The Business Value and the Dark Sides of Agile Software Development Methodologies

Theoretical Foundations and Empirical Evidence

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Theoretical Foundations and Empirical Evidence

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Zusammenfassung (German Summary)

Agile Softwareentwicklungsmethoden wie Scrum, Extreme Programming oder Kanban wurden als Reaktion auf die Defizite traditioneller, plangetriebener Vorgehensmodelle (Abrahamsson et al., 2009; Highsmith, 2002) geschaffen und stellen mittlerweile den Mainstream-Ansatz für die moderne Softwareentwicklung dar (Hoda et al., 2018). Seit der Einführung des zugrundeliegenden agilen Manifests (Beck et al., 2001) im Jahr 2001 haben diese Ansätze, welche sich als inkrementell, kooperativ, unkompliziert und anpassungsfähig charakterisieren lassen (Abrahamsson et al., 2002), eine kontinuierlich wachsende Verbreitung unter Praktikern erfahren (Digital.ai, 2024; VersionOne, 2007). Agile Softwareentwicklungsmethoden umfassen eine Reihe von *agilen Praktiken*, welche eindeutige Instruktionen und Leitlinien für die Entwicklung von Software vorgeben und dabei die agilen Kernprinzipien und -werte des agilen Manifests implementieren (Diebold & Zehler, 2016). Insbesondere die vielfältigen *Vorteile*, die sich durch die Nutzung der Methoden und den zugehörigen Praktiken ergeben und unter dem Konzept des *agilen geschäftlichen Mehrwerts* zusammengefasst werden können (Racheva et al., 2010), stellen für praktische Anwender überzeugende Gründe für die Einführung agiler Softwareentwicklungsmethoden dar (Tripp & Armstrong, 2014). Beispielhafte Vorteile umfassen eine schnellere Lieferzeit (Olszewska et al., 2016), bessere Softwarequalität und Abdeckung von Anforderungen (Alami & Krancher, 2022) sowie eine verbesserte Kommunikation im Entwicklungsteam (Hummel et al., 2015). Neben diesen Vorteilen weisen agile Softwareentwicklungsmethoden jedoch auch *Nachteile* bzw. Probleme auf, die die *Schattenseiten* der agilen Softwareentwicklung darstellen. Diese umfassen unter anderem fehlendes Kundenengagement (Hoda et al., 2011), Stress für die Entwickler (Annosi et al., 2020) sowie technische Schulden aufgrund des stetigen Lieferdrucks (Martini et al., 2015).

Neben der fortwährend steigenden Beliebtheit bei praktischen Anwendern haben agile Softwareentwicklungsmethoden auch starke Aufmerksamkeit in der wissenschaftlichen Forschung erlangt (Dingsøyr et al., 2012). Trotz dieser kontinuierlich gewachsenen Aufmerksamkeit, speziell in der Information Systems Research und der Softwareengineering-Community (Baham & Hirschheim, 2022; Hoda et al., 2018), sind die Fragen „ob, wie, warum und wann agile Softwareentwicklung Auswirkungen“ (Baham & Hirschheim, 2022, p. 107) im Sinne von Vor- und Nachteilen mit sich bringt, noch unzureichend beantwortet worden. Hierbei ist zunächst zu bemerken, dass der Begriff des geschäftlichen Mehrwerts agiler Softwareentwicklungsmethoden noch sehr volatil und kaum definiert ist und in der Forschung häufig als selbstverständlich aufgefasst wird (Alahyari et al., 2017; Racheva et al., 2009). Mangelnde Definitionen für den Begriff lassen sich dabei auch im verwandten Forschungsgebiet des Value-based Softwareengineerings feststellen (Salleh et al., 2023). Weiterhin wurden die Schattenseiten der agilen Softwareentwicklung in der Literatur zunächst vergleichsweise wenig beleuchtet. Zu beiden Seiten der Auswirkungen agiler Softwareentwicklungsmethoden fehlen zudem bislang systematische Übersichten, die die zum Begriff des agilen geschäftlichen Mehrwertes zählenden Vorteile und die den Schattenseiten zuzuordnenden Nachteile aufarbeiten. Neben diesen fehlenden Systematisierungen ließen sich in den ersten Jahren der Forschung zur agilen Softwareentwicklung kaum Studien finden, die klarstellen, inwiefern „individuelle agile Praktiken oder Gruppen [von Praktiken] Mehrwert schaffen“ (Racheva et al., 2009, p. 141). Mittlerweile existieren diverse Studien zu den Auswirkungen verschiedener Praktiken, jedoch ist auch hier kein systematischer Überblick zu den Ursache-Wirkungs-Beziehungen zwischen eingesetzten agilen Praktiken und ihren Vorteilen geschaffen worden. Folglich ist nicht eindeutig geklärt, welche Praktiken zu welchen Mehrwerten führen, was insbesondere für eine zielgerichtete Anwendung der Methoden hilfreich wäre. Ähnliche Defizite lassen sich

auch für das Konzept der *Agilität* feststellen, welches alle agilen Softwareentwicklungsmethoden charakterisiert (Baham & Hirschheim, 2022). Aufgrund der für lange Zeit fehlenden theoretischen Konzeptualisierung des Agilitätsbegriffs (Conboy, 2009) sind differenzierte Antworten auf die Frage, inwiefern die Kerneigenschaften der Agilität im Kontext der Softwareentwicklung zu den verschiedenen Auswirkungen beitragen, bislang unzureichend erarbeitet worden. Abschließend betont die wissenschaftliche Forschung hierzu auch die „Bedeutsamkeit des Verständnisses des Kontexts agiler Softwareentwicklungsprojekte" (Baham & Hirschheim, 2022, p. 107). In der Forschung zur agilen Softwareentwicklung werden Informationen zum *Kontext* der Studien jedoch häufig nur unzureichend beschrieben (Jalali & Wohlin, 2012; Vallon et al., 2018). In dieser Hinsicht werden zudem oft reduktionistische Strategien eingesetzt, die den Kontext der Studie ausblenden (Baham & Hirschheim, 2022). Diese Dekontextualisierung agiler Softwareentwicklungsmethoden (Kruchten, 2011) in der Forschung trägt dazu bei, dass die Rolle der *Kontextfaktoren* zumeist unterbelichtet wird und eine Generalisierung von Erkenntnissen aus empirischen Studien ohne detaillierte Kontextbeschreibung schwierig erscheint (Vallon et al., 2018). Antworten auf die Frage, wann bzw. in welchem Kontext agile Softwareentwicklung ideal funktionieren kann und wie Kontextfaktoren die Vor- und Nachteile beeinflussen, gilt es somit noch zu liefern.

Vor dem Hintergrund der beschriebenen Defizite besteht das Ziel dieser kumulativen Dissertation darin, Forschern und praktischen Anwendern sowohl theoretische als auch empirische Einblicke in die verschiedenen Vor- und Nachteile agiler Softwareentwicklungsmethoden zu geben. Hierbei sollen zudem die Zusammenhänge zwischen agilen Praktiken, dem zugrundeliegenden Konzept der Agilität sowie den Kontextfaktoren in der agilen Softwareentwicklung und ihren Auswirkungen untersucht werden. Die zentrale Forschungsfrage dieser Dissertation lautet daher:

Forschungsfrage: *Wie ist das Spektrum von Vor- und Nachteilen agiler Softwareentwicklungsmethoden definiert, und wie tragen die Kerncharakteristika der Agilität, agile Praktiken sowie Kontextfaktoren zu diesem Spektrum verschiedener Auswirkungen bei?*

Zur Beantwortung dieser Forschungsfrage ist die Dissertation in drei Teile gegliedert. Der erste Teil der Dissertation konzentriert sich auf die grundlegenden Vor- und Nachteile bzw. Probleme agiler Softwareentwicklungsmethoden. Hierzu wird mittels zweier Literaturstudien zunächst ein umfassender, strukturierter Überblick über die in der empirischen Forschung identifizierten Vorteile gegeben, welche den geschäftlichen Mehrwert der Nutzung der Methoden begründen. Dabei zeigen die Ergebnisse, dass dieser durch agile Softwareentwicklung erzielbare Mehrwert, im Gegensatz zum in der IS-Literatur häufig primär mit finanziellen Aspekten betrachteten geschäftlichen Mehrwert von IT-Investments (Schryen, 2013), eine Vielzahl an anderen, nicht primär finanziellen Vorteilen impliziert. Konkrete Vorteile, die in der bestehenden Literatur identifiziert wurden, umfassen beispielsweise eine bessere Abdeckung von Kundenanforderungen, kürzere Lieferzeiten, höhere Quellcode-Qualität und Produktivität, bessere Transparenz in der Entwicklung sowie zufriedenere Entwickler und Kunden. In diesem Sinne zeigt die Dissertation, dass der geschäftliche Mehrwert der agilen Softwareentwicklung als „mehr als bloß Zahlen" (Racheva et al., 2010, p. 140) aufzufassen ist und eine breitere Perspektive auf das Konzept erforderlich ist.

Weiterhin beinhaltet der erste Teil der Dissertation auch eine Literaturstudie zu den Nachteilen und Problemen der agilen Softwareentwicklungsmethoden. Mithilfe dieser dritten Studie wird das Spektrum der Auswirkungen der agilen Softwareentwicklung balanciert betrachtet, um somit eine ausschließlich positive, einseitige Sichtweise zu vermeiden. Die dritte Studie identifiziert diverse problematische Aspekte in der bestehenden Literatur, unter anderem ein mangelndes Kundenengagement, Mehraufwand durch Meetings und zusätzliche Arbeit, Stress für Entwickler, hohen

Lieferdruck sowie technische Schulden in der entwickelten Software. Zudem untersucht die Studie Beziehungen zwischen Problemen und identifiziert primäre Treiber der problematischen Auswirkungen der Methoden. Mithilfe dieser Analyse wird die Komplexität der potenziellen Schattenseiten der agilen Softwareentwicklung in dieser Dissertation weitergehend verdeutlicht, sodass die Problembereiche zukünftig mehr Aufmerksamkeit erfahren. Die Ergebnisse der drei Literaturstudien ermöglichen somit einen umfassenden Überblick über die Auswirkungen der agilen Softwareentwicklung. Sowohl der agile geschäftliche Mehrwert als auch die Schattenseiten sind abschließend als multidimensionale Konzepte aufzufassen. Damit trägt der erste Teil der Dissertation zu einem besseren Verständnis für Forschung und Praxis bzgl. der Vorteile, als auch der potenziellen negativen Auswirkungen der Nutzung agiler Softwareentwicklungsmethoden bei.

Der zweite Teil der Dissertation betrachtet anschließend die positiven Auswirkungen der Nutzung verschiedener agiler Praktiken. Agile Praktiken können dabei grundsätzlich grob in Projektmanagementpraktiken sowie Softwareentwicklungspraktiken unterschieden werden (Baham & Hirschheim, 2022). Mit einer literaturbasierten Systematisierung der in bisherigen Forschungsarbeiten beschriebenen Beziehungen zwischen genutzten agilen Praktiken und den verschiedenen positiven Auswirkungen ermöglicht die Dissertation zunächst einen tiefergehenden Einblick in die Ursache-Wirkungs-Beziehungen der agilen Methoden. Hierbei ist hervorzustellen, dass Projektmanagementpraktiken vor allem Vorteile für die individuellen Entwickler, das Entwicklungsteam und die Beziehung mit dem Kunden schaffen. Softwareentwicklungspraktiken tragen hingegen vor allem Vorteile für das entwickelte Softwareprodukt und den Entwicklungsprozess selbst bei. Zur Realisierung eines vertieften Einblicks in die Auswirkungen einer spezifischen Gruppe agiler Praktiken wurde zudem eine empirische Studie zu Projektmanagementpraktiken durchgeführt, welche auch als soziale Praktiken bezeichnet werden (Hummel et al., 2015). Die Ergebnisse zeigen dabei, dass diese Praktiken diverse soziale agile Prinzipien wie Kommunikation, Reflektion, Selbstorganisation und Business-IT-Alignment stimulieren, wodurch sich wiederum sowohl Vorteile für die Entwickler als auch Mehrwerte für ökonomische Aspekte der Softwareentwicklung ergeben. Insbesondere Reflektion durch retrospektive Meetings und Business-IT-Alignment werden in der Studie als besonders wichtig identifiziert, während tägliche Meetings und Kommunikation keine signifikanten Einflüsse beitragen. Diese teilweise überraschenden Erkenntnisse können daher Anstöße zur Untersuchung der Nützlichkeit dieser Praktiken liefern, während das in der agilen Forschung selten betrachtete Konzept des Business-IT-Alignments für zukünftige Untersuchungen einen neuen, potenziell zentralen Aspekt darstellen kann. Mithilfe dieser Studien liefert die Dissertation somit einen Beitrag zur Beantwortung der Frage, wie agile Softwareentwicklungsmethoden und zugehörige Praktiken geschäftlichen Mehrwert schaffen.

Durch eine weitere Studie im zweiten Teil ermöglicht diese Dissertation zudem Einblicke, inwiefern die Wertschaffung mit agilen Softwareentwicklungsmethoden kontinuierlich aufrechterhalten werden kann. Hierzu werden die Konsequenzen kritischer Probleme aus dem ersten Teil der Dissertation für die stetige Lieferung von geschäftlichem Mehrwert beleuchtet und entsprechende Abhilfemaßnahmen zur Linderung dieser Probleme identifiziert. Die Studie untersucht dabei die Konsequenzen für den geschäftlichen Mehrwert mit Hinblick auf volatile Anforderungen, Lieferdruck, mangelndes Kundenengagement, stetig erforderliche Nachbesserungen, Meetings und Unterbrechungen, sowie technische Schulden in der Entwicklung. Die Ergebnisse zeigen, dass insb. die Produktqualität, die Prozesseffizienz und die Lieferzeiten negativ beeinflusst werden, sowie zusätzlicher Aufwand durch diese Kernprobleme resultiert, sofern sie nicht adäquat mitigiert werden. Hierzu leitet die Studie insgesamt 48 praktisch anwendbare Maßnahmen ab, die Anwendern in der Softwareentwicklung dienlich sein können, um diese Probleme zielgerichtet zu adressieren.

Hierbei stehen vor allem technische Maßnahmen, neue Prozessartefakte, prozedurale Anpassungen sowie alternative Mittel in der Kundenansprache im Fokus. Zusammengefasst liefert der zweite Teil dieser Dissertation somit Antworten auf die Fragen, inwiefern Vorteile der agilen Softwareentwicklung von bestimmten agilen Praktiken stimuliert werden, und wie eine kontinuierliche Lieferung von Mehrwert mit Hinblick auf kritische Probleme gewährleistet werden kann.

Zuletzt analysiert der dritte Teil der Dissertation mit einer Literaturstudie, wie das in agilen Softwareentwicklungsmethoden zentrale Konzept der Agilität (Baham & Hirschheim, 2022) zu den verschiedenen, unter anderem im ersten Teil identifizierten, positiven und negativen Auswirkungen der agilen Vorgehensweisen beiträgt. Weiterhin untersucht dieser Teil die essenzielle Rolle von Projektkontextfaktoren, von denen der Einsatz agiler Softwareentwicklungsmethoden besonders abhängig ist (Hoda et al., 2010; Kruchten, 2011). Folglich betrachtet der dritte Teil die Zusammenhänge zwischen Agilität, Kontextfaktoren und den unterschiedlichen Auswirkungen, sprich verschiedenen Vor- und Nachteilen der Nutzung agiler Softwareentwicklungsmethoden.

