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Does Agile + Lean = Effective: An Investigative Study

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Abstract

Context: Agile and Lean methodologies can be effective in the development and implementation of information systems projects. However, there are differing approaches used to select which methodology to use for a project. What factors should be considered when deciding on a methodology? **Objective:** This paper focuses on the common themes in how methodologies are selected by Agile and Lean coaches. Identifying factors that are considered are important is extensible to organizations that are considering these methodologies. **Method:** A phenomenological approach was used in this study. Subject matter experts, consisting of Agile project managers were interviewed. Participants were selected as a result of their participation at the Agile 2013 conference. In depth interviews, designed to capture the depth and breadth of their experience were conducted. The interviews were transcribed and presented back to the participants for review prior to analysis. **Results:** Four themes of importance emerged from this research. Self-organization of teams was considered a critical success factor for utilizing agile methodologies, this permits the teams to be balanced. Equally important agile coaches must have an in depth understanding of the teams strengths and weaknesses. Organizational cultural impacts agile and lean use. Organizations must be adaptable and willing to accept change as these approaches differ significantly from more traditional methodologies such as the waterfall method. Business value and methodology evolution were also found to be significant. **Conclusion:** The results provide insight to agile coaches and information systems managers when considering using agile and lean methodologies. Companies conclude on the methodology that works for them, but do not always implement it correctly. This research will help them understand when to use agile methodologies and have the necessary support in place for a successful implementation.

Keywords: Lean IT, Agile Methodologies, Qualitative Research, Software Development Life Cycle

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1. Introduction

The Software Development Life Cycle (SDLC) is commonly recognized within Information Technology (IT) organizations as a way to organize and plan for software development. The SDLC is recognized as a structure for all of the actions involved in a successful software development, which encompasses requirements gathering, analysis, design, coding, and testing (Sharma, Sarkar, & Gupta, 2012). SDLC practices can be utilized within companies to implement successful IT projects. These methodologies include Spiral, Waterfall, RAD, and more recently, Agile.

The SDLC has two primary concerns: a focus on the process and quality of the software or result of the development (Sharma et al, 2012). Many software development methods are intent on successfully following these two principles. The two primary methodologies thought about today are Waterfall and Agile. Though based on the same founding values, the planning and thought processes within each methodology differ immensely.

While many of the SDLC methodologies can be implemented in diverse IT organizations, there often are methods that work better in different organizations based on cultural fit. There has been much research conducted around the benefits and pitfalls of each SDLC methodology. This paper looks to determine which Agile and Lean methodologies work best within the IT industry. Specifically, the research looks to answer how methodologies are selected based on the experiences and knowledge of experts.

Analysis of existing methodologies, and when they are most effective, can provide value to all companies with IT organizations to understand how methodologies have worked and what experts look for when they are analyzing fit for a methodology. The results of this research can help companies better understand and make educated decisions on which methodology would most benefit their organization.

2. Literature Review

2.1 Software Development Life Cycle Methodologies

The earliest version of a software methodology known is the code-and-fix method, which is recognized for its two simple stages: writing the code and then solving any problems seen within the code (Misra, 2012). Despite the simplicity of this method and involving only the necessary people in software development, code-and-fix became a fairly expensive methodology for companies. This methodology focused on many iterations of code, which accelerates IT costs. Also, with this method, there was limited involvement of customers or requirements and planning sessions to ensure that the final product met the needs of the business.

The Stagewise method surfaced in 1956. The base of this method was to organize the SDLC into several different stages, including operational planning and specifications, coding requirements, testing, and evaluations. The issues that arose around the Stagewise method were mostly around the requirements only taking place at the beginning of the SDLC. Within the ending stages of the Stagewise method, there was no opportunity to look for improvement (Misra, 2012).

In 1970, the Waterfall method, one of the more popular SDLC methodologies emerged. Still similar to many of the principles of the Stagewise method, Waterfall continues to apply stages within the development life cycle. In addition, the Waterfall method added feedback loops between stages to ensure that the limitations within the Stagewise method would be addressed. It also added another new stage called "prototyping" prior to the development stage to provide another opportunity to ensure that the requirements were being met. Today, the Waterfall method is still seen as a methodology being used by many companies, specifically large corporations. Though it has seen many successful implementations, there still are many pitfalls within the Waterfall methodology. The methodology is focused on certifying that there is documentation, which has been seen to be excessive (Misra, 2012).

