

# THE BUSINESS VALUE OF AGILE SOFTWARE DEVELOPMENT: RESULTS FROM A SYSTEMATIC LITERATURE REVIEW

*Research Paper*

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## Abstract

*A key promise of agile software development (ASD) is to deliver business value. While research and practice indeed report multiple benefits resulting from the adoption of ASD methodologies, the bandwidth of the achievable business values is not well understood yet. To clarify the concept of ASD business value and provide a systematic perspective on its multidimensional nature, we present the results of a literature review, in which we investigated the attainable benefits when adopting ASD methodologies. The contribution of the paper is twofold. First, we provide a systematic overview of 43 distinct ASD business values, which includes prominent values such as increased productivity and less regarded values, for example improved business IT alignment. Using a conceptual lens based on Chow and Cao (2008), we furthermore relate the identified business values to the factors determining the success of ASD projects, thus proposing a novel model to explain ASD success.*

*Keywords: Business Value of Agile Software Development, Agile Methodologies, Literature Review*

## 1 Introduction

Delivering business value is one of the key promises of agile software development (ASD) methodologies and declared as a fundamental principle in the Agile Manifesto (Beck et al., 2001; Alahyari et al., 2017). Yet, while literature provides ample evidence that ASD methodologies can indeed create business values of various kinds, the concept itself has not been clearly defined in the field of ASD. Literature emphasizes that the business value of ASD is not only manifested in the final software product and its characteristics, “but also in the development process as such” (Racheva et al., 2010, p. 132). Beyond this observation, however, evidence regarding the achievable benefits remains scattered across the literature base and has not been consolidated so far (Racheva et al., 2009). As a consequence, it is still left somewhat unclear, which kind(s) of business value(s) can be expected from ASD and how the adoption of ASD methodologies exactly contributes to the success of development efforts. Clarifying the connection between ASD and achievable business values appears necessary, though, as ASD methodologies are usually adopted with specific goals in mind and need to prove their merits.

To clarify the connection between ASD and the achievable benefits, we present the results of a study, in which we analyzed the potential of ASD methodologies to create business value. Our goal is to define the term business value in the context of ASD and to establish a better understanding of its multidimensionality, that is, of the different forms of business value that ASD methodologies can create. We study the following research questions: “*Which forms of business value can the use of ASD methodologies create? In which ways do these business values contribute to ASD project success?*”

To answer these questions and gain in-depth insights into the multidimensional nature of the ASD business value concept, we conducted a systematic review of the information systems (IS) literature. Based on the findings of 34 research articles, we systematically identify the business values observed in the application of ASD methodologies and organize them into a coherent concept. In developing a new conceptual lens based on the critical success factor model by Chow and Cao (2008), we relate the identified business values to the factors that determine the success of ASD projects. The results contribute to the body of knowledge in two ways: first, we formulate a more profound definition of the so far still blurry business value concept in ASD and provide a consolidated view into its multifaceted nature. To better explain ASD success, we moreover provide a new lens that describes how the achieved business values contribute to the success of ASD projects. It provides insights into the so far mostly hidden mechanisms of ASD methodologies and may help to uncover some of the ‘theoretical glue’ (Conboy, 2009) that defines the essence of agility in the field of IS development (ISD).

We proceed as follows: in the next section, we describe the theoretical background, the conceptual lens derived from Chow and Cao (2008), and related work. The research approach behind our study is documented in section 3. In section 4, we present the ASD business values identified in our literature review. We discuss the results as well as the implications for academia and practice in section 5. The paper ends with a conclusion and an outlook on future research avenues (section 6).

## **2 Theoretical Background and Related Work**

### **2.1 Agile Software Development Methodologies**

ASD methodologies such as Scrum or Extreme Programming (XP) introduce new approaches to software development (SD) that rely upon *agility* to facilitate the development process. Basically, SD agility can be understood as “the continual readiness of an ISD method to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer value [...] through its collective components and relationships with its environment” (Conboy, 2009, p. 340). As a unified base to conceptualize SD agility, the Agile Manifesto defines twelve agile principles that express the essence of the term (Beck et al., 2001). Thereby, the first principle mandates to deliver business value, specifically in the form of “valuable software” (Beck et al., 2001). Generally, the principles can be understood as abstract “guidelines” (Abrantes and Travassos, 2011) to realize agility through the application of agile practices. Agile practices hence support the implementation of agile principles on site by introducing concrete working, interacting, and managing procedures for the development process (Gupta et al., 2019). An ASD methodology then comprises a certain set of agile practices that aim at improving the agility of development teams in different ways. The ASD methodology being used accordingly defines the subset of agile principles that are being implemented. While the connection between agile practices (e.g., daily meetings) and the corresponding agile principles (e.g., direct communication) often seems obvious, it is typically less clear how certain agile practices contribute to the creation of business value. This unclear connection is partly caused by the missing definition of the term ASD business value, thus calling for a clearer conceptualization of the value creation in ASD methodologies.