Bezüglich der Auswirkungen des Agilitätskonzepts werden vier Kernaspekte der agilen Softwareentwicklung auf Basis eines theoretischen Rahmenwerks von Baham and Hirschheim (2022) betrachtet. Die Analyse zeigt, dass Kommunikation ein integraler Treiber diverser Vorteile ist und selten Probleme impliziert. Eine kontinuierliche Miteinbeziehung des Kunden ist ebenso bedeutsam, da ohne entsprechendes Engagement eine Vielzahl von negativen Auswirkungen resultieren kann. Für die Kernaspekte der iterativen Entwicklung und der kontinuierlichen Inspektion bzw. Anpassung der Arbeitsergebnisse zeigt sich ein gemischtes Bild. Zwar sind diese Kernaspekte essenziell, um diverse Mehrwerte erzielen zu können, jedoch resultieren bei exzessiver Entwicklungsgeschwindigkeit und zu häufigen Inspektionen diverse Probleme wie technische Schulden in der Software und gestresste Entwickler. Folglich erscheinen diese Kernaspekte ein zweischneidiges Schwert zu implizieren, sodass eine balancierte Realisierung der Agilität in der agilen Softwareentwicklung erforderlich ist. Weiterhin entstehen Vorteile überwiegend durch das Zusammenwirken der verschiedenen Kernaspekte des Agilitätskonzepts, während sich Probleme zumeist auf die inadäquate Realisierung eines spezifischen Aspekts zurückführen lassen. Durch diese Erkenntnisse wird somit ein besseres Verständnis der Eigenschaften des Agilitätskonzepts im Kontext der agilen Softwareentwicklung und wie es zu den verschiedenen Auswirkungen beiträgt, ermöglicht. Mit Hinblick auf die Rolle des Kontexts zeigt die Studie, dass zwölf Kontextfaktoren mit unterschiedlichen Nuancen von hoher Bedeutung für die Auswirkungen der agilen Softwareentwicklung sind. Insbesondere die Stabilität des Entwicklungsteams und der Kundenanforderungen, das Alter des Systems, das Kundenengagement sowie die Verteilung des Teams werden als potenziell kritisch identifiziert. Zusammen mit anderen Kontextfaktoren wird zudem ein Sweet-Spot-Modell entwickelt, welches ein für agile Softwareentwicklungsmethoden optimales Umfeld ausweist. Dieses Modell kann der Forschung im Themenkomplex der agilen Softwareentwicklung dienlich sein, um detailliertere Beschreibungen und Analysen des jeweiligen Kontexts ihrer Studien zu realisieren. Hiermit kann auch die Dekontextualisierung der agilen Softwareentwicklung (Kruchten, 2011) reduziert werden. Zusammengefasst liefert der dritte Teil der Dissertation somit Einblicke in die Rolle der Kernaspekte der Agilität bzw. der Kontextfaktoren in der agilen Softwareentwicklung und wie diese die verschiedenen Auswirkungen beeinflussen.

Mit Bezug auf die zentrale Forschungsfrage dieser kumulativen Dissertation lässt sich abschließend feststellen, dass der geschäftliche Mehrwert sowie die Schattenseiten agiler Softwareentwicklungsmethoden ein breites Spektrum unterschiedlicher Aspekte aufweisen. Dieses Spektrum der verschiedenen Vor- sowie Nachteile ist somit als multidimensional aufzufassen. Zudem zeigt

die Dissertation, dass agile Praktiken sich hinsichtlich der primär beigetragenen Mehrwerte voneinander unterscheiden. Im Speziellen heben Projektmanagementpraktiken vor allem Mehrwerte für die Entwickler, das Team und die Kundenbeziehung, während Softwareentwicklungspraktiken besonders das Softwareprodukt und den Entwicklungsprozess positiv beeinflussen. Weiterhin zeigt die Dissertation, dass Agilität im Kontext der agilen Softwareentwicklung nicht nur positive Implikationen besitzt, sondern, abhängig von der Realisierung der Kerncharakteristika des Konzepts, auch Probleme hervorrufen kann. Diesbezüglich ist eine nachhaltige, ausbalancierte Umsetzung des Agilitätskonzepts erforderlich, um Vorteile zu realisieren und Probleme zu vermeiden. Abschließend verdeutlicht die Dissertation mittels des Sweet-Spot-Modells die Sensitivität der agilen Softwareentwicklung hinsichtlich des Kontexts, in dem sie eingesetzt wird.

Zusammengefasst liefert die Dissertation somit einen Beitrag für die Forschung im Themenkomplex der agilen Softwareentwicklung, speziell in der Disziplin der Wirtschaftsinformatik, sowie für die praktischen Anwender der Methoden in der täglichen Entwicklungspraxis.

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List of Abbreviations

ASD	Agile Software Development
CCI	Continuous Customer Involvement
GenAI	Generative Artificial Intelligence
IA	Inspect and Adapt Cycles
ID2	Iterative Development/Incremental Design
IS	Information Systems
ISD	Information Systems Development
IT	Information Technology
OLS	Ordinary Least Squares
PM	Project Management
QCA	Qualitative Comparative Analysis
RQ	Research Question
SD	Software Development
SE	Software Engineering
SPI	Software Process Improvement
VBSE	Value-based Software Engineering
VIF	Variance Inflation Factor
WC	Working Cooperatively/Collaboratively/in Close Communication
XP	Extreme Programming

Introductory Paper

1 Introduction

"We are uncovering better ways of developing software by doing it and helping others do it" (Beck et al., 2001) – these opening words of the Agile Manifesto, formulated by 17 leading software development (SD) practitioners in 2001, marked the starting point for the emergence of a new SD approach that revolutionized the SD industry in the 21st century. *Agile software development* (ASD) *methodologies*, which nowadays represent the mainstream approach for SD work (Hoda et al., 2018), were introduced as a response to the shortcomings of traditional, plan-driven approaches (Abrahamsson et al., 2009; Highsmith, 2002). These heavyweight, documentation-focused methodologies seemed no longer sufficient to deal with continuously changing requirements (Boehm, 2002), demanding a lightweight, nimble, and more flexible process to absorb this change. To this end, ASD methodologies proposed a fundamental paradigm shift, emphasizing incremental delivery of valuable software, closer cooperation and communication among developers and customers, straightforward simplicity, and adaptability to change (Abrahamsson et al., 2003; Beck et al., 2001). These qualities of ASD seem particularly necessary in today's volatile, uncertain, complex, and ambiguous business environment (Bennett & Lemoine, 2014; Taskan et al., 2022). Over the years, various ASD methodologies have been introduced, including Scrum (Schwaber & Beedle, 2002), Extreme Programming (XP) (Beck, 2006), or Kanban (Anderson, 2010), among other methods (Abrahamsson et al., 2003). Since its inception, ASD has experienced a continuously growing adoption by SD practitioners, as becomes apparent from the first to the most recent Annual State of Agile Reports (Digital.ai, 2024; VersionOne, 2007), with Scrum continuously being the most popular approach. Further growth of the ASD industry is expected in the near future, as projected, for instance, for the Chinese market (iResearch, 2023a, 2023b). Considering their widespread and continuously growing adoption, ASD methodologies indeed appear to have uncovered better ways for the development of software in the 21st century.

Besides continuously growing adoption in practice (Digital.ai, 2024), ASD methodologies also sparked a strong interest in academia (Dingsøyr et al., 2012). Especially software engineering (SE) research, where ASD has developed into an important subdomain (Hoda et al., 2018), yet also the information systems (IS) research domain has contributed valuable knowledge on ASD in the context of IS development (ISD) (Abrahamsson et al., 2009; Baham & Hirschheim, 2022). Research and practice agree that ASD methodologies can provide various desirable *outcomes*. These are evidenced by the *benefits* that the use of ASD in ISD projects can entail, e.g., a better alignment with the business requirements and higher product quality (Alami & Krancher, 2022; Digital.ai, 2024). These and other *benefits*, which relate to the *business value* of ASD (Racheva et al., 2010), imply key adoption motives for organizations (Tripp & Armstrong, 2014). However, practical and scientific literature alike increasingly point out a range of *issues* of ASD methodologies, indicating that there are two sides to the same coin of *outcomes*. Such *issues,* which correspond to the *dark side* of ASD, include stress for developers (Annosi et al., 2020), technical debt in products (Behutiye et al., 2017), and difficulties in time and effort estimation (Digital.ai, 2023; Heikkilä et al., 2017). As a potential consequence, practitioner satisfaction with ASD has recently declined substantially compared to previous years (Digital.ai, 2024), since issues occurring with the use of the methodologies generally undermine the key promises of the Agile Manifesto (Beck et al., 2001). Based on these diverging observations of *benefits* and *issues* as *outcomes* of *ASD methodologies* in research and practice, it consequently seems necessary to intensify investigations into "if, how, why and when ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107).

1.1 Research Motivation

Delivering value to the business, i.e., early, swiftly, and continuously providing the customer with a working, valuable software product, is a key principle embedded in the Agile Manifesto (Beck et al., 2001). One could assume that the *business value* of ASD methodologies would be primarily attributed to the worth of the delivered software. Alternatively, the economic value attained with these methodologies could be considered as a means to grasp their business value, as is the case for the business value of information technology (IT) investments examined in the IS research domain (Melville et al., 2004; Schryen, 2013). Still, despite ASD being practiced and researched for over two decades, the concept of business value appears volatile in ASD literature (Racheva et al., 2009) and similarly remains unclarified in the value-based SE (VBSE) domain (Salleh et al., 2023). While research suggests that business value in ASD goes beyond only economic benefits and product-related valuable aspects (Alahyari et al., 2017; Racheva et al., 2010), the term is rarely clearly defined and employed measures for value are also often not explicitly described (Salleh et al., 2023). In practice, a similar challenge can be observed. Organizations struggle to "measure the value for the business" (Digital.ai, 2023, p. 15), while the provided business value supposedly is the most common way to evaluate the success of delivery in ASD (Digital.ai, 2022). Thorough evaluations of this business value seem difficult to realize, however, given the lack of clarity of what the term business value exactly entails in the ASD context (Racheva et al., 2009). Also, in light of various *issues* that ASD can imply besides its *benefits*, e.g., technical deficiencies in the software (Martini et al., 2015), or stress for developers due to the constant delivery pressure (Annosi et al., 2020), and other challenges faced by practitioners (Gregory et al., 2016), it seems difficult to grasp *what* ASD methodologies actually offer regarding the delivered *business value*.

Besides understanding the business value concept, also enabling a value-targeted use of ASD and associated *practices* is important. ASD methodologies entail a range of ASD practices that describe activities to address specific aspects of SD (Diebold & Zehler, 2016), e.g., coding, requirements management, or testing. ASD practices also implement the key characteristics of the concept of SD *agility*, which characterizes all ASD approaches (Baham & Hirschheim, 2022). Practitioners use different ASD practices (Diebold & Dahlem, 2014; Vallon et al., 2018) to create agility in the SD process, and thereby contribute to customer value (Conboy, 2009; Dingsøyr et al., 2012). However, knowledge of the links between ASD practices, agility, and business value is still limited (Alahyari et al., 2017; Baham & Hirschheim, 2022; Racheva et al., 2009). Several studies have made progress regarding ASD practices and their benefits forming the business value of ASD, e.g., Hummel et al. (2015), Kude et al. (2019), or Alami and Krancher (2022). However, the benefits and the large variety of ASD practices need to be brought together into a coherent understanding, which would also facilitate a more target-oriented use, e.g., for new adopters. Similarly, how SD agility, operationalized by ASD practices, contributes to benefits remains to be better understood (Baham & Hirschheim, 2022). The limited knowledge on the mechanisms among ASD practices, agility, and business value seems further exacerbated by a lack of understanding of how *contextual factors* influence this interplay. This aspect needs to be emphasized here, as the use of ASD is a highly context-dependent practice (Hoda et al., 2010). Surprisingly, research suffers from a decontextualization of ASD in empirical studies (Kruchten, 2007, 2011), as context information is often insufficiently reported (Vallon et al., 2018). To add, the common context-reductionist strategies in ASD research (Baham & Hirschheim, 2022) make it difficult to determine *how* and *when* ASD methodologies, practices, and agility contribute to *business value*.

Taken together, while several dedicated studies have examined the concept of business value in the context of ASD methodologies, e.g., Alahyari et al. (2017), Kautz et al. (2014), or Racheva et al. (2010), its distinct characteristics seem unclarified. This lack of clarity is corroborated by the apparent vagueness of the business value concept in assessments of the success of ASD use in practical literature (Digital.ai, 2021, 2022). To add, the spectrum of challenges and issues faced by ASD practitioners (Fitriani et al., 2016; Gregory et al., 2016) that have negative consequences for the delivered business value still needs to be better understood. Gaining such a better understanding of the different outcomes of ASD appears critical to thoroughly assess the business value achievable with these methodologies in practice, and to clarify the debated concept in academic research. Additionally, developing thus far limited knowledge of how ASD practices (Racheva et al., 2009), agility, and context factors (Baham & Hirschheim, 2022) influence the realization of ASD's business value would enable a more value-targeted application of ASD methodologies and associated practices. Lastly, comprehending the relationships among these aspects from an academic stance can contribute towards explaining the mechanisms of business value creation with ASD, as was proclaimed in the Agile Manifesto (Beck et al., 2001) more than two decades ago.

Against this backdrop, the objective of this dissertation is to enable a comprehensive perspective on the *benefits* constituting the *business value* that *ASD methodologies* were conceived to realize and simultaneously shed light on the various *issues* which form ASD's *dark side*. Additionally, this dissertation intends to develop further insights into how the fundamental concept of *agility*, different types of *ASD practices*, and the specific characteristics of *contextual settings* in which ASD methodologies are being applied, contribute to these outcomes. Overall, the studies featured in this cumulative dissertation thereby aim to contribute knowledge on the theoretical foundations of ASD, associated practices, and the concept of agility, as well as develop empirical perspectives on how to achieve and sustain business value creation with these methodologies. In doing so, also practical recommendations to inform practitioners of ASD methodologies are derived. Taken together, this cumulative dissertation examines the following overarching research question (RQ):

Research Question: *What defines the spectrum of benefits and issues of agile software development methodologies, and how do the key characteristics of agility, agile practices, as well as contextual factors, contribute to this spectrum of different outcomes?*

1.2 Research Questions

This section offers an overview of the five research questions related to the main research question of this dissertation. Each research question corresponds to a specific research objective. All research questions and the specific aspects of ASD methodologies, practices, core characteristics of agility, and the outcomes that these questions investigate are shown in Figure 1.1 on page 9.

Research Objective 1: Understanding Business Value and Dark Sides of ASD Methodologies

Various benefits of ASD that form its business value seem already embedded in the Agile Manifesto (Beck et al., 2001), e.g., a continuous delivery of high-quality software (Alami & Krancher, 2022; Alami et al., 2022), responsiveness to change (Fitzgerald et al., 2013; Karrenbauer et al., 2019), better communication (Hummel et al., 2015; Pikkarainen et al., 2008), or a sustainable pace (Overhage & Schlauderer, 2012b). While many empirical studies find benefits of ASD, research also identifies a range of issues, e.g., technical debt in the software (Martini et al., 2015), stress for developers (Annosi et al., 2016), or requirement volatility (Dasanayake et al., 2019).

