

Software Startups: Motivations for Agile Adoption

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Abstract: Agile software development methodology (ASDM) has become a more popular development method for software development, especially for web and startup companies. It has also been characterized differently from plan-based methodologies mainly because of its focus on adapting to change and delivering products of high quality through simple work processes. Agile adoption is nonetheless a complex task, and not all agile processes and practices are suitable for small-scale startups. There are some agile practices that have negative impact on startups. The failure of some startups is mainly caused by the failure to develop products due to the lack of adopting of proper development methodology. However, there is a lack of studies on factors that affect the selection or adoption of agile methodologies. This study therefore attempts to showcase the motivation rationale for agile adoption among software startups in Saudi Arabia. An online survey was conducted for software startups in the Kingdom of Saudi Arabia to elicit their responses on their motivations for adopting agile methodologies. The outcome reveals that the top five motivations for agile adoption are the need for accelerated product delivery, enhanced ability to manage changing priorities, increased software maintainability, simplified development process, and need for enhanced delivery predictability. This outcome will support startup companies, projects managers and development teams, etc.

Keywords: Agile adoption, software startups, motivations, agile processes and practices, development methodology

I. BACKGROUND

Agile software development methodology (ASDM) have in the last decades dramatically increased in its usage and has drastically changed the way software development is performed (Diebold & Dahlem, 2014). In a survey conducted by Azizyan et al (2011) in 35 countries, over 66% of the captured companies use agile development methods. VersionOne (2015) found from a recent survey conducted globally that among the 3,880 respondents, 58% of the teams in the surveyed companies use ASDM. ASDM has not only become effective for software development, it has also become more flexible, with the capacity of delivering benefits like handling requirements changes, providing

productivity gains, and business alignments (Campanelli & Parreiras, 2015). ASDM consists of the following methodologies: Extreme programming (XP), Scrum, Lean software development, Feature driven development (FDD), Dynamic software development methodology (DSDM) and Crystal methodologies, etc. In fact, there are about 20 agile and lean methods (Dyba & Dingsoyr, 2008). However, these methodologies share many of the core values and principles defined in the Agile Manifesto (Beck et al., 2001). ASDM is a lot different from the traditional methodologies. It has lesser documentation, enables fast delivery, increases customer satisfaction, accepts requirements changes, improves quality, and provides more transparency to customers (Pikkarainen et al., 2012). Nerur et al. (2005) confirmed that agile methodologies are fit for projects with high level of changing requirements, which provide high quality solutions for end users, or for companies with innovative culture. Unlike the traditional development methodologies characterized by sequential phases and heavy upfront planning, agile methodology deals with unpredictability and change. It relies heavily on people and close customer collaboration rather than formalized processes (Nerur et al., 2005). Agile Manifesto (2001) states the precedence and priority of the agile development core values of 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. The main attributes of agile are short iterations, collaborative decision making, quick feedback loops, and continuous integration of code changes into the project (Cockburn, 2006). ASDM is suitable for projects with small teams or for high innovative projects (Cohen et al., 2004) and these criteria exist in software startups.

Agile adoption describes the process of adopting and implementing agile practices, processes, and values in software development. The adopted practices may correspond with either one agile method or to a combination of agile methodologies (O'Connor & Duchonova, 2014). Agile adoption process is dependent on organizational environment, agile methodologies, and practices where they are often tailored to be integrated into existing processes (Rohunen et al., 2010), the adoption of agile methodologies is a continuous and interactive activity, which includes adaptation and customization of the development method throughout the execution of the project (Krasteva et al., 2010). Furthermore, factors like organizational culture, resistance to change, and the need for the support of high level management make agile adoption a complex process

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(Campanelli&Parreiras, 2015). ASDM is however, an interesting and viable option in achieving quality, project budget control, alignment with organization’s business strategy and frequent and continuous delivery of value (Campanelli&Parreiras, 2015).The adoption of ASDM in an organization is influenced by several motivations, such as, a desire to increase quality, efficiency, and/ or effectiveness (Tripp & Armstrong, 2014). More so, agile practices selection is consistent with organizational values, culture, reality, needs, and strategies in order to generate a tailored ASDM (Campanelli&Parreiras, 2015). ASDM tailoring is affected by organizational culture, objectives, and environment. Each ASDM defines their own processes and practices but they nonetheless still share in common the same values addressed in the agile manifesto (Beck et al., 2001). However, from the software development perspective, choosing and adopting the proper development methodology is a critical task (Nerur et al., 2005). Each agile methodology consists of several practices like pair programming, stand up meeting, short iteration, retrospective, etc. A big pool of available agile practices makes it difficult to select which set of practices fits the needs of an organization (Conboy & Fitzgerald, 2010).