### **2.2 Business Value of Agile Software Development**

The need to clarify the creation of business value through use of ASD methodologies has been emphasized by several researchers (Racheva et al., 2010; Alahyari et al., 2017). While business value

is often understood as an economic term that manifests itself in constructs like costs or productivity, literature has shown that the use of ASD methodologies can lead to several additional benefits such as employee-wellbeing related values (Racheva et al., 2010). These observations suggest that business value in the context of ASD “is not only dollars” (Racheva et al., 2010, p. 131) but instead depicts a multifaceted concept. To our best knowledge, however, there exists no clear definition of the term yet. To define the term *ASD business value*, we refer to the notion of IS business value, which describes the creation of business value through the effective usage of IS. In literature, IS business value is defined as “the impact of investments in particular IS assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment” (Schryen, 2013, p. 141). To extend this rather economic perspective, we propose a tailored definition to capture the essence of *ASD business value*:

*ASD business value is the multidimensional impact of the utilization of ASD methodologies on the performance and capabilities of organizational entities at various levels, resulting in overall increased performance in terms of development success.*

Based on this conception, our goal is to investigate the multidimensional impacts of ASD on the performance of various organizational entities and to develop the abstract definition of ASD business value into a more tangible concept. Assessing this multidimensionality through a systematic lens appears particularly important, as the concept still needs clarification. Prior research has shown that the success of ASD depends upon several factors as antecedents (Misra et al., 2009; Dikert et al., 2016; Chow and Cao, 2008; Ahimbisibwe et al., 2015). To depict the role of critical success factors for ASD project success, the conceptual model by Chow and Cao (2008) distinguishes *organizational, people, process, technical* and *project* factors. Since the objective of our research is to analyze the multidimensionality of the ASD business value concept on distinct levels, we adopt this model as conceptual lens. In this line of thought, literature also suggests that the usage of ASD methodologies leads to the realization of distinct positive effects on the level of these success-driving factors. Examples from the extant body of literature discuss improved communication within the team (Hummel et al., 2015), reduced work exhaustion of the individual developer (Venkatesh et al., 2020), increased business IT alignment (Elbanna and Murray, 2009; Tessem, 2014), and improvements in process performance and flexibility (Begel and Nagappan, 2007; Tarhan and Yilmaz, 2014).

In our analysis, we use the conceptual logic of Chow and Cao (2008) to attribute the observed effects of ASD methodologies to the various success factors. We assume that the use of ASD methodologies positively influences these success factors and the resulting ASD success dimensions. Therefore, we propose to examine the ASD business value concept on the level of the critical success factors and on the level of the development success. Thereby, we consider the *organizational* level, *individual* level, *team* level and *process* level, as well as traditional success criteria on the *ASD success* level for our conceptual lens. During an analysis of related work, we found that research in the ASD domain frequently investigates *people* factors on the team level (Hummel et al., 2015) and the individual level (Venkatesh et al., 2020) as disjunct units of analysis. We consequently separate the *people* factor described by Chow and Cao (2008) into two distinct levels, resulting in an *individual* and a *team* level. Note that the model by Chow and Cao (2008) also includes *technical* factors as another critical success factor. As these factors characterize the application of various ASD practices – i.e., refactoring, regular delivery, and integration testing, see Chow and Cao (2008, p. 963, Table 2) –, we summarize them as the use of ASD methodologies rather than depicting them as separate success factors for ASD success in our lens.

In addition, project characteristics are also deemed to be a critical success factor by Chow and Cao (2008). While we acknowledge the importance of project characteristics – i.e., project size and project complexity – for the resulting ASD success, we consider project characteristics to be a moderator between the different success factors and the resulting ASD success. This perspective is in line with recent research on ASD projects (Ahimbisibwe et al., 2015). As we intend to investigate the general breadth of facets of ASD business value, the analysis of the role of this moderator is not within the scope of our research endeavor. Therefore, we excluded the project factors from our conceptual lens.

In sum, our conceptual lens comprises *individual, team, organizational, process, and ASD success* levels. We deem breaking down the assessment into these five levels to be adequate, as it allows for a multidimensional analysis of the ASD business value concept in the following chapters.

## 2.3 Related Work

While the knowledge base on ASD business value is still in a nascent state, several studies have examined the creation of business value through the application of ASD methodologies, leading to first steps towards the definition of ASD business value. Extant research has focused on identifying success factors for ASD from diverse perspectives, for instance by analyzing the perceived success of ASD projects (Lee and Xia, 2010; Hummel and Epp, 2015). Yet these contributions typically assess success and value creation through traditional performance indicators only, thus neglecting the multidimensionality of ASD success. In contrast, especially more recent studies emphasize the multifaceted nature of ASD business value (Alahyari et al., 2017). Examples for examined business value dimensions that go beyond traditional performance indicators include employee and customer satisfaction (Heidenberg et al., 2012; Racheva et al., 2010), collaboration (Korpivaara et al., 2021) as well as increased innovation and learning (Alahyari et al., 2017). To highlight the centrality of the customer in ASD business value realization, scholars have also investigated the perceived benefits of ASD from a customer perspective. Exemplary findings that extend traditional performance indicators include improved transparency and better requirements meeting as distinct benefits of ASD (Schlauderer and Overhage, 2013). While these studies provide some insights into the business value of ASD methodologies, the evidence remains scattered across the literature base and has not been consolidated so far (Racheva et al., 2009). As stated in Racheva et al. (2009), “the notion of [ASD] business value is slippery and highly volatile” (p. 14), thus indicating a lack of coherence in literature. To reduce this gap in the literature, we therefore aim at obtaining both a clearer understanding of the term ASD business value as well as providing a consolidated overview of its multiple dimensions.

## 3 Research Methodology

To systematize and summarize the current body of knowledge on ASD business value in IS research, we conducted a systematic literature review according to the guidelines of vom Brocke et al. (2009). We pursue the objective of clarifying the concept of ASD business value, particularly focusing on the multifaceted forms of business value resulting from the usage of ASD methodologies.