In 1977, the first major paper based on the principles of Lean and Kanban was published (Riezebos, Klingenberg, & Hicks, 2009). Though originally introduced in the manufacturing industry, Kanban focused on philosophies that could be applied within IT organizations.

The main premise of Kanban was just-in-time methods and limiting work in progress. Kanban also introduced the concept of self-organizing teams and enabled managers to facilitate environments where teams could identify and make process changes on their own (Anonymous, 2004).

Agile, a more recent SDLC methodology was devised by a group of researchers and executives from United States companies at the Iaccoca Institute at Lehigh University in 1991 (Denning, 2013). A few years later, in 2001, 17 software practitioners met in Snowbird, Utah to vindicate the principles of Agile. There, they created the "Manifesto for Agile Software Development," which culminates the findings and values of Agile and explains its primary principles (Misra, 2012). The principles revolve around ensuring the customer is involved throughout the entire SDLC process, software is delivered frequently in iterations, and that self-organizing teams develop the best products. There are several other SDLC methods that fall into the category of Agile, including SCRUM and Extreme Programming (XP).

2.2 Methodology Adoption

Chang & Thong (2009) found that systems development methodologies are advancers for software development. Despite seeing the value, there tends to be resistance from many organizations to adopt methodologies. They require behavioral changes at the team level. Methodologies are continuously evolving to solve new business problems. To deploy a methodology effectively, it is important that there is engagement and acceptance. There tends to be resistance from software developers; they also note that organizations looking to implement a methodology face opposition from IT employees.

Denning (2013) found that senior management and business schools have not focused on Agile methodologies. Regardless of the methodology, this resistance can be observed in many diverse organizational settings. Though Agile and Lean promote a new change and drive to achieve in a different manner than the more traditional development methods, these challenges still exist and impact implementations.

Browaeys and Fisser (2012) believe that the meanings of Lean and Agile vary due to the experience of the researchers. They used an epistemological approach for their research and found that Lean typically stems from manufacturing and that Agile has been more prominent in software development disciplines. Putnik (2012) believes that the relationship between Lean and Agile could be related or disparate.

Putnik also explains that researchers have tried to integrate Lean and Agile by creating an approach called “LeAgile”. Other researchers believe that Agile is a form of Lean. According to Denning (2013), the principal variations of Agile have been communicated as Agile, SCRUM, and Kanban. Chan and Thong (2009) believe the methodologies that align with the Agile Manifesto include Extreme Programming (XP), Crystal Methods, Lean Development, SCRUM, and Adaptive Software Development. Sharma et al. (2012) acknowledge that there are several methods for how Agile can be implemented including Extreme Programming (XP), SCRUM, and Feature Driven Development (FDD). The relationship between Agile and Lean methodologies seems uncertain. Putnik (2012) believes there is an occasion to further explore the relationship between Agile and Lean and that there is opportunity to determine a consensus on their relationship.

Agile and Lean methodologies bring new challenges to the forefront. They change the way IT departments interact with their end consumers and put more of an emphasis on the interactions with the customers (Denning, 2013). Sharma et al. (2012) recognize that customer satisfaction is an advantage of Agile methodologies due to their active involvement and feedback, which results in a higher quality product. Chan and Thong (2009) believe that customer interaction is crucial to the success and adoption of Agile methodologies. Misra (2012) agrees that communication is a huge component of Agile methodologies and enables teams to perform better due to more face-to-face interactions with teammates and customers.

Other advantages of Agile methodologies include preparedness for ongoing change and less documentation and materials than traditional software development life cycle methodologies. If managers are willing to enable their teams to make more decisions in regards to process improvement, teams tend to operate in a more flexible manner and results tend to be more creative. Jyothi and Nageswara (2012) found that the rate of defects also decreased due to Agile.

2.3 Agile Limitations

Customer involvement can be seen both as a benefit and a detriment to software development. The time that customers need to spend with decision-making and providing feedback to IT teams can be significant.

Customers also need to be explicit when giving business requirements to IT organizations to ensure that time is appropriately spent (Sharma, et. Al., 2012). According to Chan and Thong (2009), Agile methodologies tend to simplify the work to be completed, which can be seen both as an advantage and a drawback. Along with this, there tends to be less documentation involved throughout the Agile process. Another one of the disparagements of Agile, is that the methodologies are often seen as the new best methods and can therefore be misinterpreted and applied incorrectly (Misra, 2012). There are just as many downsides as there are advantages to implementing Agile methodologies.