A remarkable number of new software startups are launched everyday globally. In particular, in the Middle East and North Africa (MENA) region, software startups are an emerging trend in the last few years. The number of software startups in the MENA region increased eight times in 2011 as compared with 2005 (Frost & Sullivan, 2012). This shows an amazing growth rate. This growth is however occasioned by a number of factors, such as, many success stories, big opportunities, government regulations, and government support. This growth rate is predicted to be higher in the future. Software startups refer to small software companies that are trying to explore new business opportunities and working to solve problems whose solutions are not well known in a highly volatile market environment (Giardino et al., 2014). Software startups have significant impact on economies, as they are responsible for 20% of job creation in the United States alone (Giardino et al., 2014). Most of the new startups in the United States and even worldwide are software-related companies that are web technology-based (Coleman & O’Connor, 2008). There are several characteristics that make startups a unique type of software projects. They are highly uncertain and rapidly evolving (Giardino et al., 2014), they are characterized by limited resources, multiple influences, great risk of failure, etc (Sutton, 2000). Most startups fail within a few years of their creation (Crowne, 2002). This is caused by failure to develop product (Paternoster et al., 2014), and failing to select proper development methodology and failure to adopt suitable software technology (Coleman & O’Connor, 2008; Giardino et al., 2014). Others factors include: failures in product development due to the inexperience of the development team, lack of ownership of products, lack of strategic plan for product development, and unrecognized product platform (Crowne, 2002). More so, startups do not have sufficient resources to investigate the best development methodologies available (Coleman & O’Connor, 2008). In

some cases, there is partial adoption of software development methodologies in late stages of the startup lifecycle (Paternoster et al., 2014).

There are limited studies in agile methodologies in MENA region (Alnafjan, 2012; Hajjdiab&Teleb, 2011; Hajjdiab et al., 2012). There is also an indication from the publication pattern on agile software development based on countries that there are gap in such studies in the MENA region (Dingsoyr et al., 2012). Furthermore, the development of software processes in general were done in the United States and other European countries, with most empirical evidences emanating also from these countries, thus making such processes suitable for or fitted to their culture (Asnawi et al., 2011). However, a few studies on agile adoption have been carried out in developing countries, such as Brazil (da Silva et al., 2005) and Malaysia (Asnawi et al., 2012). As at the point of this present study, there are not enough studies found on agile adoption in the Kingdom of Saudi Arabia (KSA). Moreover, most of the recent studies do not focus on startups as a medium that adopt ASDM , that currently plays a huge role software industry in the region. There is also a global absence of studies related to startups software development. These gaps provide a good rationale for this study. Software startups also have big gap in the adoption of agile software development methodologies. There are gaps on studies that focus on startups in a software engineering context (Sutton, 2000). Tripp and Armstrong (2014) asserted that there is lack of studies on factors that affect how agile methodologies are tailored or selected. It is hence necessary to unravel the possible motivations for the adoption of agile software development methodologies (processes and practices) in the KSA. The study was carried out in KSA because KSA is one of the countries with the largest support for startups, along with Jordan and United Arab Emirate in the MENA region. More so, the ecosystem in KSA contains many business accelerators and incubators that are supported by private and public sectors. Wyne and Wamda Research Lab (2014) assert that 38 of all new startup companies in the MENA region will open offices in KSA within the next two years. Thus, KSA is a well suited option for a study of this nature.

II. METHODOLOGY

In this study, an online survey approach was used to capture responses from respondents. The survey was conducted between March and April 2016. The potential participants were invited via email invitations. Questionnaires were sent to 25 business incubators in KSA, with 175 questionnaires distributed to software startups inside those incubators. Out of this number, 76 responses were received (representing a response rate of 43%). As software engineering surveys suffer from low response rate (average of 5%), any response rate higher than 5% is acceptable (Lethbridge et al., 2005). Also, a response rate of 30% or higher is considered acceptable (Sekaran & Bougie, 2010).