The first step of our literature review pertains to the definition of our review type. We adopted the taxonomy of Cooper (1988) to determine the characteristics of our study. Due to page limitations, we provide a full characterization online, see <https://doi.org/10.6084/m9.figshare.19403489>. In the second step of our literature review, we defined central terms and concepts that are related to our research objective. Before delineating the concept of ASD business value, we shed light on ASD methodologies as the general underlying topic. Hence, we perceived ASD methodologies, ASD practices and the different notions of added values resulting from the usage of ASD methodologies (i.e., benefits, advantages, or improvements) to be the fundamental terms that constitute our research topic. In this step, concepts generally related to the notion of agile, i.e., agile supply chains and agile manufacturing, were explicitly excluded, as these terms do not correspond to our focus on ASD methodologies. In the following, we developed the search string below, which emphasizes the different notions of business value and ASD-related terms, while it also excludes irrelevant terms:

((("agile software development" OR "agile method\*" OR "agile practi\*" OR "agile development") NOT ("agile manufacturing" OR "agile supply chain" OR "agile engineering" OR "organizational agility")) AND (value\* OR "business value" OR benefi\* OR advantage\* OR perform\* OR achiev\* OR increase\* OR success\* OR profit\* OR accept\* OR adoption\*))

Using this search string, we searched the AIS eLibrary to identify articles in AIS-related conferences and journals. Secondly, we used the search string to identify relevant articles in the Senior Scholars Basket of Journals, which are not fully included in the collection of the AIS eLibrary. As a result, we identified 224 potentially relevant research articles. To ensure the validity of the identified research

articles, we applied a structured literature evaluation process. First, we defined distinct inclusion and exclusion criteria. For the final review sample, we only included articles that were published within the last 15 years (2006-2021), as the discussion on ASD in scientific literature gained momentum from 2006 onwards (Dingsøy et al., 2012; Baham and Hirschheim, 2021). Furthermore, the articles needed to be explicitly relevant to the scope of our literature study (i.e., benefits and other notions of ASD business value). We also rejected opinions, keynotes, viewpoints, and other articles that cannot be characterized as full research papers. Lastly, we excluded articles that thematize agility as a general concept and do not refer to the context of ASD methodologies. Along the identified inclusion and exclusion criteria, we scanned the initial review sample using a title- and abstract-based screening procedure. As a result of this step, we excluded 154 research articles from our review sample and analyzed the 70 resulting articles in a full-text screening. Based on the full-text screening and additional forward and backward searches, we defined a final review sample of 34 research articles.

The fourth step thematizes the analysis of the literature sample. To ensure scientific rigor, we applied a systematic coding scheme following the guidelines of Gioia et al. (2013) and Wolfswinkel et al. (2013). Both articles propose a three-step coding scheme to establish a systematic data structure, consisting of open, axial, and selective coding. This grounded theory-oriented approach allows for the exploration and systematization of extant findings on ASD business value, while also supporting the theorization of the ASD business value concept and thereby identifying prospective avenues for future research (Wolfswinkel et al., 2013). In the open coding step, we extracted 298 text fragments from our review sample that relate to the notion of ASD business value. As a result, we derived 43 distinct 1<sup>st</sup> order concepts depicting ASD business values. In the axial coding step, we synthesized the 1<sup>st</sup> order concepts into 14 2<sup>nd</sup> order themes. As this step entails a clustering of the text fragments, we grouped 1<sup>st</sup> order concepts that bear similarities on complementary ASD business values. As the subsequent selective coding step entails the identification and development of relations between the 2<sup>nd</sup> order themes (Wolfswinkel et al., 2013), we grouped the 14 identified 2<sup>nd</sup> order themes along the levels of the conceptual lens. Here, themes manifesting themselves on a similar level were clustered together. As an example, interaction and cohesiveness of the team were both assigned to the team level. Analogously, themes that discuss traditional success criteria or depict a specific value for the customer were categorized within the ASD success category. In sum, we were able to classify all identified 2<sup>nd</sup> order themes into one respective element of our proposed ASD business value concept. This classification can be found online in full detail: <https://doi.org/10.6084/m9.figshare.19403489>.

As a final step, vom Brocke et al. (2009) suggest the proposal of a research agenda. For our research endeavor, we derived three distinct propositions that inform both researchers and practitioners with an interest in ASD business value, thus depicting avenues for future research and practical application.

## 4 Results: Systematization of ASD Business Values

In the following sections, we present the results of our classification along the constitutive elements of our conceptual lens on ASD business value. We delineate the identified business value themes and list the values, exemplary contributions, and the identified frequency in the literature ( $\Sigma$ ) in Tables 1-5.

### 4.1 Individual Level Values

Business values assigned to this category represent values that are manifested on the level of the individual employee that applies ASD methodologies. Table 1 summarizes the value concepts and corresponding themes described in the following. This value category particularly focuses on the human side of value creation and encompasses *employee-wellbeing-related values*, values that indicate an *improved job perception* as well as *improved individual inventiveness*.

The first business value theme depicts *employee-wellbeing-related values*. This theme encompasses *improved employee satisfaction*, *increased employee motivation & engagement*, *increased employee pride*, and *reduced work exhaustion* as business values that can be achieved by applying ASD methodologies. First, several studies reported a general *increase of employee satisfaction* (Tripp et al.,

2016; Karrenbauer et al., 2019), stating higher degrees of enthusiasm (Fitzgerald et al., 2006) and more enjoyment at work (Fitzgerald et al., 2006; Bose, 2008). Besides, developers in ASD projects were also reported to show *increased motivation* (Elbanna and Murray, 2009; Cao and Park, 2017) and more *engagement* at the workplace (Huck-Fries et al., 2019). The increased motivation and general employee satisfaction were particularly evident in Cao and Park (2017, p. 7): “It was great to get the feedback at the end of the iteration. What you had done, the value of it, become clear to me and that motivated me because I saw the value of my work, and it was certainly enjoyable working this way”.