As of now, however, comprehending the spectrum of these outcomes is difficult for several reasons. First, while ASD business value is a frequently debated topic, e.g., in Heidenberg et al. (2012), Kautz et al. (2014), Racheva et al. (2009), or Racheva et al. (2010), prior work refers to different dimensions forming the business value of ASD, causing a fragmented perspective on the concept. To add, systematizations of benefits, which would contribute to more conceptual clarity, are still lacking. Second, the issues forming the dark side of ASD have only found their way into the debate more recently, especially since ASD initially experienced a hype (Janes & Succi, 2012). To add, studies providing an overview of key issues in ASD are scarce, e.g., Fitriani et al. (2016). In sum, the ASD business value concept seems rather ambiguous, while the dark side also remains opaque. From an academic stance, consolidations of prior findings would help to understand the spectrum of outcomes of ASD. For the business value side in particular, achieving conceptual clarity has been a long-standing issue in ASD literature and VBSE research alike, as suggested by Alahyari et al. (2017) or Salleh et al. (2023). Also, as "most published studies take the concept of business value for granted and do not state what it means" (Racheva et al., 2009, p. 141), systematizing the benefits that form the business value of ASD would enable future studies to better define what it implies in their context. For the downsides, identifying issues that occur frequently would ensure a more balanced representation of ASD's outcomes. From a practical stance, a consolidated view on the spectrum of outcomes can allow practitioners to better realize what ASD can offer yet also raise awareness for potential issues. This would also enable them to determine *if* ASD methodologies prove their merits by delivering business value in organizations, while also helping to identify areas for improvement. To develop a comprehensive perspective on the outcomes of ASD, i.e., *what* may result from the methodologies, the first research question is:

RQ1: *What are the benefits related to the business value and the issues forming the dark side of ASD methodologies?*

Research Objective 2: Achieving and Sustaining Business Value in ASD Methodologies

ASD methodologies rely on a "number of practices that are believed to deliver greater value to customers" (Dingsøyr et al., 2012, p. 1214). While early ASD research did not provide studies "which clearly [indicate] how exactly individual agile practices […] create [business] value" (Racheva et al., 2009, p. 141), recent studies have delivered insights into how specific ASD practices contribute to beneficial outcomes. Examples include, among others, the benefits of XP practices for bug severity and complexity (Maruping et al., 2009), as well as reductions in work exhaustion (Venkatesh et al., 2020), effects of pair programming on team performance (Kude et al., 2019), or benefits of ASD practices for job satisfaction (Tripp et al., 2016). Though many empirical studies have examined the relationships among ASD practices and beneficial outcomes, such findings still need to be compiled into a systematic form. To add, while ASD practices can be distinguished into project management (PM) and software engineering (SE) practices (Baham & Hirschheim, 2022; Tripp et al., 2016), "how groups of [agile] practices […] create [business] value" (Alahyari et al., 2017, p. 272), remains to be investigated further. Prior studies that focus on, e.g., the group of PM practices (also referred to as social practices), only assess benefits such as communication (Hummel et al., 2015) or psychological safety and performance (Hennel & Rosenkranz, 2020). Thereby, how this group of practices delivers other beneficial outcomes remains unaddressed. From an academic perspective, developing a systematic overview of which ASD practices seem primarily related to which benefits would thus enable a better understanding of the cause-effect mechanisms in ASD. This could also help future research in investigating how combinations of ASD practices contribute to business value realization. For practical perspectives

on ASD, gaining such knowledge would enable a more value-targeted application of these practices. Considering the current deficiencies regarding *how* different ASD practices relate to certain beneficial outcomes of ASD, the second research question posed in this dissertation is:

RQ2: *How do different ASD practices contribute to the business value of ASD methodologies?*

Besides achieving business value, also sustaining a continuous value delivery, as suggested in the Agile Manifesto (Beck et al., 2001), is important. This seems especially pressing, as several frequently occurring issues in ASD can hinder business value delivery with the methodologies, as identified, e.g., by Alahyari et al. (2017). Such issues include low customer involvement (Hoda et al., 2011), technical debt (Martini et al., 2015), volatile requirements (Dasanayake et al., 2019), meeting overhead and disruptions (Wiesche, 2021), excessive rework (van Waardenburg & van Vliet, 2013), or delivery pressure (Annosi et al., 2016). While research recognized them as problematic, the specific consequences for continuous business value delivery, if unaddressed, are less regarded. To add, measures to mitigate these issues and avoid their business value-diminishing consequences are either scattered in the literature or generally remain to be identified. This also concerns ASD method tailoring research, which investigates how "customizing the agile method to meet the context and circumstances of use" (Tripp & Armstrong, 2016, p. 4) leads to improved performance in ASD. Here, mitigation measures to adapt to critical issues and overcome them are scarce. Also, ASD method tailoring research mostly focuses on motives and criteria or approaches of contingency factors tailoring and method engineering (Campanelli & Parreiras, 2015), but does not offer issue-focused adaptation measures. From an academic perspective, assessing the value-reducing consequences of key issues seems critical to better understand the fragility of a sustained business value delivery with ASD. To add, finding adaptation measures can enable tailoring research to assess how nuanced customizations of ASD methodologies contribute to business value delivery, beyond only focusing on adoption or omission of ASD practices for project success (Tripp & Armstrong, 2016). Meanwhile, from a practical stance, a set of adaptation measures would enable practitioners to improve business value delivery while creating awareness of the adverse consequences of critical issues typically encountered in ASD use. Considering the current gaps in knowledge of *how* critical issues affect business value delivery and *how* practitioners can adapt and overcome them to sustain it, the third research question of this dissertation investigates:

RQ3: *How can key issues that impede the continuous delivery of business value in ASD methodologies be mitigated with adaptation measures to avoid their negative consequences?*

Research Objective 3: Towards Explaining the Different Outcomes of ASD Methodologies

Despite recognizing the broad spectrum of different outcomes of ASD, research still struggles to explain "how, why and when ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107). A key factor seems to be the "lack of theoretical glue" (Conboy, 2009, p. 344) in ASD research, as "different perspectives persist concerning what it means to be "agile", leading to conceptual ambiguity" (Baham & Hirschheim, 2022, p. 103). This ambiguity is apparent in the heterogeneity of extant definitions for the agility concept in ASD methodologies. Henderson-Sellers and Serour (2005), Lyytinen and Rose (2006), Conboy (2009), Lee and Xia (2010), or Rathor et al. (2016) all define agility, yet emphasize different aspects and facets to be related to the concept in the ASD context. Furthermore, since the "ASD [research] field is largely practice-driven" (Yang et al., 2025, p. 3), the domain of "agile research has lagged behind practice" (Abrahamsson et al., 2009, p. 281), struggling to comprehend ASD agility from a theoretical stance. Therefore, it also remained difficult to investigate the different outcomes of ASD from the perspective of agility.

To address this issue, Baham and Hirschheim (2022) recently conceptualized agility along four characteristic core concepts to enable a more "unified theoretical understanding of ASD" (p. 118), thereby "drawing upon the [Agile] Manifesto, 20 years of practice, and extensive research efforts" (p. 110). The four core concepts include incremental design and iterative development (ID2), inspect and adapt cycles (IA), working cooperatively/collaboratively/in close communication (WC), and continuous customer involvement (CCI), as shown in Figure 1.1. The proposed theoretical core entails "a basic, parsimonious, and common set of concepts found across virtually all ASD methods that enable IS development agility" (Baham & Hirschheim, 2022, p. 118). Since it offers a unified perspective on agility and provides conceptual clarity that was lacking for a long time in ASD research, it now seems feasible to investigate "when, how, and why ASD methods and techniques impact […] outcomes" (Baham & Hirschheim, 2022, p. 119), which entails the key idea behind the fourth RQ. From an academic stance, using the framework to assess "which core concepts might yield the greatest impacts on desired outcomes such as time to market and software quality" (Baham & Hirschheim, 2022, p. 119) would enable research to better understand how the benefits of ASD are created. Similarly, doing so would help to explain how ASD, based on its core characteristics, can also imply issues alongside the beneficial outcomes. Beyond, operationalizations of the framework can support ASD research towards developing more consensus on the key characteristics of agility, advancing the theoretical debate on ASD, and learning how the concept of agility contributes to ASD's outcomes. From a practical perspective, investigating the outcome-creation mechanisms can help practitioners in a more goal-oriented application of ASD, e.g., by pointing out the aspects of agility that need to be balanced in practice to maximize benefits and avoid issues. Therefore, the fourth research question is defined as follows:

RQ4: *How do the core characteristics of agility in the context of ASD methodologies contribute to the creation of both benefits and issues?*

Lastly, besides *what* outcomes result from ASD methodologies and *how* benefits and issues are created through the core characteristics of agility, also studying "*when* ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107), i.e., in which specific contextual settings, seems important. Since ASD is "a highly diverse, adaptable, contextual, situated practice" (Baham & Hirschheim, 2022, p. 108), Kruchten (2011) suggested that for SD processes, "only three factors matter: context, context and context" (p. 352). This bold claim seems valid, as "an optimal [SD] process is regarded as being dependent on the situational characteristics of individual [SD] settings" (Clarke & O'Connor, 2012, p. 433). Surprisingly, the ASD research domain often neglects the role of contextual factors, as was described early on as the phenomenon of decontextualization of ASD (Kruchten, 2007). As such, studies that specifically discuss the impact of contextual settings on ASD are scarce, for instance, Kruchten (2011) or Hoda et al. (2010), and only focus on a limited set of context factors. Determining *when* ASD methodologies ideally operate, i.e., in which contextual settings, thus remains difficult. While Kruchten (2011) proposed a vague model that defines such an "agile sweet spot" (p. 355), this model "excludes some important contexts and has [a narrow] scope" (Kirk & MacDonell, 2014, p. 3). On the contrary, related works on generally important context factors in SD feature a substantially larger range of relevant aspects, e.g., Clarke and O'Connor (2012). Consequently, from an academic perspective, "scholars […] stress the importance of understanding ASD's project context" (Baham & Hirschheim, 2022, p. 107). Studying contextual factors in ASD and identifying those that are especially critical for business value delivery would therefore contribute to a better understanding of the understudied role of the context in ASD. To add, defining a set of context factors especially relevant for the ASD domain can

enable future studies to provide a more comprehensive account of the specific contextual characteristics of their examinations. In this regard, studies in the ASD domain commonly apply "reductionist strategies [that] often miss more context-rich research" (Baham & Hirschheim, 2022, p. 108), and thereby do not provide deeper insights into the context in which ASD is examined, again implying the decontextualization of ASD (Kruchten, 2007). From a practical stance, defining the ideal nature of contextual characteristics that should be ensured for successful ASD can help to improve practical applications of the methodologies. Based on such insights, practitioners could also better determine if the contextual surroundings are suitable for the use of ASD methodologies. Consequently, the fifth research question of this dissertation is defined as:

RQ5: *When, i.e., in which ideal contextual settings do ASD methodologies operate best and deliver benefits, and which contexts cause issues?*

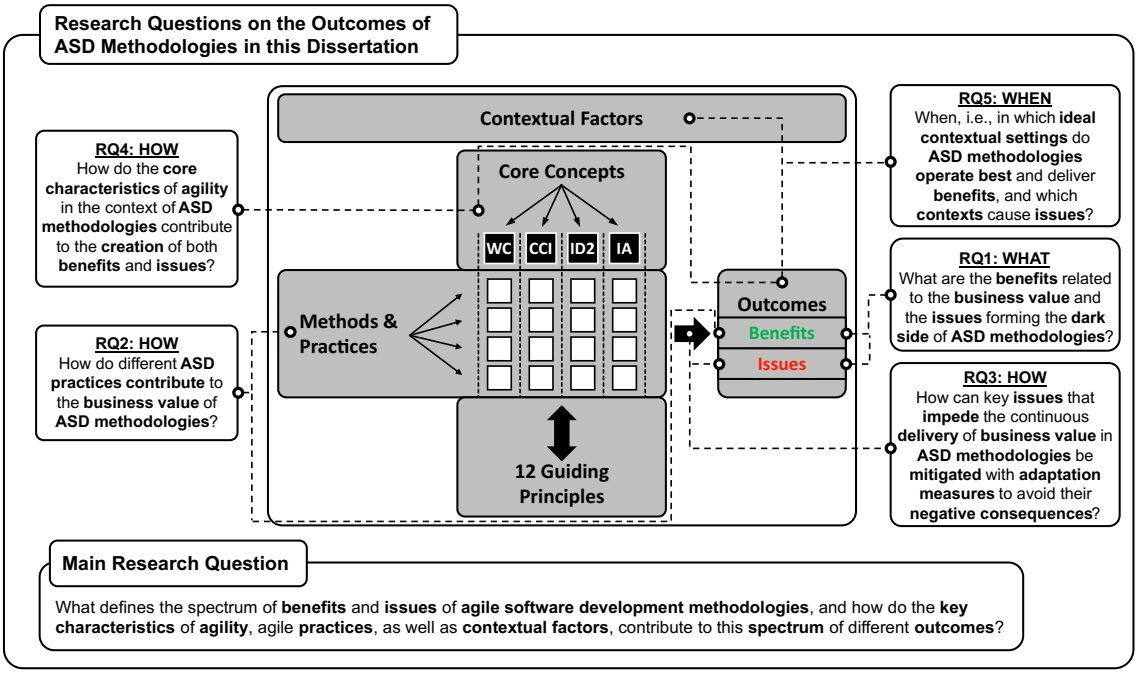

Figure 1.1: Research Questions Investigated in this Dissertation

1.3 Structure of the Dissertation

This cumulative dissertation investigates the overarching research question and the five subordinate questions through an introductory paper and six research papers. The dissertation is divided into three parts with dedicated research objectives and papers that address the corresponding research questions. The structure of the three parts and the introductory paper is described below, while Figure 1.2 and Table 1.1 on page 11 visualize the overall contents of this dissertation.

The first part of the dissertation provides groundwork on the spectrum of outcomes that are associated with the use of ASD methodologies. It contains three literature reviews that synthesize prior findings on the benefits of ASD that relate to the business value of the methodologies (Paper I and II), and on issues that form the dark side of the methodologies (Paper III). This part offers an introduction into the foundations of outcomes, clarifying the benefits that contribute to a continuously increasing adoption of ASD in practice. It also offers insights into how distinct PM and SE practices contribute to these benefits. To enable a more balanced perspective on the outcomes

of ASD, key issues are identified and systematized next. Here, the most critical issues are delineated in detail by identifying relationships among them and assessing how they seem to reinforce each other. This part, therefore, primarily addresses the questions of *if* or *what* outcomes can be generally expected from ASD methodologies (RQ1, Paper I-III). In addition, it develops insights into *how* specific beneficial outcomes result from the use of distinct ASD practices (RQ2), i.e., by systematizing which benefits can be achieved with different SE and PM practices (Paper II).

The second part is dedicated to the examination of *how* benefits can be achieved with ASD methodologies. Paper IV focuses on social/PM ASD practices in an empirical study and assesses *how* daily meetings, retrospectives, pair programming, co-location, and shared leadership contribute to the realization of social principles embedded in ASD, which in turn leads to the realization of economic and developer-related benefits. Social/PM ASD practices are in focus here, as project failure is often attributed to social and political issues (DeMarco & Lister, 2013), suggesting that social/PM practices are of particular importance for ASD business value creation (RQ2). Paper V similarly focuses on ASD's business value by assessing how six critical issues found in Paper III affect the sustained delivery of valuable software products. The study investigates the consequences of delivery pressure, technical debt, meeting overhead, lacking customer involvement, required rework, and volatile requirements for the continuous business value delivery with ASD. Paper V also develops a set of measures to adapt to these issues and avoid their negative consequences (RQ3). Part two of this dissertation thus investigates *how* business value can be realized with different ASD practices, and *how* a continuous delivery of valuable software, as suggested in the Agile Manifesto (Beck et al., 2001), can be ensured when encountering critical issues.

Finally, the third part investigates *how* and *when* ASD creates outcomes. Forming the third part of this dissertation, Paper VI relies on the core concepts framework for agility in ASD by Baham and Hirschheim (2022) to assess *how* ASD methodologies, based on their inherent characteristics, seem to contribute to both benefits and issues (RQ4). The study also examines how context settings, in which ASD methodologies are applied, influence the realization of outcomes. This analysis contributes answers to the question of *when* (RQ5), i.e., under which contextual characteristics, ASD methodologies ideally operate by reconceptualizing an "agile sweet spot" (Kruchten, 2011, p. 355) model for ASD-based projects. In sum, Paper VI provides initial insights towards answering "*how, why* and *when* ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107).

