?," *Project Management Journal,* vol. 45, pp. 21-34, 2014.

[3] J. Cho, "Issues and Challenges of agile software development with SCRUM," *Issues in Information Systems,* vol. 9, pp. 188-195, 2008.

[4] K. N. Rao, G. K. Naidu, and P. Chakka, "A study of the Agile software development methods, applicability and implications in industry," *International Journal of Software Engineering and its applications,* vol. 5, pp. 35-45, 2011.

[5] D. Batra, D. VanderMeer, and K. Dutta, "Extending agile principles to larger, dynamic software projects: A theoretical assessment," *Journal of Database Management (JDM),* vol. 22, pp. 73-92, 2011.

[6] F. Bergadano, G. Bosio, and S. Spagnolo, "Supporting collaboration between customers and developers: a framework for distributed, agile software development," *International Journal of Distributed Systems and Technologies (IJDST),* vol. 5, pp. 1-16, 2014.

[7] N. Rahman, D. Rutz, and S. Akhter, "Agile development in data warehousing," in *Principles and Applications of Business Intelligence Research*, ed: IGI Global, 2013, pp. 286-300.

[8] S. P. Cano, C. S. González, C. A. Collazos, J. M. Arteaga, and S. Zapata, "Agile software development process applied to the serious games development for children from 7 to 10 years old," *International Journal of Information Technologies and Systems Approach (IJITSA),* vol. 8, pp. 64-79, 2015.

[9] M. Ceschi, A. Sillitti, G. Succi, and S. De Panfilis, "Project management in plan-based and agile companies," *IEEE software,* vol. 22, pp. 21-27, 2005.

[10] M. Coram and S. Bohner, "The impact of agile methods on software project management," in *Engineering of Computer-Based Systems, 2005. ECBS'05. 12th IEEE International Conference and Workshops on the*, 2005, pp. 363-370.

[11] D. J. Fernandez and J. D. Fernandez, "Agile project management—agilism versus traditional approaches," *Journal of Computer Information Systems,* vol. 49, pp. 10-17, 2008.

[12] B. Boehm and R. Turner, "Using risk to balance agile and plan-driven methods," *Computer,* vol. 36, pp. 57-66, 2003.

[13] S. Nerur, R. Mahapatra, and G. Mangalaraj, "Challenges of migrating to agile methodologies," *Communications of the ACM,* vol. 48, pp. 72-78, 2005.

[14] V. Vinekar, C. W. Slinkman, and S. Nerur, "Can agile and traditional systems development approaches coexist? An ambidextrous view," *Information systems management,* vol. 23, pp. 31-42, 2006.

[15] A. Cockburn and J. Highsmith, "Agile software development: The people factor," *IEEE Computer,* vol. 34, pp. 131-133, 2001.

[16] K. J. Taylor and K. J. Taylor, "Adopting Agile software development: the project manager experience," *Information Technology & People,* vol. 29, pp. 670-687, 2016.

[17] M. J. Benner and M. L. Tushman, "Exploitation, exploration, and process management: The productivity dilemma revisited," *Academy of management review,* vol. 28, pp. 238-256, 2003.

[18] C. B. Gibson and J. Birkinshaw, "The antecedents, consequences, and mediating role of organizational ambidexterity," *Academy of management Journal,* vol. 47, pp. 209-226, 2004.

[19] Z.-L. He and P.-K. Wong, "Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis," *Organization science,* vol. 15, pp. 481-494, 2004.

[20] D. Bishop, A. V. Deokar, and S. Sarnikar, "On Understanding Preference for Agile Methods among Software Developers," *Information Resources Management Journal (IRMJ),* vol. 29, pp. 12-36, 2016.

[21] D. F. Birks, W. Fernandez, N. Levina, and S. Nasirin, "Grounded theory method in information systems research: its nature, diversity and opportunities," 2013.

[22] R. Matavire and I. Brown, "Investigating the use of grounded theory in information systems research," in *Proceedings of the 2008 annual research conference of the South African Institute of Computer Scientists and Information Technologists on IT research in developing countries: riding the wave of technology*, 2008, pp. 139-147.