Overall, there is a lot of research around the benefits and pitfalls of Agile and Lean methodologies, but no clear way to determine which method fits best in IT organizations. The research can be used independently to compare methodologies, but does not include any examples that help shape organizations' opinions on what methodology would fit best for them.

3. Methodology

3.1 Introduction

This research followed a phenomenological approach; in-depth interviews were conducted to attempt to draw experiences from participants to understand their perspectives on when methodologies work best.

The interview questions were formulated based on the research postulates and findings from the literature review. The questions focused on determining which methodologies are being used most frequently and were also designed to determine if experts and beginners in the field selected methodologies in the same fashion and if educational backgrounds have an influence. Overall, the interviews were intended to reveal how methodologies are selected based on the knowledge of the participants.

3.2 Question Development

The following research questions were intended to understand the experience of the interviewee and then to investigate their experience on which methodologies work best in IT organizations:

1. What is your name and title?
2. Throughout your career, which IT methodologies have you been exposed to? Where did you learn about them?
3. What has been your experience with Agile and Lean?
4. How long have you been practicing Agile or Lean?
5. Where did you learn about Agile or Lean?
6. Through your experience, what are the benefits you have seen with Agile and Lean?
7. What are the disadvantages of Agile and Lean?
8. How do you determine what type of IT methodology to use when you are approached as a coach? Or if you are someone using Agile or Lean at your company, how did you decide which one to implement?
9. What forms of Agile and Lean are being implemented the most? Why do you think they are more popular?
10. Do you have any other thoughts on which IT methodologies are the most successful?

The first five questions aided in providing an understanding of the background of the interviewee. Since the interviewees were selected randomly at a conference of Agile managers, it was assumed that they all had a basic understanding of Agile methodologies. However, these questions served to determine if answers to the more opinion-based questions could correlate to the experience level of the person. The remainder of the questions were open-ended to elicit unique responses, which is one of the primary benefits of interviewing (Stake, 2010).

3.3 Interviews

Interviews were conducted one-on-one in person. Seven people with experience in Agile methodologies were interviewed. All participants were asked the same questions, however, after having an understanding of the experience level of the interviewee; questions were modified to relate to participants based on their role and experience within the Agile community. The researcher ensured that each participant also understood the purpose of the study, which better empowered them to ensure that their answers appropriately answered the research questions and that they knew the primary goal of the research.

After all interviews were complete, the researcher individually transcribed the interview. This provided an opportunity to assess content validity of the interview.

3.4 Content Validity

After each interview was completed, the transcripts were organized and then sent back to the participants to confirm that all responses were recorded correctly. This helped to ensure the content validity of the research and also provided all participants with an opportunity to update their responses to appropriately reflect their experiences. Therefore, this process ensured that the researcher was able to capture responses that correctly reflected the knowledge and experience of all participants.

3.5 Sample and Selection Process

A sample population was selected at the Agile2013 conference in Nashville, Tennessee, an industry conference specializing in Agile methodologies. The attendees at this conference ranged from Agile experts to beginners. The conference participants work in an environment where Agile methodologies are used and thus meet the criteria for investigation of our research postulate. This follows the protocol for the phenomenological sample selection process.

At the conference, there were many coaches in attendance, who typically work for consulting companies that have successfully implemented forms of Agile and Lean in many diverse IT settings. There were also many employees from large corporations, who are either immersed in Agile or Lean projects. The beginning interview questions helped the researcher to better understand the familiarity level of Agile and Lean methodologies for each participant and to confirm that there were a variety of experience levels included in the research. They also served to put the participants into the environment where they were comfortable discussing their experiences in-depth.

4. Results

After all of the interviews were complete, the next step of the research was to analyze the findings and look for common factors. After the transcripts were typed, the participants had an opportunity to review their responses.

Upon approval from the interviewees, the information from the research was then sorted into patches, which provided a visual result of the interview results by interviewee. After considering individual responses, the patches were able to display commonalities within responses from participants. The researcher then annotated and added interpretations to each patch. Next, coding took place, which is the process of organizing data based on common themes, areas, and problems related to the research (Stake, 2010). The coding was organized based on the specific questions.