Of the six papers included in this dissertation, one paper is published in a peer-reviewed SE journal, while another paper is published in a peer-reviewed multidisciplinary journal. A third paper is published in a peer-reviewed IS journal. Furthermore, two papers have been published in the proceedings of two peer-reviewed IS conferences. Lastly, one paper has been published in the peer-reviewed proceedings of an SE conference that specifically focuses on ASD methodologies. All six papers are listed in Table 1.1 in the sequence of their occurrence in this dissertation. The contents of the papers remain unmodified and match those in the official publications. Note that for reasons of consistency, all papers have been formatted to a uniform standard regarding font style and size, citation and referencing style, headings, figures, and tables. Additionally, due to the terminology evolving over the duration of this dissertation project, some wording may slightly vary across the papers.

The introductory paper is structured as follows: Section 2 illustrates the research context of this dissertation, describing ASD methodologies, the fundamental concept of agility, different ASD practices, outcomes of ASD, and the important role of contextual factors. Section 3 outlines the

research methods employed in this dissertation, including systematic literature reviews, expert interview studies, and regression analysis. Subsequently, Section 4 summarizes the main results of the six research papers included in this dissertation. Based on these findings, the key contributions as well as main implications for both research and practice are discussed in Section 5. Furthermore, Section 6 addresses potential limitations of this research, followed by future research directions in Section 7. The introductory paper ends with a short outlook in Section 8.

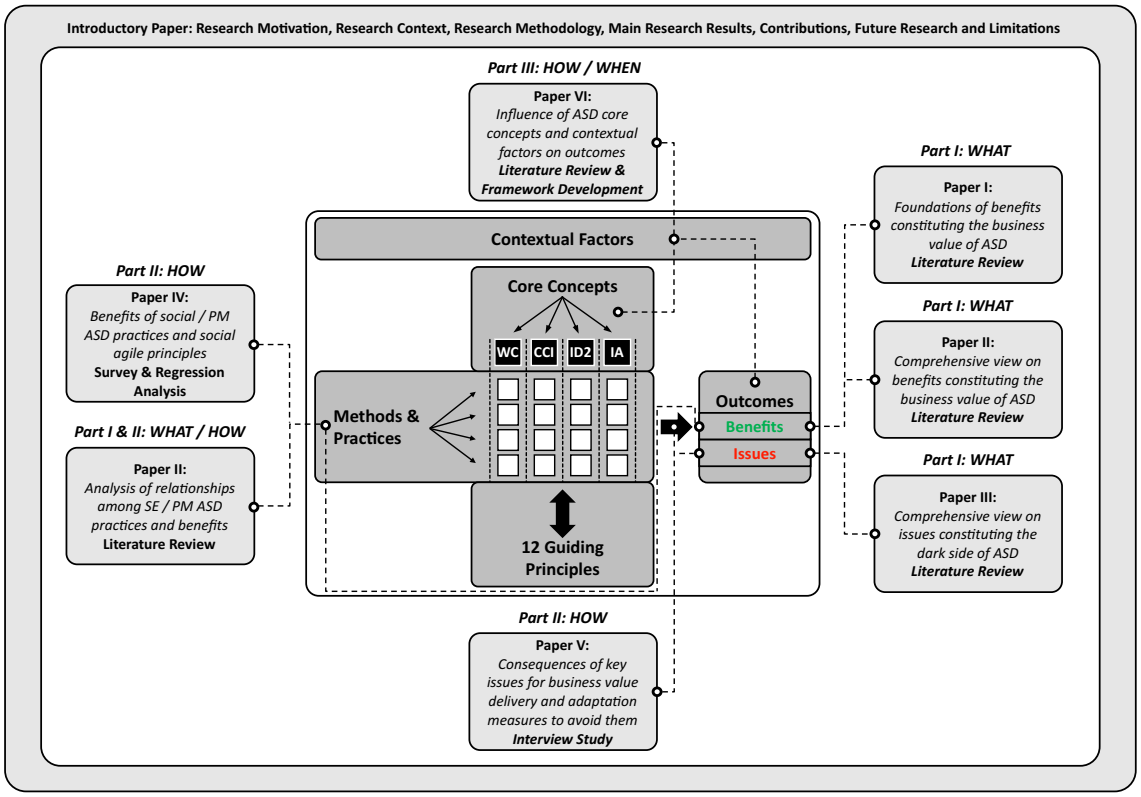

Figure 1.2: Structure of this Dissertation, Main Parts, and Corresponding Papers

Table 1.1: Overview of All Papers Included in the Dissertation

#	Paper Citation
I	**Meckenstock, J.-N.**, Hirschlein, N., Schlauderer, S., & Overhage, S. (2022). The business value of agile software development: Results from a systematic literature review. *ECIS 2022 Proceedings*, Timisoara, Romania. https://aisel.aisnet.org/ecis2022_rp/24
II	**Meckenstock, J.-N.**, Hirschlein, N., Schlauderer, S., & Overhage, S. (2025). Unraveling agile software development business value: A qualitative systematic review of agile practices and benefits. *Pacific Asia Journal of the Association for Information Systems*, 17 (5). https://aisel.aisnet.org/pajais/vol17/iss5/3
III	**Meckenstock, J.-N.** (2024). Shedding light on the dark side – A systematic literature review of the issues in agile software development methodology use. *Journal of Systems and Software*, 211. https://doi.org/10.1016/j.jss.2024.111966
IV	**Meckenstock, J.-N.**, Schlauderer, S., & Overhage, S. (2022). How do individual social agile practices influence the development success? An exploratory study. *Wirtschaftsinformatik 2022 Proceedings*, Nürnberg, Germany. https://aisel.aisnet.org/wi2022/it_strategy/it_strategy/7
V	**Meckenstock, J.-N.** & Wallmichrath, V. (2025). Adapt and overcome - How agile practitioners adapt to issues that impede the delivery of value: An interview study. *Agile Processes in Software Engineering and Extreme Programming. XP 2025.* Lecture Notes in Business Information Processing, vol. 545, Brugg-Windisch, Switzerland. https://doi.org/10.1007/978-3-031-94544-1_17
VI	**Meckenstock, J.-N.**, Hirschlein, N., Schlauderer, S., & Overhage, S. (2025). Agile's anatomy: How agile's core concepts and contextual factors influence benefits and issues. *IEEE Access*, 13. https://doi.org/10.1109/ACCESS.2025.3614373

2 Research Context

The following sections provide an introduction to the theoretical background of ASD methodologies. First, the foundations of ASD are elaborated on, including a short synthesis of essential elements of ASD methodologies. Subsequently, the concept of agility is introduced, which entails the characteristic essence of the underlying principles of how ASD methodologies approach SD work. Here, also the agility framework for ASD by Baham and Hirschheim (2022), which guides this dissertation, is illustrated. Furthermore, this chapter provides a perspective on the benefits achievable with ASD that constitute the business value of the methodologies. In analogy, typical issues are discussed which form the dark side of ASD methodologies. Lastly, the key role of contextual factors that can particularly affect the utilization of ASD is illustrated. Together, this section enables a comprehensive overview of the concepts discussed in this dissertation.

2.1 Agile Software Development Methodologies

With the beginning of the 21st century, ASD emerged as a new approach for SD work to address the shortcomings of traditional, plan-based development paradigms, e.g., the waterfall model (Royce, 1970) and the V-model (Boehm, 1979, 1984). Traditional SD approaches were considered no longer suitable to "concentrate only on the functions needed immediately, delivering them fast, collecting feedback and reacting rapidly to business and technology changes" (Abrahamsson et al., 2003, p. 1). Furthermore, the "rapidly growing and volatile internet software industry as well as […] the emerging mobile application environment" (Abrahamsson et al., 2002, p. 11) exceeded the capability of traditional SD methods. In this vein, such a "sequential […] approach to product development may conflict with the goals of maximum speed and flexibility" (Takeuchi & Nonaka, 1986, p. 137) that need to be fulfilled to compete in these environments. Consequently, the need for faster delivery, more customer focus, and an absorptive capacity for change prompted the conceptualization of new approaches to develop software products. In light of the growing volatility, uncertainty, complexity, and ambiguity (Bennett & Lemoine, 2014; Taskan et al., 2022) in today's business environment, also often referred to as the VUCA world (Johansen & Euchner, 2015), highly flexible and adaptive approaches for SD thus seem more required than ever before.

While not defined under the notion of ASD at the time, initial concepts that relate to the characteristics of ASD methodologies known today already appeared in early works by Takeuchi and Nonaka (1986). Here, suggestions on how to approach the "new new product development game" (Takeuchi & Nonaka, 1986, p. 137) with a more flexible, faster, and especially iterative process were initially laid out. These suggestions later served as the conceptual foundations for the ASD framework Scrum (Schwaber & Beedle, 2002; Schwaber & Sutherland, 2020), and were thus already described before the actual inception of the ASD movement at the beginning of this century. In this regard, driven by the need for new SD approaches, 17 software practitioners convened in 2001 to "[uncover] better ways of developing software" (Beck et al., 2001), which resulted in the formulation of the Manifesto for Agile Software Development (Beck et al., 2001). The Agile Manifesto has four core values and 12 principles that serve as guidance as to how ASD methodologies approach SD, as shown in Figure 2.1. To this day, the Agile Manifesto remains a guiding reference for ASD, as it articulates the core characteristics of the methodologies and has been "instrumental in shaping how ASD is thought about and practiced" (Baham & Hirschheim, 2022, p. 106), thereby influencing the definition of various approaches introduced by the ASD industry.

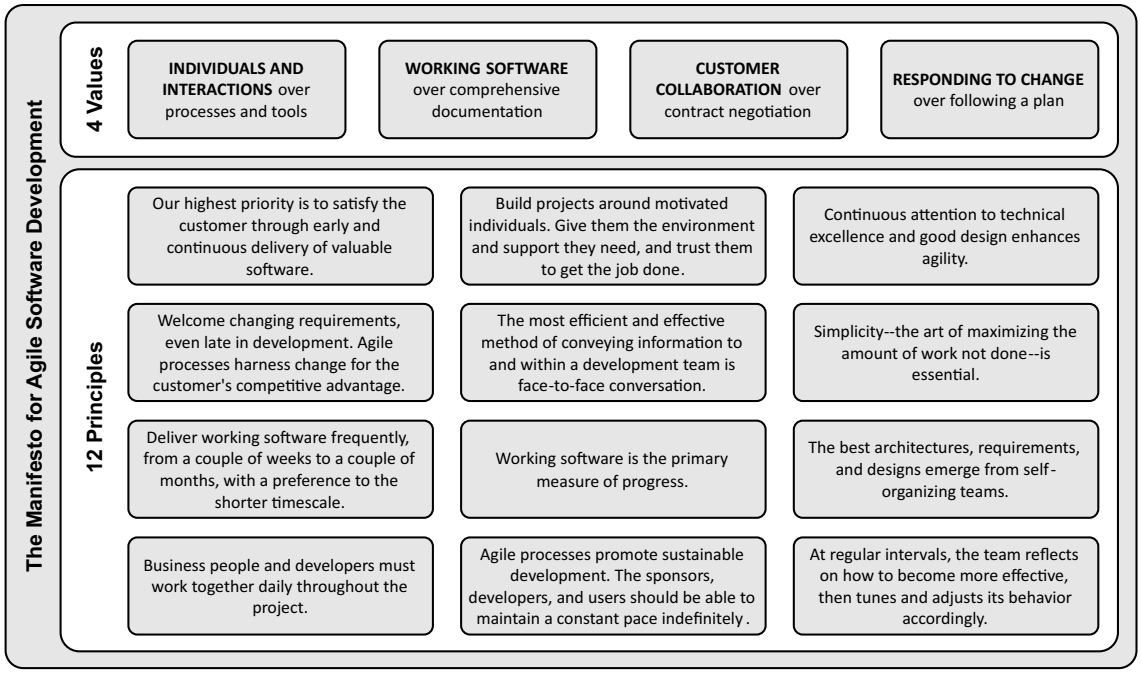

Figure 2.1: The Manifesto for Agile Software Development (Beck et al. 2001), Adapted from Uludağ (2022)

Since the advent of the Agile Manifesto in 2001, "more than 14 different agile methodologies or frameworks" (Cooper & Sommer, 2016, p. 5) have emerged. Several of these methodologies were already introduced before the formulation of the Agile Manifesto, as suggested in an evolutionary map of ASD approaches by Abrahamsson et al. (2003). Today, the most commonly utilized ASD methodologies include Scrum, Kanban, XP, or hybrid forms of the frameworks (Digital.ai, 2023), while "Scrum has been the most popular [ASD framework]" (Digital.ai, 2024, p. 11) for almost two decades. To add, since ASD's "shown and potential benefits have made them attractive […] for larger projects and […] larger companies" (Dikert et al., 2016, p. 87), also several large-scale ASD frameworks have been developed. Examples include the "Scaled Agile Framework, Large-Scale Scrum, Spotify, Nexus, and Scrum at Scale" (Conboy & Carroll, 2019, p. 46), which continuously gain popularity in practical applications (Digital.ai, 2023, 2024). These specific large-scale adaptations of ASD are out of the scope of this dissertation; however, as the main focus is on ASD methodologies in their original form, being "designed for use in small, single-team projects" (Dikert et al., 2016, p. 87). The generic characteristics of ASD are laid out in the following.

Generally, ASD methodologies are centered around a common set of core values, agile principles, and agile practices (Abrantes & Travassos, 2011; Diebold & Zehler, 2016). Figure 2.2 on the following page, adapted from Diebold and Zehler (2016), visualizes these different components. The four values expressed in the Agile Manifesto (Beck et al., 2001), shown above in Figure 2.1, represent the essential foundations of ASD methodologies, valuing a highly collaborative-communicative and responsive development approach with intense customer involvement that frequently provides working software. Acting "as refinements of the core values" (Diebold & Zehler, 2016, p. 20), the twelve agile principles represent guidelines (Abrantes & Travassos, 2011) that further specify how to approach SD work with ASD methodologies. In this regard, ASD proposes the "idea of self-organizing teams whose members are not only collocated but also work at a pace that sustains their creativity and productivity" (Dingsøyr et al., 2012, p. 1214). Furthermore, the principles suggest to "accommodate change in requirements at any stage of the SD process [while] customers are actively involved in the development process, facilitating feedback and reflection"

(Dingsøyr et al., 2012, p. 1214). Other aspects that can be inferred from the principles of the Agile Manifesto include "motivated and empowered software developers […], technical excellence and simple designs [as well as the creation of] business value by delivering working software to users at regular short intervals" (Dingsøyr et al., 2012, p. 1214). In conclusion, as was adequately summarized by Abrahamsson et al. (2002), ASD methodologies are "*incremental* (small software releases, with rapid cycles), *cooperative* (customer and developers working constantly together with close communication), *straightforward* (the method itself is easy to learn and to modify, well documented), and *adaptive* (able to make last moment changes)" (p. 19). Further characteristics of ASD are shown in Table 2.1 on the following page, including a comparison with traditional SD approaches, which is based on prior comparisons of aspects suggested by Nerur et al. (2005, p. 75), Conboy et al. (2011, p. 49), and Overhage and Schlauderer (2012b, p. 5455).