[23] B. G. Glaser and A. L. Strauss, *The discovery of grounded theory: Strategies for qualitative research*. Piscataway, NJ: Transaction Books, 1967.

[24] K. Charmaz, *Constructing grounded theory: A practical guide through qualitative analysis*: Sage Publications Limited, 2006.

[25] J. M. Corbin and A. Strauss, "Grounded theory research: Procedures, canons, and evaluative criteria," *Qualitative sociology,* vol. 13, pp. 3-21, 1990.

[26] C. B. Draucker, D. S. Martsolf, R. Ross, and T. B. Rusk, "Theoretical sampling and category development in grounded theory," *Qualitative health research,* vol. 17, pp. 1137-1148, 2007.

[27] C. Dunne, "The place of the literature review in grounded theory research," *International Journal of Social Research Methodology,* vol. 14, pp. 111-124, 2011.

[28] P. Biernacki and D. Waldorf, "Snowball sampling: Problems and techniques of chain referral sampling," *Sociological methods & research,* vol. 10, pp. 141-163, 1981.

[29] S. Nerur and V. Balijepally, "Theoretical reflections on agile development methodologies," Communications of the ACM, vol. 50, pp. 79-83, 2007.

[30]   R. Field, "John Dewey (1859-1952)," Internet encyclopedia of philosophy, 2005.

[31]   M. Webster. (undated). [Online]. Available: https://www.merriam-webster.com/dictionary/pragmatism

[32]   K. Beck, et al. (2001, February 22). *Manifesto for Agile Software Development*. Available: http://www.agilealliance.org/

[33]   B. Boehm, "Get ready for agile methods, with care," *Computer,* vol. 35, pp. 64-69, 2002.

[34]   R. N. Charette, "Why software fails," *IEEE spectrum,* vol. 42, p. 36, 2005.

[35]   R. Hoda and L. K. Murugesan, "Multi-level agile project management challenges: A self-organizing team perspective," *Journal of Systems and Software,* vol. 117, pp. 245-257, 2016.

[36]   G. Melnik and F. Maurer, "Comparative analysis of job satisfaction in agile and non-agile software development teams," in *International Conference on Extreme Programming and Agile Processes in Software Engineering*, 2006, pp. 32-42.

[37]   D. Larsen, "Team agility: exploring self-organizing software development teams," *Industrial Logic and The Agile Times Newsletter,* http://www/. *futureworksconsulting. com/resources/TeamAgilityAgileTimesFeb04. pdf,* 2010.

[38]   Z. Masood and S. Farooqi, "Benefits and key challenges of agile project management under recent research opportunities," *International Research Journal of Management Sciences,* vol. 5, pp. 20-28, 2017.

[39]   T. Dingsøyr, T. E. Fægri, T. Dybå, B. Haugset, and Y. Lindsjørn, "Team Performance in Software Development: Research Results versus Agile Principles," *IEEE Software,* vol. 33, pp. 106-110, 2016.

[40]   N. A. Bonner, N. Kulangara, S. Nerur, and J. T. Teng, "An Empirical Investigation of the Perceived Benefits of Agile Methodologies Using an Innovation-Theoretical model," *Journal of Database Management (JDM),* vol. 27, pp. 38-63, 2016.

[41]   S. Balaji and M. S. Murugaiyan, "Waterfall vs. V-Model vs. Agile: A comparative study on SDLC," *International Journal of Information Technology and Business Management,* vol. 2, pp. 26-30, 2012.

[42]   M. Friesl and W. Kwon, "The strategic importance of top management resistance: Extending Alfred D. Chandler," *Strategic Organization*, vol. 15, pp. 100-112, 2017.

[43]   V. Stray, D. I. Sjøberg, and T. Dybå, "The daily stand-up meeting: A grounded theory study," *Journal of Systems and Software,* vol. 114, pp. 101-124, 2016.