In addition, developers also showed signs of *increased pride* of their project work (Cao and Park, 2017). A fourth business value pertains to *reduced work exhaustion*, as employees showed less tendencies for burnout (Ghobadi and Mathiassen, 2017) and reduced stress (Overhage and Schlauderer, 2012b; Venkatesh et al., 2020). This was particularly due to more balanced workloads (Huck-Fries et al., 2019) and reduced fluctuations, indicating a more sustainable pace in the development process (Overhage and Schlauderer 2012b).

The second identified business value theme comprises *job-perception-related values*. For this theme, we identified *improved role understanding*, an *increased job autonomy* as well as *improved job meaningfulness* as distinct ASD business values. As an initial insight, Venkatesh et al. (2020) observed more congruent role perceptions in ASD, thus indicating an *improved role understanding*, which was also reported in Huck-Fries et al. (2019) due to reduced role ambiguity. Moreover, the general usage of ASD methodologies provided developers with *increased job autonomy* (Tripp et al., 2016; Huck-Fries et al., 2019). Together, these benefits result in overall improved working conditions, which was also indicated through *improved job meaningfulness* (Huck-Fries et al., 2019).

1 <sup>st</sup> Order Value Concept	2 <sup>nd</sup> Order Value Theme	Description	Exemplary Contributions	Σ
Improved Employee Satisfaction	Employee-Wellbeing-related Values	Added values indicating an increase in employee's mental welfare	Fitzgerald et al. (2006) Tripp et al. (2016)	11
Increased Employee Motivation & Engagement			Elbanna and Murray (2009) Cao and Park (2017)	5
Increased Employee Pride			Cao and Park (2017)	1
Reduced Work Exhaustion			Ghobadi and Mathiassen (2017) Venkatesh et al. (2020)	4
Improved Role Understanding	Job-Perception-related Values	Added values indicating an improved employee's attitude towards the working conditions defined by the respective job	Venkatesh et al. (2020) Huck-Fries et al. (2019)	2
Increased Job Autonomy			Huck-Fries et al. (2019) Tripp et al. (2016)	2
Improved Job Meaningfulness			Huck-Fries et al. (2019)	1
Increased Employee Creativity	Inventiveness-related Values	Added values indicating an increased imaginativeness	Elbanna and Murray (2009)	2
Increased Employee Innovativeness			Karrenbauer et al. (2019)	1

Table 1: Individual Level ASD Business Values

The last value theme discusses *inventiveness-related values*, covering *increased employee innovativeness* and *increased employee creativity*. As stated in Elbanna and Murray (2009), ASD methodologies allow employees “to find alternative and complementary ways that enhance the management and deliverables of the project” (p. 12), highlighting an *increased employee creativity* through the use of ASD methodologies. In addition, Karrenbauer et al. (2019) reported increased *employee innovativeness* on the individual level, particularly in innovation projects. As such, „highly motivated [employees] bring in more innovations” (Karrenbauer et al., 2019, p. 841), while also allowing “new ideas and features [to surface] that increased creativity” (Fruhling and Vreede, 2006, p. 57).

## 4.2 Team Level Values

The business values identified in this section particularly manifest themselves on the team level. In Table 2, we list the corresponding business values and 2<sup>nd</sup> order themes. These include *interaction-related values*, *capability-building-related values* as well as *team-cohesiveness-related values*.

1 <sup>st</sup> Order Value Concept	2 <sup>nd</sup> Order Value Theme	Description	Exemplary Contributions	Σ
Improved Communication	Interaction-related Values	Added values indicating an improved cooperation and synergistic interaction between agile team members and stakeholders	McHugh et al. (2011) Hummel and Epp (2015)	11
Improved Team Collaboration			Cao and Park (2017) Vidgen and Wang (2009)	13
Improved Coordination			Bonner et al. (2010) Overhage and Schlauderer (2012b)	3
Improved Stakeholder Collaboration			Hummel and Epp (2015) Ghobadi and Mathiassen (2017)	2
Improved Learning Effects	Capability-building-related Values	Added values indicating improved knowledge sharing in ASD teams	Cao and Park (2017) Vidgen and Wang (2009)	8
Improved Team Knowledge Dissemination			Fruhling and Vreede (2006) Balijepally et al. (2014)	9
Improved Team Cohesion	Team-Cohesiveness-related Values	Added values indicating stronger team unity and coherence between agile team members	Fruhling and Vreede (2006) McAvoy and Butler (2006)	5
Reduced Social Loafing			McAvoy and Butler (2006)	1
Improved Team Morale			Fitzgerald et al. (2006) Fruhling and Vreede (2006)	4
Increased Trust Among Employees			Hummel and Epp (2015) McHugh et al. (2011)	3

Table 2: Team Level ASD Business Values

For the team level, we first describe the *interaction-related value* theme, which entails *improved communication*, *improved team collaboration*, *improved coordination* of the team as well as *improved stakeholder collaboration*. As regards *improved communication*, ASD methodologies such as Scrum, provide “a clear communication structure and procedure” (Hummel and Epp, 2015, p. 5051), which leads to generally *improved communication*, i.e. through mutual understanding (McHugh et al., 2011). As a second business value, ASD facilitates *improved team collaboration*, observable through mutual support between the team members (Cao and Park, 2017; Vidgen and Wang, 2009; Fitzgerald et al., 2006). The third business value depicts *improved team coordination*, which seems to result particularly from the flexibility of ASD methodologies (Overhage and Schlauderer, 2012b). Besides, *improved stakeholder collaboration* was also mentioned in extant literature. Involving customers in sprint reviews helps to understand customer demands (Hummel and Epp, 2015), thus working “collaboratively rather than in an adversarial relationship” (Ghobadi and Mathiassen, 2017, p. 706).