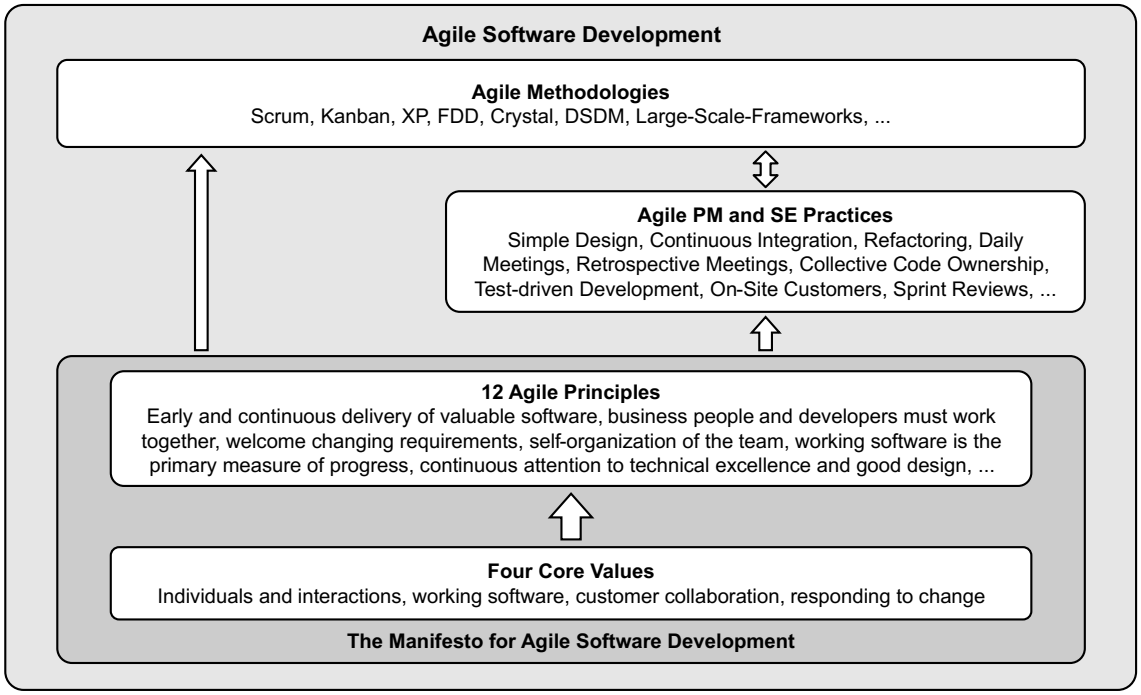

Figure 2.2: Components of Agile Software Development, Adapted from Diebold & Zehler (2016)

Following Figure 2.2, ASD practices "implement the principles governing the processes or methods" (Abrantes & Travassos, 2011, p. 355). These practices entail "established instructions, e.g., tasks, activities, technical aspects, or guidelines, with a specific focus or with an aspect in the development of software that is performed […] to address […] agile core values and agile principles" (Diebold & Zehler, 2016, p. 21). Each ASD methodology comprises several practices that are primarily associated with it. Scrum, for example, entails daily meetings, sprint retrospectives, sprint reviews, and sprint planning sessions (Schwaber & Sutherland, 2020), while XP consists of pair programming, on-site customers, refactoring, among several other practices (Beck, 2006). ASD practitioners often employ a variety of practices from multiple ASD frameworks (Fitzgerald et al., 2006), also known as method tailoring (Campanelli & Parreiras, 2015; Tripp & Armstrong, 2016). More insights into ASD practices, how research distinguishes them into PM and SE practices (Baham & Hirschheim, 2022; Tripp et al., 2016), and how they contribute to the concept of agility that underlies all ASD methodologies (Baham & Hirschheim, 2022; Conboy, 2009), will be introduced in the following section. Similarly, the foundations of the different outcomes of ASD and associated practices, as well as the role of context factors, will be subsequently laid out.

Table 2.1: Comparison of Traditional and Agile Software Development Approach Characteristics

Criterion	Traditional SD Approach	Agile SD approach
Fundamental Assumption	Systems are fully specifiable, predictable, and can be built through meticulous and extensive planning.	High-quality, adaptive software can be developed by small teams using the principles of continuous design improvement and testing based on rapid feedback and change.
Development Model	Life cycle model (Waterfall, Spiral, or some variation).	The evolutionary-delivery model, for example Scrum, XP, Kanban, or other frameworks.
Project Planning	Up front, planning is done using a work breakdown structure and milestones. Project manager assigns tasks in advance.	Continuous, development process managed from iteration to iteration. Planning is done on different strategy levels. Assignment of tasks is discussed in daily meetings.
Knowledge Documentation	Explicit and substantial, documentation is considered to be an integral part of the development process.	Tacit and minimal, no instruction to write down knowledge in a documentation. Instead, the transfer of knowledge is fostered through various meetings.
Management Culture	Command-and-control.	Responsive, leadership and collaboration.
Customer Involvement and Requirements	Customer involvement is important usually only during project analysis, requirements are fixed in a contract-like document.	Customer involvement is critical and continuous for continuous discussion of the requirements with the customer.
Continuous Learning	Not frequently encouraged, lessons learned usually only once at the end of a project.	Embraced, retrospective meetings after each sprint.
Collaboration and Communication	Formal communication and only when necessary, collaboration with the customer usually during the definition of requirements only.	Informal and continuous communication, close collaboration within the development team and with the customer throughout the project.

2.2 Agility in Agile Software Development

The concept of agility – "the quality of being agile, readiness for motion, nimbleness, activity, dexterity in motion" (Abrahamsson et al., 2002, p. 11) implies a lightweight, flexible, and highly responsive "alternative to documentation driven, heavyweight software development processes" (Ilieva et al., 2004, p. 326). Agility thereby characterizes all existing ASD approaches (Baham & Hirschheim, 2022). Some characteristics of agility in the context of ASD can already be inferred from the Agile Manifesto (Beck et al., 2001), e.g., ASD being incremental, cooperative, straightforward, and adaptive (Abrahamsson et al., 2002). However, "even though much has been said and written on the subject, a consensus on a definition of agility has not yet emerged" (van Oosterhout et al., 2006, p. 133). Consequently, capturing what specifically characterizes the essence of the concept has been a challenge since the inception of ASD. While scholars have proposed different conceptualizations of agility, a varying emphasis on the characteristic properties of the concept in the ASD domain is apparent. Examples include Highsmith (2002), Henderson-Sellers and Serour (2005), Lyytinen and Rose (2006), Conboy (2009), Lee and Xia (2010), Rathor et al. (2016), or the Agile Alliance (2025). Table 2.2 provides a collection of these different perspectives on the notion of agility and the specific emphasis of these conceptualizations. Considering these diverging perspectives, ASD research for long suffered from a "lack of theoretical glue" (Conboy, 2009, p. 344) regarding a universally accepted conceptualization of agility. Establishing "a unified way of understanding ASD [and agility] across various methods" (Baham & Hirschheim, 2022, p. 104) has thus been a difficult task to resolve for research and practice alike.

Table 2.2: Definitions of Agility in the Context of ASD Methodologies from Related Literature

Definition of Agility	Emphasis	Authors
Agility is the ability to both create and respond to change in order to profit in a turbulent business environment.	Create and respond to change.	Highsmith (2002, p. 16)
Information system development (ISD) agility is concerned with why and how ISD organizations sense and respond swiftly as they develop and maintain information system applications.	Sense and respond to change.	Lyytinen and Rose (2006, p. 183)
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 (economy, quality, and simplicity), through its collective components and relationships with its environment.	Create, embrace and learn from change and contribute to customer value.	Conboy (2009, p. 340)
A method that can react rapidly to changes internal to the project and also to longer term environmental changes. A dual agility method should be able to serve the two most needed flexibility demands: agility to changes and agility to self-tuning and/or [Software Process Improvement (SPI)].	React to changes, refinement of processes.	Henderson-Sellers and Serour (2005, p. 6)
A software team's capability to efficiently and effectively respond to and incorporate user requirement changes during the project life cycle.	Respond to and embrace change in requirements.	Lee and Xia (2010, p. 90)
Software development agility is the capability to manage various kinds of changes during the development process. This includes the ability to sense, respond to and learn from change.	Sense, respond to and learn from different changes.	Rathor et al. (2016, p. 1)
Agile is the ability to create and respond to change. It is a way of dealing with, and ultimately succeeding in an uncertain and turbulent environment.	Create and respond to change under uncertainty.	Agile Alliance (2025, no page)

To address this long-standing issue in ASD research, a recent study by Baham and Hirschheim (2022) proposed a framework to capture the characteristic essence of agility in the context of ASD methodologies. According to their work, agility is defined as "a software development team's ability to anticipate, create, learn from and respond to changes in user requirements through a process of continual readiness" (p. 112). In more detail, agility is thereby characterized by four theoretical core concepts, which comprise incremental design and iterative development (ID2), inspect and adapt cycles (IA), working cooperatively/collaboratively/in close communication (WC), and continuous customer involvement (CCI). Together, they are proposed to form a theoretical core for agility in the ASD context. In contrast to prior, mostly diverging conceptualizations of agility in ASD listed in Table 2.2, the theoretical core concept framework for ASD agility suggested by Baham and Hirschheim (2022) makes the frequently debated notion more explicit and tangible along its four characteristic core concepts. These four core concepts embrace important ideas of the aforementioned prior works, incorporate essential contents of the Agile Manifesto (Beck et al., 2001), while also drawing on findings from practice to provide a comprehensive perspective. To add, this agility framework was exclusively developed for the ASD domain (Baham & Hirschheim, 2022), thereby differentiating it from other previous conceptualization attempts that relied on findings from various other, non-ASD-specific domains for their definitions, see for example Conboy (2009). Figure 2.3 visualizes the proposed agility framework for the context of ASD methodologies. Due to the fact that the proposed conceptual framework and its theoretical core offer a "basic, parsimonious, and common set of concepts found across virtually all ASD methods that enable IS development agility" (Baham & Hirschheim, 2022, p. 118), this dissertation employs the framework and its components as the main lens of analysis. The following paragraphs briefly outline the key components of the framework.

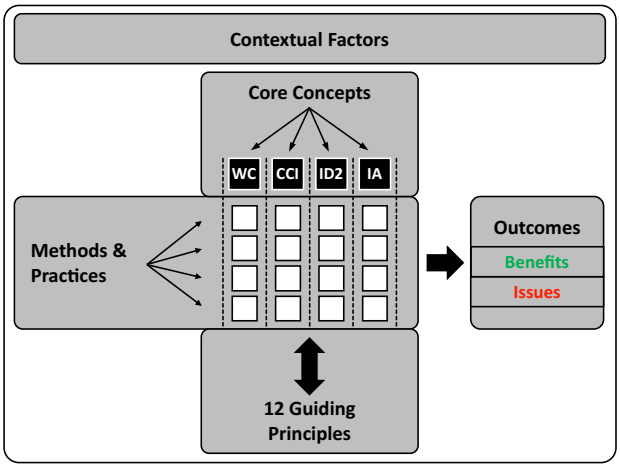

Figure 2.3: Framework for Agility in ASD Methodologies, Adapted from Baham & Hirschheim (2022)

As its centerpiece, the framework in Figure 2.3 contains the four core concepts that define agility in ASD (Baham & Hirschheim, 2022), highlighted by the black boxes. The four core concepts are informed by the 12 principles of the Agile Manifesto (Beck et al., 2001) and operationalized by different applied ASD practices. First, ID2 refers to the iterative way of SD in short, incremental delivery cycles, which focus on a reduced set of requirements in each iteration to enable constant inspections of deliveries and preparing for subsequent iterations, based on previous learnings. The second core concept IA entails the continuous inspection, reflection, and adaptation of performed work during and after each iteration, with the goal of improving the product and the process to enable a constant delivery of business value to the customer. WC characterizes the collaborative modus operandi of ASD, which relies on a small, self-organized, and autonomous development team that works in constant communication among participating members, which also includes frequent interactions with the customer. Hence, the last core concept CCI implies continuous involvement of customers or the business side of development, which ensures frequent feedback on deliverables, while allowing for a joint evaluation of changes in requirements. Table 2.3 features the four concepts of agility to emphasize how they enable to "anticipate, create, learn from and respond to change" (Baham & Hirschheim, 2022, p. 118), and specific ASD practices that facilitate the realization of the different properties of agility captured by the respective core concept.

Table 2.3: Characteristics of the Core Concepts of Agility in ASD by Baham and Hirschheim (2022)

Concept	Description of Core Concept (Baham & Hirschheim, 2022, p. 118)	Enabling ASD Practices
ID2	Anticipating change by working iteratively - in short, delivery cycles - and thereby reducing the scope of the product to small increments to create opportunities for inspection; creating change through incremental software design in response to change from what has been learned.	Small releases, sprints, iteration backlogs, iteration planning, review and retrospective meetings
IA	Anticipating change by instituting ceremonies for inspecting and adapting (i.e., learning from and creating change in response to discovered changes) the product increment (e.g., simplifying - "just enough" - design, testing software frequently) and the development process (e.g., updating work statuses, reevaluating team processes, reprioritizing requirements).	Daily meetings, review/demo sessions, retrospective meetings, continuous testing and integration, code refactoring
WC	Anticipating change through recognizing and predicting changes in one's environment; creating change as a team by working together to respond to change from what has been learned collectively.	Co-location, daily meetings, on-site customers, retrospective meetings, pair programing, open office space
CCI	In addition to the cell above, centralising user requirements changes by working together with the customer to collectively identify and respond to change early through close customer involvement.	On-site customers, review sessions, iteration planning, open office space

Following the logic of the framework in Figure 2.3, ASD methodologies rely on different practices to achieve agility within the SD process, as indicated by the white boxes. In related work, "there is a high degree of agreement among the scholars pertaining to the categorization of ASD practices into social and technical types" (Gupta et al., 2019, p. 14). Social ASD practices "relate to a considerable degree to the social interaction, collaboration, and direct communication of ISD team members" (Hummel et al., 2015, p. 280). Exemplary practices in this category include daily stand-up meetings, retrospective sessions, or sprint reviews (Gupta et al., 2019; Hummel et al., 2015). Technical ASD practices, meanwhile, "focus on coding, functionality, and testing to facilitate the software development process" (Tripp & Armstrong, 2016, p. 5). Examples of practices in this category include refactoring, continuous integration, or collective code ownership (Gupta et al., 2019). The framework by Baham and Hirschheim (2022) makes a similar distinction of ASD practices, differentiating between PM and SE practices. Since PM practices mostly "focus on planning, coordination, work metrics, and communication to facilitate the software development process" (Tripp & Armstrong, 2016, p. 5), it seems valid to equate them with the social practice type suggested in Gupta et al. (2019). In analogy, given that technical practices imply "engineering practices that help teams develop high-quality and sustainable code" (Alami et al., 2022, p. 7), considering them as semantically equal to SE practices seems adequate. Table 2.4 and Table 2.5 on the following page contain typical technical/SE and social/PM practices according to Baham and Hirschheim (2022), Gupta et al. (2019), Hummel et al. (2015), Tripp et al. (2016), and Tripp and Armstrong (2016), with a short description of their properties.

As can be inferred from Figure 2.3, realizing agility in the SD process leads to different outcomes, e.g., "desired outcomes such as time to market and software quality" (Baham & Hirschheim, 2022, p. 119). Similarly, Conboy (2009) proposes that agility contributes to "customer value (economy, quality, and simplicity)" (p. 340). Related work provides evidence that ASD can also lead to various other beneficial outcomes, e.g., reduced defect densities (Fitzgerald et al., 2006), more frequent releases (Olszewska et al., 2016; Senapathi et al., 2011), or higher job satisfaction (Tripp et al., 2016). Together, these and other benefits relate to the business value of ASD methodologies (Kautz et al., 2014; Racheva et al., 2010), which will be further discussed in Section 2.3.1. At the same time, it should be noted that agility in ASD does not only imply beneficial outcomes. Several issues can be associated with the characteristics of agility in the ASD context, for instance, technical debt (Martini et al., 2015) and stress for developers (Annosi et al., 2016) due to the highly paced iterative development, workflow disruptions caused by frequent meetings (Stray et al., 2016; Wiesche, 2021), or a lack of customer involvement (Hoda et al., 2011). These and various other issues thus suggest that ASD methodologies also have a rather dark side to them. In Section 2.3.2, a deeper look into these undesirable issues is provided to enable a balanced perspective on the different outcomes that can be associated with the methodologies.

