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A study of value in agile software development organizations

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ABSTRACT

The Agile manifesto focuses on the delivery of valuable software. In Lean, the principles emphasise value, where every activity that does not add value is seen as waste. Despite the strong focus on value, and that the primary critical success factor for software intensive product development lies in the value domain, no empirical study has investigated specifically what value is. This paper presents an empirical study that investigates how value is interpreted and prioritised, and how value is assured and measured. Data was collected through semi-structured interviews with 23 participants from 14 agile software development organisations. The contribution of this study is fourfold. First, it examines how value is perceived amongst agile software development organisations. Second, it compares the perceptions and priorities of the perceived values by domains and roles. Third, it includes an examination of what practices are used to achieve value in industry, and what hinders the achievement of value. Fourth, it characterises what measurements are used to assure, and evaluate value-creation activities.

1. Introduction

Agile and Lean Software Development have gained much popularity during the last decade. The very first principle of Agile Manifesto reflects on the highest priority to be satisfying customers through delivery of valuable software. Similarly Lean principles have a particular emphasis on Value and the first principle of Lean software development considers every activity or process to be waste unless it adds some Value to either the company or its customers (Poppendieck, 2011).

The focus on Value is in line with most studies looking at critical success factors for software intensive product development, distinguishing successful from failed software projects, showing that the primary critical success factors lie in the Value domain (Boehm, 2006b). The understating of Value as a concept is however somewhat limited (Dingsøyr et al., 2012; Dybå and Dingsøyr, 2008; Racheva et al., 2009). Value is traditionally seen as profit generation and adding Value is a pecuniary activity that needs to be taken into account from a software business perspective. Value is however a much more complex concept as described by Khurum et al. (2013); 2014) in their Software Value Map. There they elaborate not only on Customer Value, and Financial Value for the development company, but also on internal Value Aspects such as the Value (or Value degradation of assets) and legacy within the development company.

Independent how you define and use Value however, the basic aim for a company developing software intensive products and services (called company from now on) is to maximise Value creation for a given investment. For this to be possible it is necessary to understand what is considered Value and what are the strategies that drives Value and assures the Value creation (Aurum and Wohlin, 2007).

To the best of our knowledge no empirical study has investigated how different companies interpret the Value concept, to what extent Value and different Value Aspects are defined, what Value Aspects they consider important to achieve, and how Value Aspects are assured and/or measured. This paper presents the results of an empirical study that includes data collected through in-depth interviews with 23 participants from 14 different software development organisations in Sweden.

The remainder of this paper is organised as follows. In Section 2, the background and related work are presented. The research methodology is described in Section 3, and Section 4 presents the results and relates the findings to previous studies. Section 5 holds the main conclusions.

2. Background and related work

Agile methodologies with the promise of satisfied customers through early and continuous delivery of valuable software have

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brought unprecedented changes to the software engineering field since the articulation of the agile manifesto in 2001 (Agile Manifesto). Poppendieck and Poppendieck (2003) state that the success of many of the practices of Agile Software Development (ASD) can be explained by understanding the principles of Lean software development. The main principle of Lean states that all activities and work products that do not contribute to the customer Value are considered waste (Poppendieck and Poppendieck, 2003).

While a substantial amount of papers (e.g. Conboy and Morgan, 2011; Korkala and Abrahamsson, 2007; Mishra and Mishra, 2011; Petersen and Wohlin, 2009; Wang et al., 2012) have been published in recent years on issues related to agile software development, contributions often have been around particular agile methods or comparing agile and other development processes. Conboy and Morgan (2011) looked into the applicability and implementation of open-innovation in agile environments and challenges when combining agile and open-innovation principles. In Korkala and Abrahamsson (2007), the authors conducted two case studies to investigate the communication in distributed agile development. In addition, Mishra and Mishra (2011) investigated how agile development methodologies and management approaches are used in development of complex software projects, while Petersen and Wohlin (2009) identified issues and advantages when implementing incremental and agile practices in large-scale organisations. Wang et al. (2012) looked into how lean software development approaches can be applied in agile software development. In a study by Dingsøyr et al. in 2012 they examined publications on Agile, during the decade after introduction of the Agile methods in 2001. The results show that the majority of research was related to the differences between process-oriented approaches such as CMM/CMMI and Agile methods such as XP (Dingsøyr et al., 2012). However, no study was found to have a dedicated focus on the concept of Value and Value assurance (Dingsøyr et al., 2012).