The questionnaire has a control question that identifies the software startups that adopt agile methodologies and exclude other software development methodologies. After the elimination of software startups that do not adopt ASDM, the study participants dropped to 64. This sample is in line with Rauf and AlGhafees (2015); Sison and Yang (2007); and Sulayman and Mendes (2010), for studies where the sampling unit is an organization. In this study, the sampling unit was a startup company where the respondents were employees with software development related positions. The study sample was drawn from an estimated population of 300 software startups in KSA. Sekaran and Bougie (2010) suggests that for a population size of 300, the approximate sample size is 175. In addition, the study instrument was developed using Mohamed et al. (2014) (for demographic data), Tripp and Armstrong (2014) (for agile adoption motivation), and VersionOne (2015) (for agile adopted practices). The agile adoption motivation questions employed a 4 point Likert scale: 1. Not important, 2. Somewhat important, 3. Very important, 4. Highly important. The measure of the frequency of usage of adopted agile practices in the organization was captured in Likert form ranging as follows from: 1. Never used to 5. Always used.

III. RESULTS AND DISCUSSION

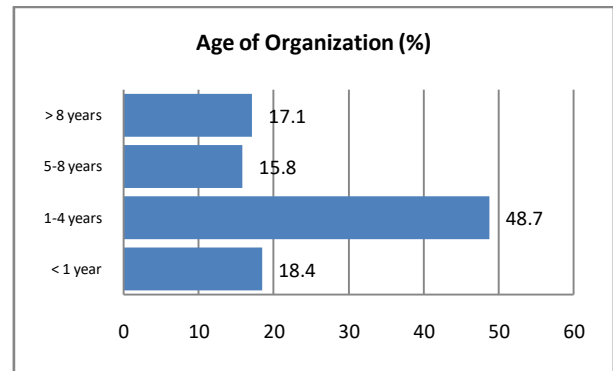


Fig. 4 Organization's Age

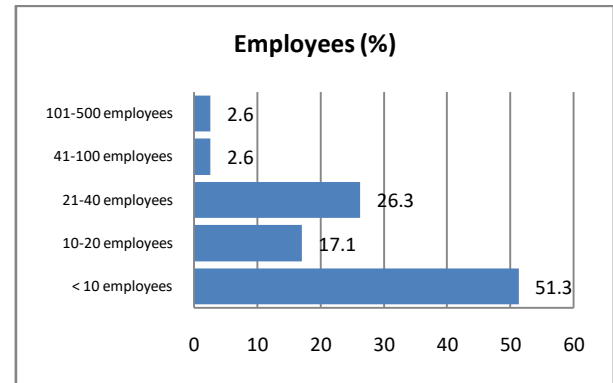


Fig. 5 Number of Employees

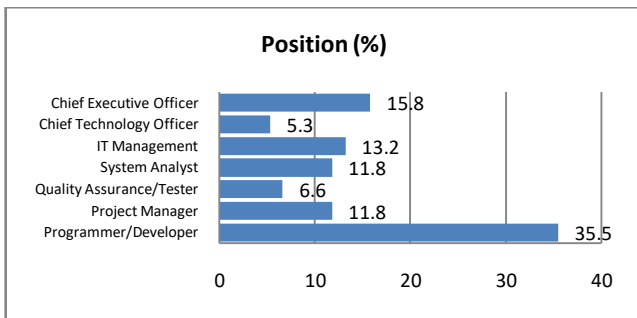


Fig. 1 Position of Respondents

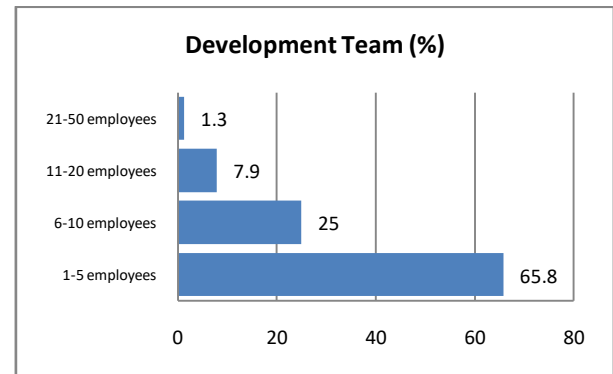


Fig. 6 Development Team

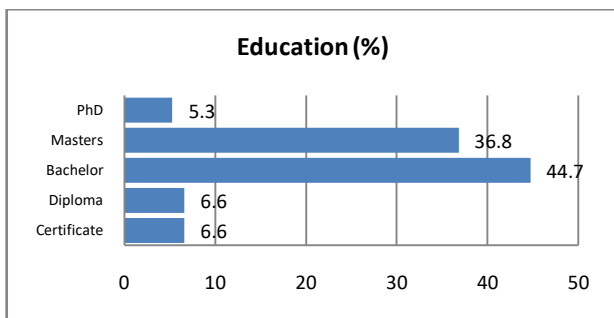


Fig. 2 Educational Qualification

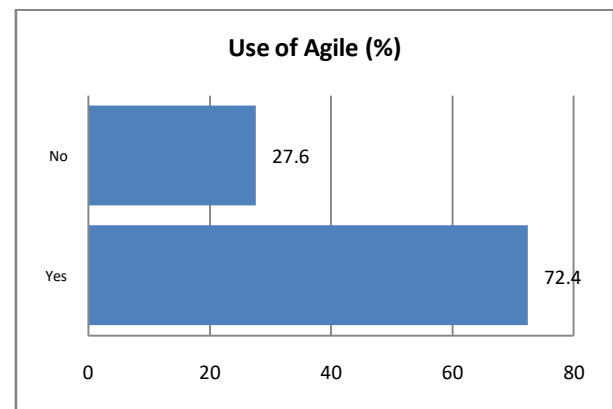