As for the last component included in the framework by Baham and Hirschheim (2022), contextual factors play an essential role for SD projects that employ ASD methodologies as their development approach. Generally, software processes are "dependent on the situational characteristics of individual software development settings" (Clarke & O'Connor, 2012, p. 433). However, related research shows that ASD-based projects are even more contingent on contextual characteristics, especially regarding system age, project criticality, distribution, customer involvement, or documentation requirements (Hoda et al., 2010; Kruchten, 2011). Consequently, Section 2.4 discusses the critical role of contextual characteristics for ASD methodologies in more detail and outlines several of the most relevant contextual factors that influence the outcomes of ASD.

Table 2.4: Typical Social/Project Management Practices in ASD Methodologies

Practice	Description of Practice
Co-Location *	Teams work together in the same location, for example, in the same room or office, together with a client representative (Hummel et al., 2015).
Continuous Prioritization *↻	Constantly assessing the importance and value of requirements in light of project constraints, e.g., time and project budgets (Berander & Andrews, 2005).
Daily Meetings ↻	A meeting conducted on a daily basis to evaluate the progress made towards the sprint goals, providing a frequent opportunity for adaptation and identification of issues that impede a constant progress in the development process (Schwaber & Sutherland, 2020).
On-Site Customer Involvement *	The customer or a representative of the business side is located on-site as a member of the SD team to provide feedback on requirements, test the product and define priorities in the development process (Abrantes & Travassos, 2011).
Retrospective Meetings ↻	A meeting of the SD team after an iteration to assess aspects that worked well and find ways to improve the effectiveness in the next iterations (Schwaber & Sutherland, 2020).
Self-Organization ∀	Teams operate in an autonomous, self-defined fashion, with the authority and the responsibility to solve tasks in their own manner (Hoda & Murugesan, 2016; Hoda et al., 2013).
Small Teams ∀	The size of ASD teams should not exceed 10 members to ensure dexterity in development and improve communication and productivity of members (Schwaber & Sutherland, 2020), ideally averaging 4-9 team members.
Sprint Planning Meeting ↻	Meeting at the start of an iteration with the customer to select requirements to be included in the sprint backlog and to define a sprint goal (Schwaber & Sutherland, 2020).
Sprint Review Meeting ↻	A demo session conducted after the development iteration to demonstrate deliverables to the customer and receive feedback based on the inspection of the delivered work (Schwaber & Sutherland, 2020), also allowing for the formulation of new requirements.
Task Board and Burndown Chart ↻	Way of visualizing the progress made in the sprint based on the sprint backlog, allowing to assess and discuss the current progress towards the sprint goal (Katsma et al., 2013).
User Stories *↻	A small note of a functionality based on defined requirements that provides value to a user, including testing criteria to determine the fulfillment of the user story (Cohn, 2004).
Note: ASD Practice primarily associated with: **Scrum**: ↻| **XP**: *| **others**, i.e., **Kanban**, or **general** part of **ASD**: ∀	

Table 2.5: Typical Technical/Software Engineering Practices in ASD Methodologies

Practice	Description of Practice
Agile Testing and Unit Testing *	Developed code is continuously tested (manually or automated) to ensure that only flawless code is pushed to the production environment (Beck, 2006).
Collective Code Ownership *	All SD team members "own" the code base, allowing anyone to modify and improve the system without having to consult other members before doing so (Beck, 2006).
Continuous Integration *	New changes to the code or new functionalities are continuously added to the system, where new code is continously tested in deployment (Beck, 2006).
Customer Acceptance Test *	A way of testing if delivered features fulfill the acceptance criteria defined by the customer to evaluate an adequate meeting of requirements (Melnik et al., 2006).
Iterative/Incremental Development ∀	Breaking down the SD process into incremental/iterative steps to make the SD process manageable, improve control and to enable inspections (Schwaber & Sutherland, 2020).
MVPs/Prototype ∀	A minimum viable product offering a minimum set of functionalities to receive feedback from the customer and proceed accordingly (Duc & Abrahamsson, 2016).
Pair Programming *	Two developers work together on the same machine writing code, where one writes the code (driver), while the other continuously checks the code (navigator) (Beck, 2006).
Pair Rotation *	The members involved in pair programming frequently change and rotate among participating developers to bring different expertise and knowledge together (Beck, 2006).
Refactoring *	Constant improvement and redesign of the code during development to enable a sustainable growth of the system and eliminate deficiencies (Beck, 2006; Martini et al., 2015).
Simple Design *	The implementation of requirements adopts the simplest way possible to streamline development and avoid unnecessary additions (Abrantes & Travassos, 2011).
Test Driven Development *	Unit test cases are written before the implementation of a functionality to determine if the code meets requirements of the predefined test scenarios (George & Williams, 2003).
Note: ASD Practice primarily associated with: **Scrum**: ↻| **XP**: *| **others**, i.e., **Kanban**, or **general** part of **ASD**: ∀	

2.3 Outcomes of Agile Software Development

The following sections discuss positive and negative outcomes that result from the application of ASD methodologies, i.e., benefits or issues. While ASD was created to "satisfy the customer through early and continuous delivery of valuable software" (Beck et al., 2001), thus embedding business value delivery and benefit realization in its core principles, issues are also described that form the dark side of the methodologies. By providing insights into both sides of ASD's outcome spectrum, a balanced understanding of the different outcomes is ensured in this dissertation.

2.3.1 Business Value of Agile Software Development

The concept of business value is a frequently debated topic in the IS research domain (Kohli & Grover, 2008; Schryen, 2013; Soh & Markus, 1995). This debate initially emerged with the investigation of the IT productivity paradox (Brynjolfsson, 1993), questioning whether investments in IT contribute to productivity gains, which nowadays appears rather resolved (Schryen, 2013). To this day, business value still represents an important subject of discussion in related IS literature. This discussion mostly focuses on the economic impacts of IT investments, e.g., financial benefits, productivity increases, cost reductions, and efficiency gains, and return on investments (Hitt & Brynjolfsson, 1996; Schryen, 2013). In a similar vein to IT investments, introductions of ASD methodologies need to prove their merits by providing benefits over traditional approaches for SD. In contrast to related literature on the business value in IS research, which appears well-matured by having provided consolidated perspectives on the concept (Schryen, 2013), the notion of business value in ASD methodologies still requires more clarification. Therefore, this section discusses related work, describes several benefits that constitute the concept of business value in ASD methodologies, and introduces a working definition for the concept derived from Paper II.

As of now, a consolidated perspective on business value in the context of ASD methodologies is still missing (Alahyari et al., 2017), making the concept "slippery and highly volatile" (Racheva et al., 2009, p. 153). Specifically, 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, p. 141). Contrasting IS business value research, however, it was already recognized early on by the ASD research community that in the context of ASD methodologies, "business value is not only dollars" (Racheva et al., 2010, p. 131). While the IS business value research domain primarily identifies economic and financial outcomes (Schryen, 2013), for ASD, various other beneficial outcomes need to be considered. Therefore, ASD research also suggests to "interpret business value as a multi-dimensional concept" (Racheva et al., 2009, p. 144). This multidimensionality becomes especially apparent in related studies that specifically study business value in ASD, including Racheva et al. (2010), Heidenberg et al. (2012), Kautz et al. (2014), or Alahyari et al. (2017). These studies emphasize different beneficial outcomes of ASD, yet rarely discuss financial benefits. First, Racheva et al. (2010) discuss higher customer satisfaction, stronger customer relationships, satisfaction of developers, higher resource efficiency, better product quality, and improved time to market. Heidenberg et al. (2012) include the dimensions of customer satisfaction, employee satisfaction, competence growth, market enabler, and monetary value in a business value model "that is intended to make explicit different factors that constitute the concept of business value in agile […] software development" (p. 49). Furthermore, Kautz et al. (2014) assess different benefits of Scrum using productivity, software quality, and developer

satisfaction as dimensions related to the focal concept. Lastly, Alahyari et al. (2017) study business value in ASD organizations along customer value, internal value, financial value, and innovation and learning benefits, while also looking into aspects of delivery time, software quality, customer retention, and various other beneficial outcomes. Financial aspects are the least prioritized value aspect here, which emphasizes that ASD "business value is more than just numbers" (Racheva et al., 2010, p. 140), while various other benefits are considered to be more important.

Table 2.6: Prominent Benefits Related to the Business Value of ASD Methodologies

Benefit of ASD	Description of Benefit	Exemplary Studies
Improved Software Quality	ASD can provide improved software quality with reduced defect density (Fitzgerald et al., 2006), while providing overall higher code quality (Alami & Krancher, 2022).	Alami and Krancher (2022) Fitzgerald et al. (2006)
Improved Developer Satisfaction	Agile developers perceive their job as more enjoyable (Melnik & Maurer, 2006), e.g., through improved job autonomy, or the use of ASD practices (Tripp et al., 2016).	Tripp et al. (2016) Melnik and Maurer (2006)
Increased Development Productivity	ASD allows to provide "faster, more productive output" (Schlauderer & Overhage, 2013, p. 9), especially when compared to waterfall projects (Sutherland et al., 2007).	Tarhan and Yilmaz (2014) Sutherland et al. (2007)
Reduced Time to Market	With ASD, "good requirements covering […] is already achieved at an early point during the project" (Overhage & Schlauderer, 2012a, p. 10), while also enabling reductions in lead time for new features (Olszewska et al., 2016).	Senapathi and Srinivasan (2012) Olszewska et al. (2016)
Better Customer Requirements Meeting	In ASD "only needed requirements are implemented" (Karrenbauer et al., 2019, p. 841), so that the actually required "customer demands can be satisfied better" (Overhage & Schlauderer, 2012a, p. 10).	Karrenbauer et al. (2019) Overhage and Schlauderer (2012b)
Improved Process Transparency	Project visibility and an overview of the current situation can be enabled by different ASD practices, e.g., daily meetings (Lagerberg et al., 2013; Paasivaara et al., 2008).	Heikkilä et al. (2015) Hossain et al. (2009)
Improved Communication and Collaboration	With ASD, "communication quality is better than before and […] much more frequent"(Paasivaara et al., 2008, p. 93), as it offers "supportive structure for communication and collaboration" (Vidgen & Wang, 2009, p. 371).	Paasivaara et al. (2008) Hummel et al. (2015)
Improved Responsiveness to Change	ASD allows to "rapidly react to urgent problems and adjust to change" (Khalil & Khalil, 2020, p. 564), enabling a faster change request turnaround (Olszewska et al., 2016).	Overhage and Schlauderer (2012b) Begel and Nagappan (2007)
Improved Customer Satisfaction	Various benefits foster customer satisfaction (Schlauderer & Overhage, 2013), e.g., closer collaboration, or faster delivery and higher quality (Senapathi & Srinivasan, 2012).	Vacari and Prikladnicki (2017) Senapathi and Srinivasan (2012)

Together, prior research suggests that the ASD business value concept is characterized by a multidimensional nature (Racheva et al., 2009), with less emphasis on financial aspects. At the same time, such studies also indicate a certain heterogeneity as to how ASD business value is understood in related work. This multidimensionality and heterogeneity both seem further evident in consideration of various other benefits featured in Table 2.6, which go beyond the ones illustrated in dedicated prior studies on the business value of ASD. To add, also various value recipients that benefit from these beneficial outcomes of ASD can be identified. In this vein, code quality and reduced defect density (Alami & Krancher, 2022; Maruping et al., 2009) primarily concern the product, while productivity (Tarhan & Yilmaz, 2014) and transparency (Overhage & Schlauderer, 2012a) relate to the ASD process. Furthermore, improved communication (Hummel et al., 2015), developer (Tripp et al., 2016), and customer satisfaction (Senapathi & Srinivasan, 2012) primarily benefit the actors involved in ASD. Consequently, an adequate conceptualization of the business value of ASD methodologies needs to encompass the wide spectrum of benefits, their different beneficiaries, and their limited financial implications to adequately reflect its multifaceted nature.

Especially due to the heterogeneity of perspectives on ASD business value in related work and the apparent multidimensionality of benefits that still remains to be thoroughly consolidated, explicit definitions of the notion of business value in the context of ASD are still missing (Alahyari et al., 2017). This is also the case in the related VBSE research domain (Salleh et al., 2023). Most studies in VBSE rely on a widely used, yet generic definition by Biffl et al. (2006), as identified by Salleh et al. (2023), while for the specific ASD context such definitions are generally lacking in related work. For this dissertation, a comprehensive working definition that incorporates the multidimensionality of associated benefits, the different beneficiaries of using ASD methodologies, and the emphasis on aspects beyond financial outcomes seems required, however, to adequately capture the focal concept. The working definition proposed below is adopted from Paper II and relies on the generic definition suggested by Biffl et al. (2006), while it is enhanced with the characteristics of business value in the context of ASD methodologies identified above. This dissertation consequently defines the ASD business value concept as follows:

The business value of ASD is constituted by the multidimensional spectrum of valuable aspects resulting from the use of ASD methodologies and associated practices that imply positive implications for developers, teams, processes, products, stakeholders, or organizations involved in ISD in the form of tangible or intangible, economic or social, monetary or utilitarian, or aesthetic or ethical, beneficial consequences.

2.3.2 Dark Sides of Agile Software Development

While ASD can deliver substantial benefits that form the concept of business value, a considerable range of issues also needs to be acknowledged to ensure a non-deceptive representation of the outcomes of the methodologies. Compared to the ASD business value debate, the discussion on the issues forming the dark side of ASD for a long time remained less intense. This negligence can be inferred, for instance, from the tertiary review by Hoda et al. (2017), where studies on the negative outcomes of ASD only make up a small part of all included articles. Studies dedicated to challenges and issues in ASD furthermore only emerged about ten years after the inception of the methodologies. Examples include Conboy et al. (2011) and Gregory et al. (2016), who focus on general challenges that practitioners face in practice. Additionally, Hoda et al. (2011) study the impact of inadequate customer collaboration, Inayat et al. (2015) examine the challenges of ASD requirements engineering practices and Petersen and Wohlin (2009) compare the advantages and issues of agile and iterative approaches. Paper II and III show similar trends, as studies on benefits are more prominent in early research, while studies on issues are less frequent and mostly appeared in later stages of ASD research. Studies with dedicated systematizations of the dark side of ASD methodologies also only feature a limited set of aspects (Fitriani et al., 2016), thus not fully representing the actual spectrum of issues. In a similar vein, practical literature, such as the Annual State of Agile Reports, initially focused particularly on the benefits of ASD (VersionOne, 2007), while neglecting typical issues encountered in practice. To add, even the more recent reports (Digital.ai, 2021; VersionOne, 2018, 2019, 2020) only discuss a few of the typical challenges and issues that can diminish ASD's value proposition. These observations can be attributed to ASD experiencing a hype followed by inflated expectations, before skepticism set in (Janes & Succi, 2012). Therefore, to prevent that ASD is generally viewed as a "silver bullet for software development" (Murphy et al., 2013, p. 75), especially in this dissertation, several issues related to the dark side of the methodologies are shown in Table 2.7, providing a more balanced perspective.