After the coding and sorting was complete, the comments from the researcher and answers to the interview questions were summarized and reviewed. This provided an opportunity to more easily view the commonalities between answers to questions and enabled the researcher to categorize the results and make assertions and conclusions. Any statements that were similarly made by more than one interviewee were then highlighted. The highlighted comments were analyzed to categorize them and create themes. When necessary, the researcher included sub-themes to ensure that the themes would be appropriately interpreted. Summary statements to better disseminate and explain each theme were created. The sub-themes were then reduced and categorized by the larger themes, which resulted in four major themes emerging from the interviews.

4.1 Analysis

After an initial review of the interview summaries and patches, high-level themes were determined. The initial questions supplied factual answers and provided clarification on the educational background and experience of each participant with Agile methodologies. The latter questions were in-depth responses designed to probe the experts knowledge of Agile methods and develop themes within common responses.

Throughout the interviews, one specific discrepancy arose that showed insight into the understanding of the terms “Lean” and “Agile” and indicated that the terms should not be used together. The majority of the interviewees asked for clarification on this. Several of the participants included Kanban as an Agile and Lean methodology. Other participants may not have known nor had experience with Kanban and other Lean IT methodologies. Due to this, the term “Agile” was used. This affirmed the discrepancy between the relationships of these two terms.

The participants framed their response to many of the questions in regards to how they currently approach situations that they face every day through their coaching or work experience.

Five of the seven participants interviewed considered themselves to be "coaches" or experts within the Agile community. Despite recognizing themselves as experts, only two of the five aforementioned participants have been practicing or coaching Agile teams for more than five years. The other two participants were managers within their companies in the initial stages of implementing an Agile methodology for their team. Both currently look towards external consulting companies to help them through the initiation process. The four major themes of the interviews were as follows: self-organization and understanding of teams, cultural impact, business value, and methodology evolution.

Four of the participants stated that teams or management typically decide which methodology they would like to implement. Coaches do not tend to be asked to provide feedback on which methodology is the best fit for the team until after the team has already decided the methodology they would like to use. The other three participants stated that they typically focus on getting to know the organizations and learning what their problems are prior to presenting a methodology or solution to them. Therefore, all seven participants seem to agree that it is very beneficial to understand what the team wants or what their goals are prior to deciding which methodology is appropriate. Table 1 provides a summary of selected comments on the advantages of Agile and Lean methodologies.

Table 1. Advantages of Agile and Lean Methodologies

Increased communication. Iterations also allow teams to show and share information more with clients.
Agile and Lean enable more transparency. It gives teams more ownership and the ability to find issues on their own and to be more transparent about them.
There is fast feedback, the ability to embrace change, and dedication across cross-functional teams.
There is more predictability; executives can understand processes and results better. Agile and Lean also enable better relationships between the business and IT. There tends to be a better product, stronger team morale, and more willingness to learn and adapt to change. I have seen evidence of these benefits on the job, through professional connections, conferences, and coaching clinics.
I like the human factor. Agile and Lean set up a condition for collaboration. Every team member contributes and there is leadership seen at every level.
Speed to market, potential business value that is more regular and easier to repeat. Agile and Lean also bring about quality and tend to be quicker and cheaper than other methodologies.

Overall, many of the participants noted that the cultural shift of an Agile methodology makes a large impact on organizations. Four participants noticed that team members tend to be more engaged and propose solutions to improve the methodology. A sub-theme underneath cultural impact is transparency; participants recognized that the improved visibility is a benefit of Agile. Six participants also mentioned that Agile methodologies improve communications, within the teams and also at the executive level. Conversely, despite the positives, six of the seven participants believe that the cultural change was also a disadvantage to Agile methodologies. They all recognized that there needs to be a lot of support from teams looking to implement any methodology, specifically within larger companies. It takes time to adopt and embrace Agile methodologies, so companies are only successful with this if they are fully willing to work through the cultural change.

The primary benefits of Agile were categorized into the theme: business value. Five of the seven participants believe that implementing an Agile methodology within an IT organization provides more information and understanding to the business. Teams can provide better estimates on how long processes take; the business also tends to be involved throughout the whole software development process, which in return, results in better feedback and adjustments that can then be made by the teams. Two participants also recognized that there also tends to be more predictability around the process and it makes it easier for replication.