Fig. 7 Use of Agile

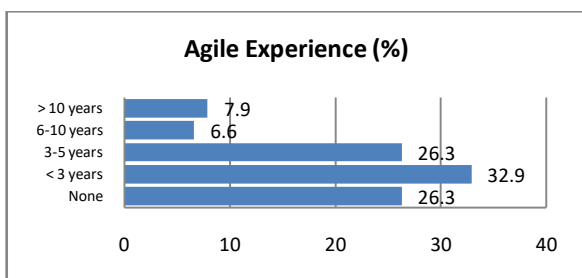


Fig. 3 Agile Experience



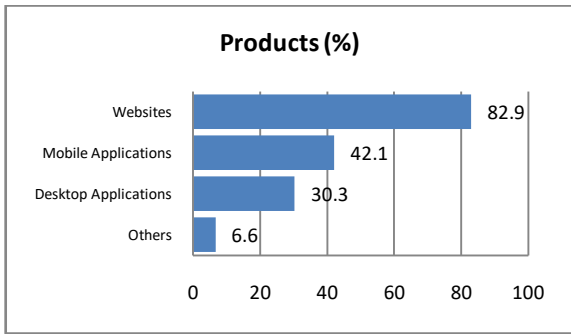


Fig. 8 Startup's Products

From the analysis, most of the respondents were programmers/developers (35.5%) (Figure 1), and majority of the startup employees had bachelor (44.7%) and masters (36.8%) degrees as educational qualification (Figure 2). This implies that the startups have educationally sound employees, with most having less than 3 years of agile experience (32.9%) and between 3-5 years of agile experience. However, there are those with more than 10 years of agile experience (7.9%) and 6-10 years experience (6.6%). Nevertheless, a substantial fraction have no agile experience (26.3%) (Figure 3). A number of the software startups are aged 1-4 years (48.7%), while others were greater than 8 years (17.1%) and less than one year (18.4 %) of age (Figure 4). Most startups had less than 10 employees (51.3%), 21-40 (26.3%) and 10-20 employees (17.1%). A very small fraction have 41-100 (2.6%) and 101-200 employees (2.6%) (Figure 5). In particular, the development team of these startups are made up of 1-5 (65.8%), 6-10 (25%), 11-20 (7.9%), and 21-50 (1.3%) staff strength (Figure 6). The startups that make use of agile methodologies are 72.4% while 27.6% do not apply agile methodologies (Figure 7).

The startups applying agile mostly produce web related (82.9%), mobile (42.1%) and desktop (30.3%) applications (Figure 8). The agile development experience of these startups are as follows: 1-2 years (30.3%), 3-5 years (23.7%), and less than one year (18.4%). Startups with more than 5 years of agile experience are 3.9% and those not practicing agile are 23.7% (Figure 9).