Table 2.7: Prominent Issues Related to the Dark Side of ASD Methodologies

Issue of ASD	Description of Issue	Exemplary Studies
Continuous Delivery Pressure	ASD requires continuous provision of new software per iteration, implying significant pressure for developers under "short iteration lengths or an extremely high and unsustainable development velocity" (Hoda et al., 2012, p. 628).	Hoda et al. (2012) McHugh et al. (2011b)
Insufficient Documentation	ASD values working software over documentation (Beck et al., 2001), while knowledge is mostly tacit and not written down (Boehm, 2002), resulting in a lack of documentation.	Behutiye et al. (2022) Ramesh et al. (2010)
Lacking Customer Involvement	Customer involvement is essential for ASD, with lacking customer collaboration resulting in a lack of feedback, loss of productivity or unclear requirements (Hoda et al., 2011).	Hoda et al. (2011) Ramesh et al. (2010)
Technical Debt	Technical debt implies deficiencies in the software code, which result from shortcuts taken for short-term delivery speed gains, negatively affecting the quality of the software in the long term if unaddressed (Martini et al., 2015).	Martini et al. (2015) Paasivaara et al. (2018)
Stress	Stress and exhaustion can result from excessive iteration cadence and the need to deliver new software at the end of each iteration (Annosi et al., 2016), as well as having to report progress frequently (McHugh et al., 2011b).	Annosi et al. (2016) Benlian (2022)
Meeting Overhead	Meetings in ASD are often seen as "as too many meetings, not very useful, or lacking clear agendas" (Alahyari et al., 2019, p. 85), and cause interruptions (Wiesche, 2021).	Mueller and Benlian (2022) Stray et al. (2016)
Requirement Volatility	Continuous, unsystematic, or late requirement changes (Hoda & Murugesan, 2016), "can have adverse consequences on project cost, schedule, and quality of the resulting product" (Dasanayake et al., 2019, p. 1).	Dasanayake et al. (2019) Hoda and Murugesan (2016)

2.4 Role of Contextual Factors in Agile Software Development

Contextual factors refer to the characteristics of the respective setting in which an SD project is situated, where the situational factors of the specific setting can significantly affect the SD process (Clarke & O'Connor, 2012). Exemplary context factors include "the nature of the application(s) under development, team size, requirements volatility and personnel experience" (Clarke & O'Connor, 2012, p. 433). ASD-based projects, especially due to the characteristics of agility in ASD methodologies described before, appear even more contingent on the contextual settings in which they operate (Hoda et al., 2010; Kruchten, 2011), which can affect their outcomes. While ASD is a "highly diverse, adaptable, contextual, situated practice" (Baham & Hirschheim, 2022, p. 108), the methodologies and practices are often "completely removed from the context in which they were proven to be successful" (Kruchten, 2011, p. 352) in ASD research. Kruchten (2007) describes this phenomenon as the decontextualization of ASD. Hence, "scholars […] stress the importance of understanding ASD's project context" (Baham & Hirschheim, 2022, p. 107).

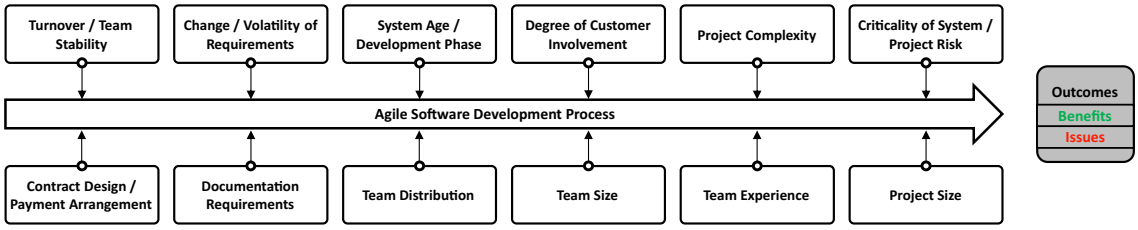

Figure 2.4: Contextual Factors Influencing ASD Methodology-based SD Processes and Outcomes

In this regard, Kruchten (2011) proposes an initial, yet not exhaustive, collection of contextual factors that characterize an ideal setting for ASD projects, called the "agile sweet spot" (p. 355). Relevant factors discussed here include the system size, its criticality and age, the rate of change, or the distribution of the SD team. This study suggests that ASD operates best with a "collocated team, of less than 15 people, doing greenfield development for [a] non-safety-critical system, in [a] rather volatile environment; [where] the system architecture is defined and stable, and the governance rules [are] straightforward" (Kruchten, 2011, p. 356). Other context settings-oriented studies by Hoda et al. (2010) focus on similar factors, but also refer to further important contextual aspects for ASD. Such factors include the degree of customer involvement, the role of fixed-budget contracts, documentation needs, the distribution of teams, or the rate of change in requirements. Other studies, e.g., Clarke and O'Connor (2012) that adopt a more generic stance on the role of context settings for SD projects, not specifically ASD, offer an even broader collection of contextual factors. Since this dissertation examines the question of *when*, i.e., in which contextual environments ASD methodologies ideally operate, and aims to reconceptualize the vague "agile sweet spot" by Kruchten (2011, p. 355), thereby also addressing the problem of decontextualization in ASD research (Kruchten, 2007), a comprehensive set of contextual factors relevant to ASD needs to be defined. Based on Hoda et al. (2010), Kruchten (2011), and Clarke and O'Connor (2012), Figure 2.4 and Table 2.8 include 12 key contextual factors for ASD methodologies. These factors are also used in the analysis of the influence of context factors on outcomes in Paper VI.

Table 2.8: Key Contextual Factors for ASD Methodologies

Contextual Factor	Description of Contextual Factor
Project / Application Size	Project size is determined the number of teams, the budget, the size of the code for the product or the duration of a project (Clarke & O'Connor, 2012; Kruchten, 2011).
Project Complexity	The project complexity depends on aspects such as tasks to be performed, dependencies with other systems, or the hardware architecture (Clarke & O'Connor, 2012).
Criticality of System in Development / Risk	The criticality and risk of a project are determined by how people are affected by a potential project failure, or negative consequences of the project (Kruchten, 2011).
System Age / Development Phase	The system age is determined by its stage in the development life cycle and the inheritance of code from legacy systems (Clarke & O'Connor, 2012; Kruchten, 2011).
Rate of Change / Volatility of Requirements	Changes in initially defined needs, i.e., the stability of requirements, emerging scope creep, and unclear requirements define the degree of change and volatility in SD projects (Clarke & O'Connor, 2012; Kruchten, 2011).
Documentation Needs	While ASD underscores minimum documentation in the Agile Manifesto (Beck et al., 2001), environments with bureaucray, regulatory requirements or public safety risks may demand additional documentation (Hoda et al., 2010; Kruchten, 2011).
Contract Design / Payment Arrangements	Budgets are a key project constraint, with different forms of financing available, including fixed budgets or time-and-material-contracts (Clarke & O'Connor, 2012). Absorbing change in ASD with fixed budgets can be difficult (Hoda et al., 2010).
Degree of Customer Involvement	Client involvement is a core concept of ASD (Baham & Hirschheim, 2022), making lacking involvement problematic for ASD project success (Hoda et al., 2011).
Team Size	The team size is determined by the number of involved members, with ASD teams ideally consisting of 4-9, ideally less than 10 members to facilitate communication and team dexterity (Schwaber & Sutherland, 2020).
Team Distribution	Distribution is determined by the geographical arrangement of involved SD team members in the project, who can operate co-located, (partly) distributed, or even work offshore (Hoda et al., 2010; Kruchten, 2011).
Team Experience / Maturity / Skill / Expertise	Experience relates to technical skills, expertise in working with development methods, or general know-how of SD team members (Clarke & O'Connor, 2012).
Turnover / Team Stability	This factor relates to the stability in the composition of an SD team, i.e., whether excessive turnover of members can be recognized (Clarke & O'Connor, 2012). High fluctuation and turnover can be problematic for ASD (de O. Melo et al., 2013).

3 Research Methodology

This dissertation employs different research methods to address the research questions posed in the introduction section. All research methods applied by the six papers in this dissertation are introduced in the following, with their individual characteristics being subsequently described.

3.1 Overview of Employed Research Methods

Selecting a suitable research method is a central step of any research endeavor (Recker, 2021). A research method generally entails "well-defined sequences of operations that if carried out proficiently yield predictable results" (Mingers, 2001, p. 242), to find answers to the investigated research questions. Depending on the research question and overall objective of the research endeavor, different methodological approaches may be applicable, which led to the emergence of a plethora of research methods being used in contemporary IS research (Recker, 2021). The specific research methods employed in this dissertation are shown in Figure 3.1 on page 26.

According to Recker (2021), research methods can be broadly categorized into qualitative, quantitative, design science, and computational techniques. Given that the studies included in this dissertation only rely on qualitative and quantitative approaches, the other two types of research techniques are not further elaborated on. With regard to the applied research methods, qualitative approaches enable "researchers to investigate phenomena in their real-life contexts" (Recker, 2021, p. 114). This type of research relies on qualitative data that includes interview transcripts, observations, audio or video files, internal documents (Bhattacherjee, 2012), or other forms of written texts, including prior scientific literature, thereby focusing on words rather than numbers (Recker, 2021). These approaches allow researchers to "uncover complex, multifaceted, or even hidden phenomena [through] a more comprehensive, multiperspective view" (Recker, 2021, p. 116), with the ultimate goal of " 'sense making' or understanding a phenomenon, rather than predicting or explaining [it]" (Bhattacherjee, 2012, p. 113), which relates more to quantitative research techniques. Consequently, qualitative research methods are generally more exploratory in nature. Most studies included in this dissertation (Paper I-III, Paper V, and Paper VI) employ qualitative research methods, including systematic literature reviews and semi-structured expert interview studies, which are subsequently explained in Section 3.2 and Section 3.3.

Quantitative research, meanwhile, "typically uses numerical analysis to illustrate the relationship among factors in the phenomenon studied" (Chen & Hirschheim, 2004, p. 205). Such approaches rely on "types of data whose values are measured in numbers" (Recker, 2021, p. 88), instead of words, as is typically the case in qualitative approaches. With quantitative data, for instance, collected through surveys and experiments (Creswell & Creswell, 2017), quantitative research and associated data analysis techniques enable researchers to test proposed hypotheses about relationships among different events or variables within examined phenomena, with the ultimate goal to "identify and document general laws" (Recker, 2021, p. 91) in reality. Consequently, IS research considers quantitative research methods to follow a "hypothetico-deductive model of science" (Recker, 2021, p. 89) that is based on theoretical assumptions or established research models. This characterizes quantitative research methods as more confirmatory and explanatory, rather than being of a more exploratory nature, which particularly applies to qualitative research approaches. With regard to quantitative research methods employed in this dissertation, Paper IV

utilizes a multiple regression analysis as a quantitative cross-sectional analysis technique (Wilde & Hess, 2007). Regression analysis is a frequently employed research method in IS research to investigate relationships between multiple independent and a dependent variable (Backhaus et al., 2021), e.g., applied ASD practices and their influences on specific beneficial outcomes in ASD projects. Section 3.4 further elaborates on the specificities of multiple regression analysis as a quantitative research method to extract findings from a quantitative dataset obtained via a survey.

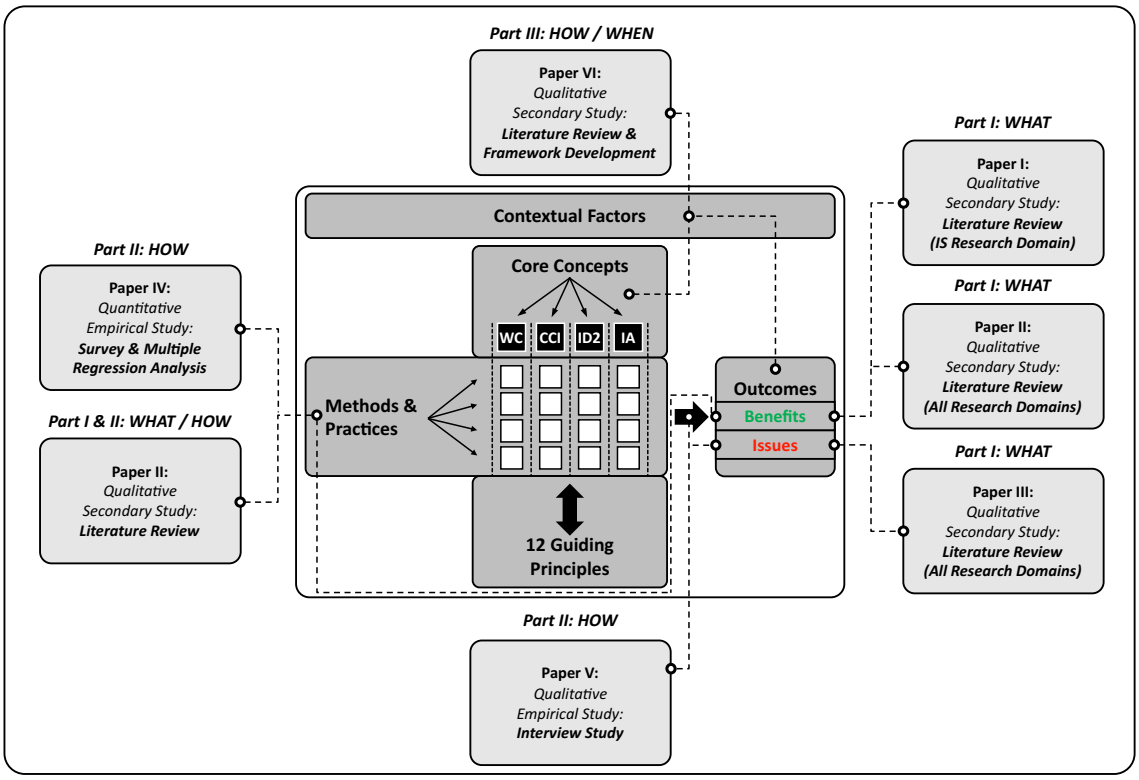

Figure 3.1: Investigated Aspects of ASD Methodologies and Applied Research Methods

Figure 3.1 highlights which research methods are utilized in the three main parts of the dissertation, and which particular aspect in the context of ASD methodologies is being investigated with the selected research approach. Paper I-III and Paper VI rely on argumentative deductive analysis techniques (Wilde & Hess, 2007) in the form of different types of literature reviews. Paper V also adopts a qualitative research method and conducts an expert interview study (Bogner et al., 2009), which is a common qualitative cross-sectional analysis technique (Wilde & Hess, 2007). With regard to quantitative approaches, Paper IV employs a quantitative cross-sectional analysis technique (Wilde & Hess, 2007) by performing multiple regression analysis (Backhaus et al., 2021) based on collected survey data. While the dissertation features both qualitative and quantitative research methods, most papers rely on a qualitative research approach, overall making this research more qualitative in nature. Given the lack of structured insights into the phenomena of the business value and the dark sides of ASD methodologies, as outlined in Section 1.2, adopting a more qualitative approach is particularly beneficial to explore and understand the focal topics in depth. In this vein, Paper I-III aim to conceptualize the notion of business value in the context of ASD methodologies and define the dark side behind them, thereby resolving the previous lack of clarity in the literature. Paper V extends this exploratory-qualitative perspective on benefits and issues by empirically investigating how such critical issues affect business value delivery. Additionally, Paper VI develops a new sweet spot model for ASD to clarify when, i.e., under which

specific circumstances, ASD methodologies should ideally be utilized to maximize business value realization. To complement the qualitatively derived insights of the other studies, Paper IV quantitatively examines how different social/PM ASD practices stimulate beneficial outcomes for developers and economic benefits in ASD projects. Concludingly, with the selected research methods, the dissertation offers both qualitative and quantitative perspectives on the different outcomes of ASD to better understand and explain the investigated phenomena. All applied research methods are described in the following, with a particular focus on the reasons behind their selection, their individual strengths in deriving answers to the research questions in the three parts of the dissertation, and the inherent limitations of the different research approaches.