The second group of business values refers to *capability-building-related values* and encompasses *improved learning effects* and *improved team knowledge dissemination*. In particular, the latter not only refers to the transfer of technical knowledge, but also to the distribution of “knowledge about who knows what” (Vidgen and Wang, 2009, p. 363). In addition, XP practices, i.e. pair programming, support knowledge sharing among team members (Balijepally et al., 2014; Fruhling and Vreede, 2006). Similarly, other ASD practices facilitate mutual learning and enable team members to improve their skill set (Cao and Park, 2017; Vidgen and Wang, 2009).

The last identified 2<sup>nd</sup> order value theme pertains to factors depicting *team-cohesiveness-related values*. This category encompasses *improved team cohesion*, *reduced social loafing*, *improved team morale*, and *increased trust among employees*. Extant research in this field reported that ASD methodologies “promote high levels of social cohesion and a sense of ownership among team members” (McAvoy and Butler, 2006, p. 9), thus indicating an *improved team cohesion*. Another

aspect was the *reduction of social loafing* behavior, implying mutual commitment and engagement (McAvoy and Butler, 2006). In addition to communication, Scrum also facilitated “*building morale* and helping the team to ‘gel’”, (Fitzgerald et al., 2006, p. 209). The final value concept pertains to the *increased trust among employees* practicing ASD methodologies, which is for instance gradually established in daily meetings and joint retrospectives (Hummel and Epp, 2015; McHugh et al., 2011).

### 4.3 Organizational Level Values

While the first two examined levels allowed for a distinct assignment of the different value concepts to either individuals or entire teams, we also identified several values that affect the entire organization. We grouped these under the term *collective organization-related value*. Herein, we refer to the business values of *improved resource usage*, *improved business IT alignment*, *improved business innovativeness* and *better market sensing*. These values are listed in Table 3.

1 <sup>st</sup> Order Value Concept	2 <sup>nd</sup> Order Value Theme	Description	Exemplary Contributions	Σ
Improved Resource Usage	Collective Organization-related Values	Added values affecting an entire organization when developing software using ASD methodologies	Fruhling and Vreede (2006) Jentsch (2017)	3
Improved Business IT Alignment			Elbanna and Murray (2009) Overhage et al. (2011)	2
Improved Business Innovativeness			Elbanna and Murray (2009)	1
Better Market Sensing			Anderson et al. (2017)	1

Table 3: Organizational Level ASD Business Values

First, we found that ASD leads to *improved resource usage*. This was particularly evident in Gerster et al. (2018), who observed that “efficient resources allocation [...] avoids wasting resources for applications or features not valued accordingly by the business” (p. 7), emphasizing the ability of ASD methodologies to prioritize valuable features for the customer. Another consequence of ASD methodology use that affects the entire organization lies in the *improved alignment of business and IT*. For instance, the use of Scrum as a popular ASD methodology “increases business knowledge on the IT side” (Overhage et al., 2011, p. 6). In addition, Elbanna and Murray (2009) report the closure of the business-technical gap, as both sides were aware of each other’s internal operations, which “improved the business ability to innovate” (p. 11). Hence, ASD methodologies can also lead to *improved business innovativeness*. Finally, *improved market sensing* represents the last business value in this category. Anderson et al. (2017) report that “frequent iterations enable a firm to explore the market space without overreacting to spurious market signals” and thus “improve market fit” (p. 8).

### 4.4 Process Level Values

The business values identified in the 4<sup>th</sup> section concern the ASD process itself and the benefits that can be observed directly on the process level. Table 4 shows the identified values and corresponding 2<sup>nd</sup> order themes. We found *process-flexibility-related values*, *process-complexity-related values* as well as *process-performance-related values* as relevant 2<sup>nd</sup> order themes for this level.

Regarding *process-flexibility-related values*, we identified *improved responsiveness to requirements change* and *continuous process refinement* as business values illustrating improved process flexibility. In a first step, we describe the *improved responsiveness to requirements change*. ASD methodologies allow to “react faster to changing market requirements” (Karrenbauer et al., 2019, p. 841) and support “the introduction of new requirements later in the lifecycle” (Balijepally et al., 2014 p. 10). Likewise, ASD methodologies allow for *continuous process refinement*. In particular, retrospectives help “finding the root causes of problems to avoid repeating the same issues” (Rodríguez et al., 2015, p. 4776), allowing the team to adjust its behavior accordingly (Balijepally et al., 2014).