When asked which methodologies were implemented the most and why, two of the participants believed that the traditional Waterfall methodology is still the most popular methodology. They attributed it to their companies already having knowledge of the Waterfall methodology and knowing that it works; the inherent tendency to use what you know. One participant was new to the Agile space and did not answer this question. The other four participants believe that Agile is emerging and is becoming the most popular methodology. Two of the participants inferred that Kanban seems to work on smaller projects and tends to work best for operational processes. SCRUM seems to be recommended more when there is a fix on a project. All of the participants agreed that different methodologies work better in some organizations than others and that it is most of all important to be willing to research and understand them prior to selecting one.

Participants were asked to comment on which methodologies are most successful. Five of the seven participants believe that it is important for organizations to determine which methodologies they like and are a fit. Different projects and cultures operate successfully with different methodologies, but as long as senior managers make a decision to implement a methodology and teams feel enabled, the methodologies tend to develop and work for the organization. The participants overall agreed that it is more important to have the teams operating this way rather than following a methodology exactly.

4.2 Relation to Prior Literature

Similar themes were found within research conducted by prior Agile studies. Chan and Thong (2009) found similar findings and developed a framework to display the acceptance of Agile methodologies. Through their research, they determined that knowledge, motivation, and opportunity attribute to the recognition of Agile methodologies. These themes relate directly to the themes found in this research since they attribute to selecting methodologies based on experience and acknowledge the importance of communication.

Cultural impact and business value were themes that were addressed by Sharma, et al. (2012). These themes are also consistent with Jyothi and Nageswara (2012), who also recognize the importance of having buy-in from senior management. The themes are also consistent with findings from Misra (2012).

Browaeys and Fisser (2012) determined that self-organizing teams is how the relationship between Agile and Lean should be treated. Though in a different context, this is very consistent with the theme of self-organization and understanding of teams.

Generally, the prior research focused on broad organizations. We focused specifically on interviewing candidates from IT organizations to gain insight from direct application of Agile methods by information technology experts and try to aid the decision-making process for managers and leaders within these organizations.

4.3 Implications

Prior research examines Agile and Lean methodologies and focuses on the benefits and pitfalls of each methodology. Chan and Thong (2009) focus on creating a framework to show how Agile methodologies can be better accepted.

Other research focuses more on comparisons of methodologies and places emphasis around the specifics of them.

This research aims to assist managers and decision-makers understand the importance of looking to information technology experts or third-party experts when they think about employing an Agile solution. Companies conclude on the methodology that works for them, but do not always implement it correctly. Though it is all right for companies to have an idea of the methodology they think would work best for them, it is still important to understand why and have the necessary support in place for a successful implementation. This research will provide these decision-makers with an understanding of how they should initiate deploying an Agile methodology.

Overall, the benefits and limitations of Lean and Agile methodologies found through this research are consistent with existing studies. However, the interviews conducted were specifically related to Lean and Agile methodologies in IT organizations. Therefore, leaders and decision-makers in these organizations can positively benefit from this focus. The positives of Agile methodologies identified also came with caveats based on the experience of the interviewees, which therefore can benefit managers. To effectively instrument an Agile implementation, company decision-makers need to understand the amount of support that is required from them to empower their teams, which is what many of the interviewees wanted to make sure came across in their statements. This also presupposes they embrace a culture of empowerment.

Also, based on the research, there seems to be no consistent answer about which methodologies work best in IT organizations. Due to the different experience levels of the participants and their exposures to SDLC methodologies, each participant had different reasons in mind for which methodologies they favored. Additional research is needed to investigate this, but it appears that organizations should be prepared to support multiple methodologies depending upon project needs and team member experience.

5. Future Research

As Agile and Lean methodologies become increasingly more popular, additional research will be designed to better understand and investigate the impact of the methodologies on project success. Additional research could help determine what the dependent and independent variables are in successful Agile implementations. It can also help to provide a more consistent set of environmental standards that would lead to successful implementations of any SDLC methodology. There is an opportunity to quantitatively research team characteristics that lead to system projects implementations faster and with higher quality. Though this may vary for organizations with different cultures, it would still provide quantitative support to back the assertions made by qualitative research.

Another interesting research opportunity is to further explore the differences between coaches who help consult and suggest methodologies compared to managers and team members who work directly with the methodologies.

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