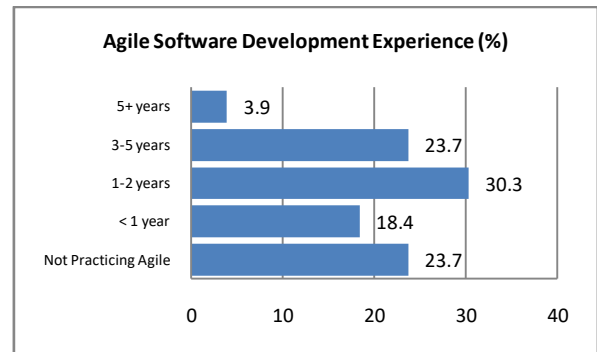


Fig. 9 Agile Experience

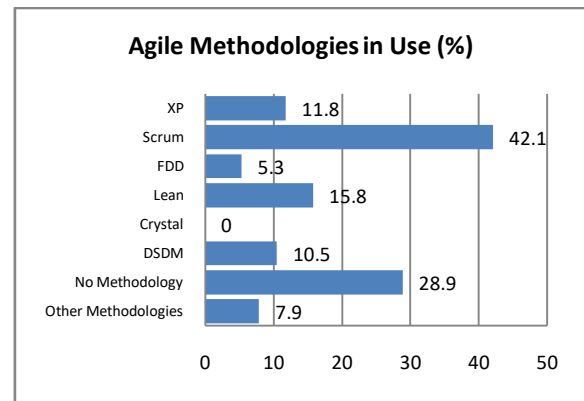


Fig. 10 Agile Methodologies in Use

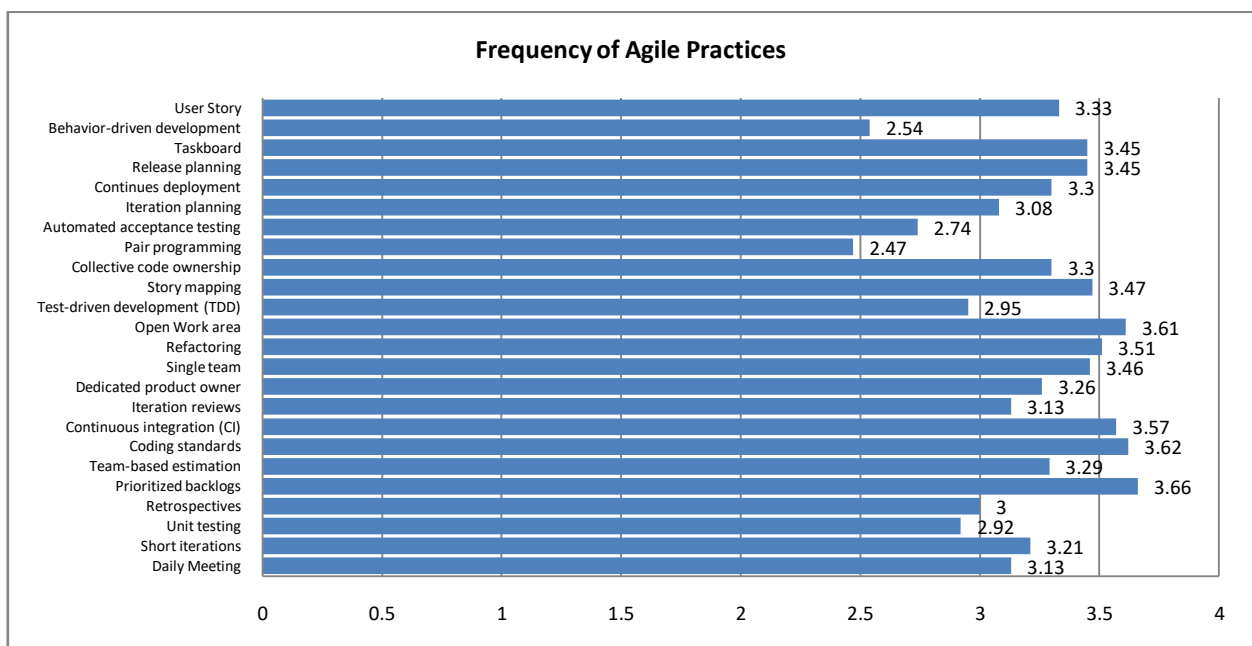


Fig. 11 Frequency of Agile Practices



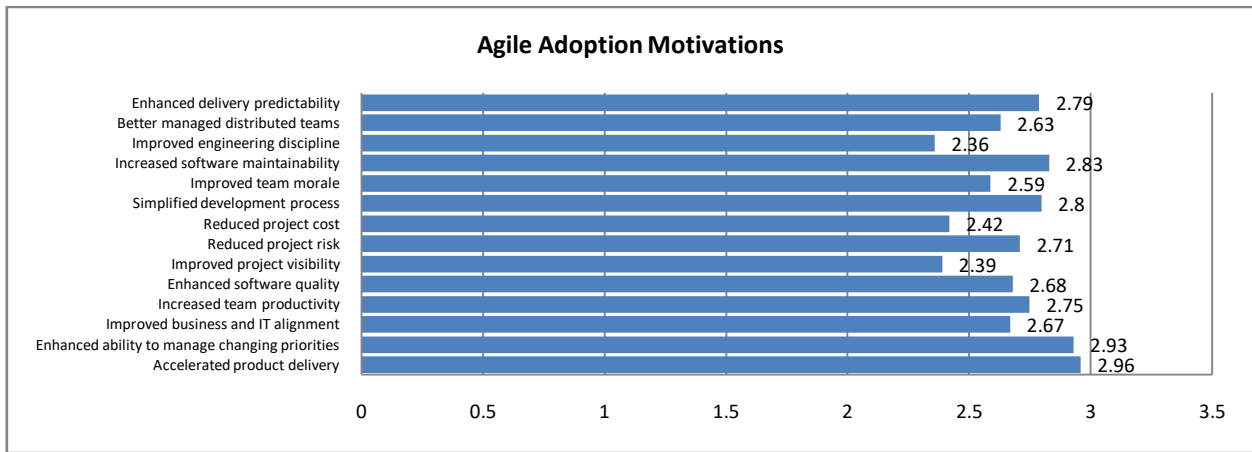


Fig. 12 Agile Adoption Motivations

Figure 10 shows the agile methodologies in use in the surveyed startups. Scrum is the most used methodology (42.1%), followed by dynamic software development methodologies (DSDM) (10.5%), lean methodologies (15.8%), XP (11.8%), and feature driven development (FDD) (5.3%). None of the startup companies utilizes crystal methodology. However, 28.9% of the startups do not practice any specific methodology. With respect to the usage frequency of agile practices (Figure 11), in the order of frequency of use, the top 5 most frequently used agile practices are: prioritized backlogs, coding standards, open work area, continuous integration, and refactoring. Others (in descending order of frequency of use) include: story mapping, single team, taskboard, release planning, user story, continuous deployment, collective code ownership, team-based estimation, dedicated product owner, short iterations, daily meeting, iteration reviews, iteration planning, retrospectives, test-driven development (TDD), unit testing, automated acceptance testing, behavior-driven development (BDD), and pair programming. Figure 12 reveals the motivations that inform the adoption of agile among software startups in KSA. Foremost among these motivations in the order of their perceived importance to the startups is the need for accelerated product delivery. This is the most important rationale for the adoption of agile among startups in KSA. The next is the need for an enhanced ability to manage changing priorities. This is closely followed by the need for increased software maintainability. Next, is the need for a simplified development process. Other motivations in a descending order of importance (priority) as perceived by software startups in KSA include: the need for enhanced delivery predictability, increased team productivity, reduced project risks, enhanced software quality, improved business and IT alignment, better managed distributed teams, improved team morale, reduced project cost, improved project visibility, and improve engineering discipline. The above 14 motivations were as originally captured in VersionOne's (2015) survey, but with some slight differences in the order of priorities and perceived importance when compared to the outcome of this current study. Furthermore, Tripp and Armstrong (2014), in their study categorized agile adoption motivations into three categories, namely, software quality, efficiency, and effectiveness. From their analysis, the need to enhance