The group of value concepts that constitute the 2<sup>nd</sup> order theme of *process-complexity-related values* comprises *improved complexity management*, *improved uncertainty management*, *improved*



transparency, increased compliance to employee needs, and improved focus on simplicity. Pertaining to overall improved complexity management, ASD was found to help cope with technical complexity, regulatory constraints as well as planning for both short and long-term perspectives (Karrenbauer et al., 2019). In addition, the use of ASD methodologies allows for improved uncertainty management, as handling scenarios with a high degree of uncertainty gave developers “a sense of security, and control over their work” (Vidgen and Wang, 2009, p. 369) when using ASD methodologies, particularly “if the definition of the final product is not quite clear at the beginning of the project” (Karrenbauer et al., 2019, p. 839). As a third value in this theme, improved transparency in ASD processes can result from the use of techniques such as the daily scrum (Bonner et al., 2010), as “the current project status and the encountered problems [become more] transparent” (Overhage and Schlauderer, 2012a, p. 10). Higher transparency also seems to be related to improved compatibility to employee needs regarding the SD process, as it meets their preferred working mode. As a last point, we identified an improved focus on simplicity in the SD process through a simpler documentation mode and simplified implementations (Karrenbauer et al., 2019; Fruhling and Vreede, 2006).

1 <sup>st</sup> Order Value Concept	2 <sup>nd</sup> Order Value Theme	Description	Exemplary Contributions	Σ
Improved Responsiveness to Requirements Change	Process Flexibility-related Values	Added Values indicating an improved SD process flexibility and demand changes adaptability	Balijepally et al. (2014) Karrenbauer et al. (2019)	5
Continuous Process Refinement			Balijepally et al. (2014) Rodríguez et al. (2015)	6
Improved Complexity Management	Process Complexity-related Values	Added values indicating a simpler execution of the SD process	Karrenbauer et al. (2019) Schmidt et al. (2014)	3
Improved Uncertainty Management			Vidgen and Wang (2009) Karrenbauer et al. (2019)	3
Improved Transparency			Overhage and Schlauderer (2012a) Bonner et al. (2010)	4
Increased Compatibility to Employee Needs			Bonner et al. (2010) Overhage and Schlauderer (2012a)	3
Improved Focus on Simplicity			Karrenbauer et al. (2019) Fruhling and Vreede (2006)	3
Improved Productivity	Process Performance-related Values	Added values indicating an improved operational performance of the SD process	Bonner et al. (2010) Parsons et al. (2008)	2
Reduced Waste			Gerster et al. (2018) Rodríguez et al. (2015)	5
Increased Efficiency			Karrenbauer et al. (2019) Fitzgerald et al. (2006)	5

Table 4: Process Level ASD Business Values

Lastly, several articles describe *performance-related values*, incorporating improved productivity, reduced waste, and increased efficiency. Development in pairs as well as co-location as guiding principles in ASD seem to positively stimulate improved productivity (Bonner et al., 2010; Parsons et al., 2008). In regards to reduced waste, Karrenbauer et al. (2019) state that “the advantage in an agile environment is that the waste previously generated with conventional methods is no longer necessary, which reduces the effort and increases the efficiency in software development” (p. 841). The improved workflow in ASD also contributes to improved efficiency, for example as “pair-programming developers did not get stuck wondering what to do next” (Fitzgerald et al., 2006, p. 206).

#### 4.5 ASD Success Level Values

The business values identified in the last section deal with the outcomes of the SD process, depicting the constitutive elements of ASD success. Table 5 shows the enclosed values and corresponding 2<sup>nd</sup> order themes. In this context, we identified *customer-demand-fulfillment-related values*, *product-quality-related values*, *timeliness-related values*, and one single *cost-related value*.

1 <sup>st</sup> Order Value Concept	2 <sup>nd</sup> Order Value Theme	Description	Exemplary Contributions	$\Sigma$
Better Customer Requirements Meeting	Customer Demand Fulfillment-related Values	Added values indicating the constant fulfillment of customers' demands and requirements	Vidgen and Wang (2009) Anderson et al. (2017)	12
Frequent Software Delivery			Vidgen and Wang (2009) Wang et al. (2012)	2
Increased Customer Satisfaction			Balijepally et al. (2014) Cao et al. (2009)	2
Improved Overall Software Quality	Product Quality-related Values	Added values indicating an enhancement of the overall product quality	Fruhling and Vreede (2006) Balijepally et al. (2014)	9
Improved Code Quality			Maruping et al. (2009) Jentsch (2017)	5
Reduced Code Complexity			Maruping et al. (2009)	1
On-Time Delivery	Timeliness-related Values	Added values indicating an expedited or timely delivery of software	Lee and Xia (2010) Fitzgerald et al. (2006)	3
Reduced Time to Market			Gerster et al. (2018) Karrenbauer et al. (2019)	7
On-Budget Delivery	Cost-related Value	Added value indicating the adherence to budget	Lee and Xia (2010) Parsons et al. (2008)	3

Table 5: ASD Success Level Business Values

The first 2<sup>nd</sup> order value theme concerns **customer demand fulfillment** and encompasses *better customer requirements meeting*, *frequent software delivery*, as well as *increased customer satisfaction*. For the notion of *better customer requirements meeting*, the short release and feedback cycles (Anderson et al., 2017) as well as sprint review meetings (Elbanna and Murray, 2009) prove beneficial. In addition, the iterative and *frequent delivery of software* (Wang et al., 2012) allows for early recognition whether development is moving in the wrong direction and thus for counter-steering quickly (Vidgen and Wang, 2009). As a result of requirements fulfillment, *customer satisfaction* regarding the product and the overall work of the project team is improved (Cao et al., 2009).