Although the majority of the published papers do not specifically look into Value and Value creation, some studies (e.g. de Azevedo Santos et al., 2011; Conboy, 2009; Hoda et al., 2011; Maruping et al., 2009; Petersen and Wohlin, 2010) have been published about Value creation through agile practices. However, they are limited to a few Value Aspects such as quality (de Azevedo Santos et al., 2011; Conboy, 2009), simplicity (Conboy, 2009; Maruping et al., 2009), frequent releases (Hoda et al., 2011; Petersen and Wohlin, 2010), and economy (Conboy, 2009). In addition, Racheva et al. (2009) conducted a systematic review on how business Value is created in agile projects. They found, with very few exceptions, that most published studies take the concept of business Value for granted and do not state what it means in general as well as in the specific study context. Racheva et al. (2009) could not find any study which clearly indicates how exactly individual agile practices, or groups of practices, create Value. The need for conducting empirical research into Value and Value creation in agile projects was mentioned as one of their implications.

Chase (2001) proposed a list of Value aspects that an individual task could contribute towards. However, a detailed account of value considerations relevant for different perspectives like customer and internal business Value are missing. Several other researchers (e.g. Conboy, 2009; Fogelstrom et al., 2010; Song et al., 2009) have presented Value constructs and corresponding valuation/measurement solutions needed for making decisions about software product development. However, the contributions are often isolated and with a limited focus on, for example, only cost, or only product characteristics such as simplicity and usability. Moreover, some researchers (e.g. Cleland-Huang, 2015; Golfarelli et al., 2013) have looked into how to use Value as input to prioritization and release planning. In Cleland-Huang (2015), the author describes an approach that takes value into account when prioritizing, while the Golfarelli et al. (2013) proposed an optimization model that creates a release plan that maximizes the business Value from a user perspective. However, none of these papers investigated what Value is, how it is defined and used in industry, or how is it measured and assured. Instead, in Cleland-Huang (2015), the author used return on investment as Value, while Golfarelli et al. (2013) used the value aspect of perceived value (from a customer perspective) as defined in Khurum et al. (2013).

A comprehensive description of existing software value aspects is provided by Khurum et al. (2013), who distinguish major four perspectives, *Customer, Internal Business, Financial*, and *Innovation and Learning*. The *Customer* perspective is concerned with the Value proposition that the company operates to satisfy customers, thus generate more sales to the most relevant (i.e. the most profitable) customer groups through the maximisation of Value aspects such as Perceived Value and Usability (Khurum et al., 2013). The *Internal Business* perspective focuses on Value aspects that are concerned with internal aspects that can be taken into consideration, such as architectural aspects, but also values tied to differentiation and maintaining quality of development base (Khurum et al., 2013). The *Financial* perspective includes the aspects and strategies that a company takes into account in order to contribute to the bottom-line improvement of the company. It embodies the long-term strategic goals of the organisation in traditional financial terms (Khurum et al., 2013). The *Innovation and Learning* perspective takes into account the intangible possessions of an organisation. It focuses mainly on skills and capabilities and internal practices that are required for supporting the Value creating processes (Khurum et al., 2013).

Despite the importance of Value, and that Value is considered critical in Agile software development, to what extent companies' utilise Value, how Value is defined, and used, is largely unexplored. Chase (2001) proposes a list of Value aspects; however, a detailed account of value considerations relevant for different perspectives missing. Although Khurum et al. (2013) provide a consolidated view on the concept of Value, they do not look into how different companies interpret the Value concept, nor what Value Aspects are considered important to achieve and how these Value Aspects are assured and/or measured, which is the purpose of this study.

3. Research methodology

The investigation presented in this paper was carried out using a qualitative approach, namely in-depth semi-structured interviews (Robson, 2002). The objective of qualitative research is to study and understand phenomena within their real-life context (Robson, 2002). A qualitative approach is useful when the purpose of the study is to explore an area of interest where the aim is to improve the understanding of the phenomena that has not yet been investigated fully (Robson, 2002). Although Khurum et al. (2013) provide four major perspectives of Value with associated Value Aspects (VA from now on), they do not look into how different companies interpret the Value concept, nor what VAs are considered important to achieve. Thus, a further in-depth understanding of Value is needed. Since the purpose of this study was to gain an in-depth understanding of Value, its definition (into different types, called, which of these VAs are considered the most important in industry, and how is Value used and measured/assured in agile software development organisations, a qualitative approach was chosen.

Predicting the probable diversity of definitions and set of VAs that could be collected, semi-structured interviews would best meet the objectives of this study. In addition, we choose to use interviews as the concept of Value could be very contextually dependent, and it could be defined and approached differently amongst companies. For this reason it was important to have a presence when eliciting the data making it possible to elaborate on what