software quality, improved/increased engineering discipline, and enhance software maintainability/extensibility was categorized under software quality motivation factors. Moreover, the need for increased productivity, accelerate time-to-market, and reduce cost were categorized as efficiency motivational factors while the need to enhance ability to manage changing priorities, and improve alignment between IT and business objectives were seen as effectiveness motivation factors. The remaining motivational rationales did not find a place in the categorization of Tripp and Armstrong (2014)

IV. CONCLUSION

This study captured the motivations that underline the agile adoption decision of software startups in the Kingdom of Saudi Arabia. It revealed that the top five motivations for agile adoption are the need for accelerated product delivery, enhanced ability to manage changing priorities, increased software maintainability, simplified development process, and need for enhanced delivery predictability. The study also shows that the top five most frequently used agile practices among the startups are: prioritized backlogs, coding standards, open work area, continuous integration, and refactoring. Furthermore, the study discovered that the top five agile methodologies in use by the startups are: Scrum methodology, DSDM, lean methodologies, XP, and feature driven development (FDD). The study therefore affirms that adoption of agile processes and practices among software startups in KSA are occasioned and influenced by the motivations captured as these are the rationale for the adoption of agile software development methodologies among the startups. The study is however limited in that it only used descriptive statistics to explain the motivations for agile adoption among software startups in KSA. It is nonetheless insightful. The outcome of this study provides support for startup companies, project managers and development teams, etc, in the MENA region and in KSA in particular. Future studies will assess the impact of agile adoption on product quality, product delivery, word-of-mouth, customer satisfaction and loyalty.



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