As another 2<sup>nd</sup> order value theme, we deem **product-quality-related values** to be an important category of the resulting ASD success. Here, we include the *improved overall software quality*, *improved code quality* and *reduced code complexity*. Regarding *overall improved software quality*, noticeable benefits comprise reduced defect density (Balijepally et al., 2014; Fitzgerald et al., 2006) and reduced bug severity (Maruping et al., 2009). In addition, ASD methodologies allow for the production of *qualitative code* (Jentsch, 2017) and reduction of overall *software complexity* (Maruping et al., 2009).

Besides adherence to schedule as an important **timeliness-related value** (Fitzgerald et al., 2006; Lee and Xia, 2010; Cao et al., 2009), indicating *on-time-delivery*, a second benefit concerns *reduced time to market* and the early availability of results. Software is thus not only available within a shorter timeframe (Gerster et al., 2018), but already accessible and usable at an early stage of the project lifecycle (Karrenbauer et al., 2019; Fruhling and Vreede, 2006; Overhage and Schlauderer, 2012a).

Lastly, for a **cost-related value**, our findings indicate that ASD can support *on-budget delivery* (Cao et al., 2009; Lee and Xia, 2010), while also delivering value in terms of superior productivity, quality and stakeholder satisfaction, without a significant increase of cost (Parsons et al., 2008).

## 5 Discussion

### 5.1 Key Findings and Contributions

To capture the essence of our research results, we derive three distinct propositions that depict the key contributions of our systematic literature review. In doing so, we propose an updated perspective on value creation in ASD processes, which suggests an extension beyond traditional ISD success criteria.

**P1: The use of ASD methodologies leads to business values that go beyond economic aspects.**

As recognized by Racheva et al. (2009; 2010) early in the debate on ASD business value creation, the value derivable from the use of ASD methodologies involves a variety of dimensions that go beyond economic impacts. Our findings show that the application of ASD methodologies implies value creation opportunities for all factors of our lens, which collectively lead to the realization of ASD success. To summarize our findings, we propose a preliminary version of a novel ASD business value model shown below. The model comprises the levels of the initial conceptual lens presented in chapter 2.2, with a more detailed elaboration using the 2<sup>nd</sup> order value themes that resulted from our literature analysis. While the perspective on ASD success comprises the traditional project success criteria, i.e., time, cost and quality, the success level is further extended with a dedicated dimension that highlights the centrality of the customer in ASD projects. This extension of the traditional view on development success follows the notion of the core principles of the Agile Manifesto (Beck et al., 2001), stating that the “highest priority is to satisfy the customer” (Beck et al., 2001) through frequent delivery of software. Therefore, ASD business value is also illustrated by the success dimensions pertaining to the fulfillment of customer demands and the timely delivery of high-quality products. Remarkably, business values indicating an economic impact of ASD methodology use are rarely featured in the extant body of literature. The only economic indicator found in our literature analysis depicts the adherence to the defined project budget, which was furthermore marginally represented in our literature sample. Generally, it was notably apparent that the concept ASD business value manifests itself particularly on the levels of the individuals, the development team, the organization, and the development process. Based on these observations, we propose the concept of ASD business value to be extended beyond prior, rather economically oriented conceptions of business value within the IS domain. Since the literature analysis emphasizes the multidimensionality of the ASD business value concept, we can conclude that it appears necessary to broaden our general perspective on the notion of business value. In doing so, extending the rather financially dominated stance with a set of more intangible value aspects to grasp the complexity business value realization in ASD is required.



Figure 1: ASD business value creation model

**P2: The realization of certain ASD business values is tied to distinct ASD practices.**

As a prominent result of our analysis, we found that the realization of certain ASD business values is linked to the application of a distinct ASD practice. We identified several practices that enhance specific ASD business values, especially in the domain of rather technically oriented practices. Examples include code refactoring, which led to performance improvements of the code (Fruhling and Vreede, 2006) and improved the detection of bugs, thereby reducing debugging time (Fitzgerald et al., 2006). In addition, pair programming and frequent testing both reduced the defect density of the developed software product (Fitzgerald et al., 2006; Balijepally et al., 2014). Also, we observed socially oriented practices, i.e., daily stand-ups and retrospective meetings, to increase collaboration and communication within the team, thereby building up trust among the team members (McHugh et al., 2011; Hummel and Epp, 2015). In consideration of these observed effects, we conclude that certain ASD practices lead to ASD business values on distinct levels. In particular, we found technically oriented practices to foster business values on the ASD success level, whereas socially oriented techniques most notably affected values on the individual and team level. While we found

some direct links between realized ASD business values and applied ASD practices as first implications in the literature, however, the origin of a certain ASD business value remains yet to be uncovered in many cases. In literature, various realized ASD business values were depicted to stem from the general application of ASD methodologies, while the underlying mechanisms of value realization, i.e., the applied practices, still remain to be a black box. Considering the identified links as a starting point, we propose that the application of certain practices promises the realization of a baseline of ASD business values. Realizing the full potential of ASD methodologies to leverage the whole bandwidth of ASD business values, however, appears to be due to a complex interplay of different ASD business value factors that needs to be further understood, as proposed below.

**P3: The complex interplay of different value factors leads to a surplus of ASD business value.**

During our analysis, we observed numerous interdependencies between the different investigated value levels as well as relationships between distinct value themes within a certain value level. As such, we noted that different ASD business values manifestations mutually defined and enriched one another, thus indicating complex interrelationships between different values. For instance, we found interactions between several team values in Fitzgerald et al. (2006) and McHugh et al. (2011). In these cases, improved communication through the use of ASD practices led to facilitated collaboration, while also increasing trust among members of the development team. Further interrelationships were identified in Elbanna and Murray (2009), where an improved alignment of business and IT departments resulting from the use of ASD practices fostered the “business ability to innovate and to extend the system to cover more business processes and departments” (Elbanna and Murray, 2009, p. 11), thus indicating an improved business innovativeness resulting from the achieved business IT alignment. As a consequence, we argue that the realization of an ASD business value surplus entails an interaction and mutual enrichment of the different facets, depicting a complex system of interwoven value aspects. Following the logic of Tanriverdi (2006), we propose that the synergistic interaction between different value aspects may lead to an extension of the realized business value resulting from the use of ASD methodologies. We observed several initial indications illustrating these synergistic interactions in contributions in our sample, however, the interplay between the different facets of ASD business value yet remains to be systematically understood. Therefore, we argue that a systematization of these interactions represents a promising avenue for future research.

## **5.2 Implications for Research and Practice**

Our research has implications for academia and practice alike. As regards academia, the results contribute to the emerging research strand on ASD business value creation, indicating several avenues for future research. First, with our systematization, we propose an initial conceptualization for the multidimensionality of the ASD business value concept. However, given the limited focus on the IS literature base only, we propose that an extension of the scope into other research domains like computer and management science seems fruitful. Secondly, the results of our analysis exhibit a certain imbalance regarding the attention different value aspects have received. Some value aspects, including team communication and collaboration, customer requirements meeting, and employee satisfaction, have been examined in detail in the extant body of knowledge. In contrast, we also found numerous values that remain largely unresearched, particularly on the organizational level. Moreover, in the current state of research, findings on financial impacts resulting from the use of ASD methodologies that affect the bottom-line of the organization also remain scarce. This negligence appears noteworthy, since financial and organizational impacts have been studied extensively in other research domains, i.e., in the IS domain or the big data analytics domain (Schryen, 2013; Elia et al., 2020). Consequently, we encourage future research to assess the potential economic impacts resulting from the use of ASD methodologies, while also addressing organizational impacts in greater detail. Lastly, we identified several indications that certain agile practices foster the realization of a distinct ASD business value. Simultaneously, we observed that most contributions do not state exactly what agile practices were used to realize certain business values. Consequently, the analysis of the effect of individual ASD practices on ASD business value embodies an avenue for future research, together

with the depicted complex interplay of ASD business value that proposedly leads to a surplus of ASD business values. We suggest that a better understanding of ASD practices and the underlying value realization mechanisms would support a more value-targeted application of ASD methodologies in practice. To summarize the academic implications of our findings, we enrich extant insights on ASD business value creation (Racheva et al., 2009; 2010; Alahyari et al., 2017). As such, we contribute towards the understanding of ASD business value and help reduce the missing ‘theoretical glue’ (Conboy, 2009) in ASD research, while also suggesting distinct new pathways for future research.

For ASD practitioners, our research provides a systematization of the spectrum of ASD business values, supporting organizations in understanding the possible benefits they may derive from the application of ASD methodologies. As such, our findings may help organizations pinpoint specific levels where business value is either already being created through ASD or support the recognition of unused potential and take appropriate actions. As another practical implication, our results may help organizations in answering the question why to implement and effectively use ASD methodologies in their daily practice. Depending on the respective context of an organization, different specificities of ASD business value may motivate the adoption of ASD methodologies. Our systematization can thus guide organizations in assessing whether ASD methodologies can satisfy their organizational needs.

### **5.3 Limitations**

Our research is not without its limitations. As such, our results potentially suffer from a subjective bias of the researchers. This issue particularly pertains to the selection of review articles and the enclosed data extraction. While we independently assessed the articles quality- and content-wise and subsequently merged our results in iterative rounds of discussion, we cannot fully rule out a potential bias. Hence, a limited probability of potentially omitted articles remains. In addition, our scope for the conducted literature search only focuses on IS research, leading to a possibly reduced breadth of distinct ASD business values. Future research that includes other outlets than the AIS eLibrary and the Senior Basket of Journals could thus further extend our perspective on ASD business value. Moreover, we have not empirically validated the identified ASD business values. This limitation is interwoven with the fact that we conducted a literature study on the potential of ASD methodology usage for business value creation. Hence, our study can only serve as a value-potential assessment of ASD methodology usage. To stabilize these findings, we plan to conduct a survey on the identified business values based on the results of the literature review. Another considerable limitation lies in solely taking a positive stance to delineate the concept of ASD business value. Consequently, we only report on the positives of ASD, leaving the potential dark side of ASD out of scope. Despite the mentioned limitations, we still hope to contribute to a clearer understanding of ASD business value.

## **6 Conclusion**

Although ASD methodologies have become widespread in practice, the delivered business value is still not well understood. To mitigate this literature gap, we proposed a definition to clarify the ASD business value concept and provided a systematic overview of its multiple dimensions. Based on a literature review, we identified 43 distinct ASD business values and related them to five factors that determine the success of ASD projects. Our findings lead to a new model that describes how ASD methodologies facilitate ISD by providing business values for the involved individuals, the team, the organization, the employed process, and with respect to the resulting ASD success.

As the body of knowledge in this field is still nascent, we concentrated on examining and describing the general potential of ASD methodologies to create business value. The presented results open numerous possibilities for future research. Such research endeavors could for instance examine the specific business value that can be achieved depending on the applied ASD practices, the business domain, or the complexity of the software. Future research endeavors could also complement our results with empirical insights into how ASD creates business value, particularly focusing on the complex interplay between various business values facets. We hope that our study can serve as a starting point to further enhance our understanding on how to realize business value through ASD.

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