3.2 Qualitative Research: Systematic Literature Reviews

Reviewing prior literature from a focal research area represents a fundamental step in any academic research endeavor (Webster & Watson, 2002). A literature review is generally conducted during the exploration phase of any research project "to understand the current state of knowledge in that area" (Bhattacherjee, 2012, p. 20). It is therefore usually located in the theoretical background of research articles to set the stage for the investigated phenomenon and associated research questions. Dedicated, stand-alone literature reviews, however, solely serve the purpose of "[reviewing] the literature in a field, without any primary data (that is, new or original) collected or analyzed" (Okoli & Schabram, 2015, p. 2), with the goal of providing "a solid starting point for all other members of the academic community that are interested in a particular topic" (Paré et al., 2015, p. 183). Doing so allows scholars to comprehensively assess the current state of knowledge, identify gaps in the literature, draw conclusions from the synthesis of related findings, or contribute to theory development (Cooper, 1988; vom Brocke et al., 2009).

The two main research domains relevant to ASD methodologies have developed their own specific approaches on how to conduct a literature review. These are the guidelines by Kitchenham and Charters (2007) being frequently applied in SE research, and the literature reviewing framework by vom Brocke et al. (2009), commonly utilized by the IS community. While each approach has its individual characteristics, both follow a methodologically structured, rigorous process to review extant findings, which is why they are summarized under the notion of a systematic literature review (Kitchenham et al., 2009). Most systematic literature reviews included in this dissertation primarily follow the guidelines by Kitchenham and Charters (2007), i.e., Paper II, Paper III, and Paper VI, while Paper I adopts the IS-related suggestions by vom Brocke et al. (2009).

Systematic literature reviews can be classified according to a typology suggested by Paré et al. (2015). Typical classification criteria include the goal of the review, the scope of addressed questions, the search strategy, the nature of primary sources, whether an explicit study selection and a quality appraisal were conducted, and the methods used for the synthesis of findings, see Paré et al. (2015, p. 186). Most literature review-based papers included in this dissertation rely on the qualitative systematic review type (Paré et al., 2015), which serves to "integrate prior empirical (qualitative or quantitative) findings" (Paré et al., 2023, p. 579). This review type adopts a comprehensive search strategy, conducts an explicit study selection and a quality appraisal, and relies on a narrative synthesis to develop insights based on the literature (Paré et al., 2015). Note that Paper I is typified according to the taxonomy by Cooper (1988), as recommended by vom Brocke et al. (2009). The following paragraphs illustrate the specificities of the literature reviews in Paper I-III and Paper VI, supplemented with additional information presented in Table 3.1 to Table 3.4.

First, Paper I conducts a systematic literature review (vom Brocke et al., 2009) to synthesize findings on the benefits of ASD related to the business value of the methodologies. Paper I lays particular emphasis on contributions from the IS literature, thereby neglecting findings from other domains. This seems adequate, however, as the notion of business value is a frequently debated concept in the IS research domain (Schryen, 2013), while conceptualizations in the ASD context generally remain scarce (Alahyari et al., 2017; Racheva et al., 2009). Hence, developing an initial overview of benefits and structuring findings from one specific research domain is appropriate.

The systematic literature review in Paper I adopts the five-step procedure suggested by vom Brocke et al. (2009). First, the type of review is defined according to the taxonomy by Cooper (1988). The review focuses on research outcomes, pursues the goal of integrating extant findings, takes a neutral perspective, and provides a selective coverage by solely focusing on IS research. The organization of findings is conceptual, which primarily informs practitioners and scholars in the field of ASD methodologies. Second, to prepare for the literature search step, search terms related to the business value of ASD, i.e., benefits, advantages, or improvements, are defined. The complete search string is included in Table 3.1. In the third step, due to the selective focus on IS research, only the AIS eLibrary and the eight IS journals included in the Senior Scholars Basket of Journals are queried with the search string. Here, a full-text search is conducted, with a limited time frame from 2006 to 2021. Also, only full research papers are included. To avoid omission of potentially relevant articles, additional forward-backward searches are performed.

Table 3.1: Characteristics of Paper I

Criteria	**Systematic Literature Review**
	Paper I
Objective	Review the IS literature on the benefits of ASD methodologies, develop an understanding for the concept of business value in ASD, and identify future research opportunities in the realm of the focal concept.
Type of Review	Systematic literature review with a selective search strategy of only IS literature.
Review Procedure	Five-step literature search and analysis procedure (vom Brocke et al., 2009), including a qualitative content analysis based on Gioia et al. (2013) and Wolfswinkel et al. (2013).
Included Databases	Senior Scholars Basket of Journals and AIS conferences in the AIS eLibrary.
Search Terms and Search String	((("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 ad-vantage* OR perform* OR achiev* OR increase* OR success* OR profit* OR accept* OR adoption*))
Search Period	2006 to 2021
Inclusion Criteria	Full research articles that report on the benefits of ASD methodologies.
Quality Appraisal	No quality appraisal was conducted, instead the selection is based on the high-quality journals in the Senior Scholars Basket of Journals and AIS conference proceedings.
Identified Articles	34 relevant academic research articles.
Review Structuring	Concept-centric classification of benefits into business value categories. Allocation of categories to five superordinate levels of manifestation. Development of pathways for future research and recommendations for theoretical and practical perspectives on the use of ASD methodologies.
Lens of Analysis	Critical success factors for ASD success model (Chow & Cao, 2008).
Main Limitations	Only includes IS research, neglects issues of ASD, no empirical verification, inherent limitations of literature reviews such as researcher bias, potential omission of relevant studies and subjective interpretation of statements.

The fourth step entails the extraction, analysis, and synthesis of findings from the literature sample, which consists of 34 relevant articles. This step relies on a systematic coding scheme in line with Gioia et al. (2013) and Wolfswinkel et al. (2013), using three coding steps. Statements from the literature sample on benefits of ASD methodologies are carefully extracted, subsequently aggregated into codes based on conceptual similarity, and lastly allocated to five levels of manifestation. These are the specific entities in ASD projects that profit from a certain benefit, classified using the success factor model by Chow and Cao (2008) with the adapted dimensions of organizational, individual, team, process, and success level business value aspects. This process results in an initial overview of benefits related to ASD, with a subsequent categorization into superordinate benefit aspects, e.g., "employee-wellbeing", "process performance", or "timeliness".

Regarding the main limitations of this approach, Paper I only considers findings from IS research and adopts a primarily positive stance on ASD. Therefore, other relevant research domains, such as SE research, are neglected, while potential issues of ASD also remain unaddressed. These deficiencies are resolved by Paper II, as well as Paper III, which will be explained in the following paragraphs. Table 3.1 on the previous page summarizes the main characteristics of Paper I.

Paper II embraces a central limitation of Paper I, which solely focuses on IS research. At the same time, this study follows a key avenue suggested for future research in Paper I. This suggestion implies investigating the benefits of different ASD practices. Thus, to provide a full perspective of findings on benefits from all relevant research domains on ASD methodologies, Paper II adopts a comprehensive search strategy, as suggested by Paré et al. (2015). Since Paper II is an extension of Paper I, selecting such a review approach that comprehensively integrates prior qualitative and quantitative findings (Paré et al., 2023) seems necessary to systematize the benefits of ASD.

As opposed to Paper I, which follows the suggestions by vom Brocke et al. (2009), Paper II adopts the guidelines by Kitchenham and Charters (2007). All steps in the study selection, quality assessment, data extraction, data synthesis, and the reporting of the review are carefully followed to enable a reproducible procedure. First, an initial study selection is performed using eight databases, i.e., IEEE Xplore, SpringerLink, ACM Digital Library, ScienceDirect, AIS eLibrary, Taylor & Francis, EBSCO Business Source Ultimate, and the Web of Science, which were queried with the same search string as in Paper I. With inclusion criteria (only English publications in journals or conference proceedings, published from 2006-2023 as complete research articles) and exclusion criteria (only articles focusing on ASD methodologies and their benefits), the initial sample is reduced. Next, a title- and abstract-based screening is conducted to limit the number of articles that need to be fully assessed. Paper II also performs a quality assessment to ensure a high-quality sample for the data analysis. The quality appraisal relies on the assessment form by Dybå and Dingsøyr (2008) and only selects studies that were evaluated with at least four out of eight quality points, in line with Hoda et al. (2017). To enable an unbiased selection of articles, the two steps of study selection and quality assessment are performed separately by two researchers, with interrater reliability scores being calculated, i.e., the Cohen's kappa coefficient (Landis & Koch, 1977; Recker, 2021). Based on the sample, forward and backward searches are performed to identify further relevant articles (Wohlin, 2014). In sum, Paper II includes 137 articles.

In analogy to Paper I, Paper II relies on the guidelines for qualitative data extraction, analysis, and synthesis by Wolfswinkel et al. (2013) using a three-step coding procedure with open, axial, and selective coding techniques. Here, statements on the benefits of ASD are extracted and aggregated based on similar conceptual characteristics (open coding), subsequently grouped with

other codes on a higher level (axial coding), before allocating them to one of five levels of manifestation in ASD projects (team and developers, customer, product, process, and financial) (selective coding). The data structure resulting from this qualitative content analysis is then transferred into a classification framework that structures the ASD business value concept and associated benefits.

In the last step, statements are extracted and assessed regarding the specific ASD practices that contribute to a certain benefit that was identified in the previous steps. This analysis relies on the classifications of ASD practices into social/PM and technical/SE practices, e.g., suggested by Gupta et al. (2019), Tripp et al. (2016), or Baham and Hirschheim (2022). The findings are then prepared in a tabular format to determine which type of ASD practice relates to which benefit.

Regarding the limitations of this study, again, only the benefits of ASD are considered. Thereby, potential issues are neglected in Paper II. In addition, the narrative synthesis of beneficial outcomes resulting from each ASD practice cannot establish or prove causality. Instead, it serves as an orientation for future examinations of the benefits resulting from different ASD practices. Departing from the shortcomings of Paper II, Paper III provides a review of the issues that relate to the dark side of ASD. Similarly, Paper IV examines the different benefits of social/PM ASD practices to address another limitation of Paper II. Table 3.2 provides more details of Paper II.

Table 3.2: Characteristics of Paper II

Criteria	**Systematic Literature Review**
	Paper II
Objective	Provide a comprehensive review of findings on the benefits related to the ASD business value concept from all domains contributing to research on ASD methodologies and systematize reported beneficial outcomes of social/PM and technical/SE ASD practices.
Type of Review	Qualitative systematic review
Review Procedure	Three-step procedure for systematic literature reviews in SE research, as suggested by Kitchenham and Charters (2007) for the identification of relevant literature, followed by a qualitative content analysis in line with Wolfswinkel et al. (2013).
Included Databases	IEEE Xplore, SpringerLink, ACM digital library, ScienceDirect, AIS eLibrary, Taylor & Francis, EBSCO Business Source Ultimate and Web of Science.
Search Terms and Search String	(((“agile software development” OR “agile method*” OR “agile practi*” OR (((“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*))
Search Period	2006 to 2023
Inclusion Criteria	Full research articles that report on the benefits of ASD methodologies and ASD practices that appeared to contribute to the observed beneficial outcomes.
Quality Appraisal	Quality assessment with quality criteria derived from Dybå and Dingsøyr (2008), only including studies scoring at least 50% of the awarded quality points (Hoda et al., 2017).
Identified Articles	137 relevant academic research articles.
Review Structuring	Concept-centric classification of benefits into business value categories. Allocation of categories to five superordinate levels of manifestation. Development of a classification framework to structure the ASD business value concept. Systematization of beneficial outcomes of social/PM and technical/SE ASD practices. Development of a comprehensive future research agenda and recommendations for theoretical and practical perspectives on the use of ASD methodologies.
Lens of Analysis	-
Main Limitations	Causality between ASD practices and observed outcomes cannot be confirmed, neglects the issues of ASD, no empirical verification, inherent limitations of literature reviews such as researcher bias, omission of relevant studies and subjective interpretation of statements.

Paper III addresses a main limitation of Paper I and II, which adopted a primarily positive stance on the outcomes related to the business value of ASD methodologies, thereby leaving the potential issues out of scope. Consequently, the goal of Paper III is to complement the findings from Paper I and II with a detailed perspective into the spectrum of issues of the methodologies and to clarify the dark side of ASD. Similar to Paper II, Paper III adopts a comprehensive search strategy to cover findings from all relevant research domains, performs a qualitative systematic review (Paré et al., 2015), and relies on the three-step procedure by Kitchenham and Charters (2007) that is described for Paper II. For the sake of brevity, the steps of this procedure are not reiterated here, as they fully align with the approach of Paper II. Instead, only the main differences between Paper II and Paper III are described. These include the selection of databases, as Paper III also considers findings from the Wiley Online Library, the search period (2006 to 2022 for Paper III), and the fact that Paper III is a single-author study; thus, interrater reliability scores during the study selection and quality assessment could not be calculated. To add, the quality assessment and inclusion/exclusion criteria match those in Paper II. Overall, Paper III relies on a sample of 70 articles.

For the qualitative content analysis of the literature sample, Paper III follows the guidelines by Gioia et al. (2013) to extract, code, and synthesize text statements on issues reported to occur in ASD methodologies. The issues identified in the statements are coded first (open coding), then grouped with similar issues forming a joint issue category (axial coding), and subsequently classified according to six dimensions of an analysis framework adopted from Chow and Cao (2008). Doing so allows for the development of a comprehensive perspective of the issues that were reported in the literature and clarifies what constituents of ASD are particularly negatively affected. To add a further level of depth in the analysis, the study furthermore examines how certain issues identified in the first step seem related to one another. In doing so, the study determines which issues appear to reinforce others, and which issues are particularly influenced by other preceding issues. This relationship analysis leads to the development of a relationship diagram to visualize apparent connections among the identified issues. Thereby, the analysis relies on the extraction of text fragments from the literature sample that state an apparent relationship. For example, Annosi et al. (2020) state that "constant pressure to deliver and the presence of short feedback loops within each work iteration increased the time pressure and the debilitating effects of stress that accompanied it" (p. 68). Here, a relationship between the issue of delivery pressure and the resulting problematic outcome of stress is apparent. Similarly, Hannay and Benestad (2010) illustrate that "volatile and late requirements introduce uncertainty in effort estimates, [which] are perceived to be a direct cause of delays" (p. 6), suggesting a relationship between volatile requirements and delayed deliveries. To ensure validity, only relationships that are identified in at least two separate studies are included in the diagram. Within the relationship diagram, particularly influential as well as comparatively often affected issues are specifically highlighted. Lastly, to emphasize the frequency of identified relationships, the strength of the arrows between the identified issues is varied to distinguish frequent and less common relationships in the issue spectrum.

Regarding the main limitations of this study, the argumentative-deductive relationship analysis cannot provide quantifiable, confirmed causal inferences. Instead, it serves as an orientation for future research efforts that examine the negative outcomes of ASD methodologies. Additionally, the study does not offer mitigation measures to address the identified issues. This shortcoming is subsequently addressed in Paper V. Table 3.3 contains additional characteristics of Paper III.

Table 3.3: Characteristics of Paper III

Criteria	Systematic Literature Review
	Paper III
Objective	Provide a comprehensive review of findings on the issues occurring in ASD that form the dark side of the methodologies and investigate how certain issues appear related to determine particularly critical issues in the spectrum of negative outcomes of ASD.
Type of Review	Qualitative systematic review
Review Procedure	Three-step procedure for systematic literature reviews in SE research, as suggested by Kitchenham and Charters (2007) for the identification of relevant literature, followed by a qualitative content analysis in line with Gioia et al. (2013).
Included Databases	IEEE Xplore, SpringerLink, ACM digital library, ScienceDirect, AIS eLibrary, Taylor & Francis, EBSCO Business Source Ultimate and Wiley Online Library.
Search Terms and Search String	((("agile software development" OR agile method* OR agile practi* OR "agile development" OR "agile information systems development") NOT ("agile manufacturing" OR "agile supply chain" OR "agile engineering" OR "organizational agility")) AND (problem* OR issue* OR downside* OR weakness* OR difficulty OR difficulties OR drawback* OR dark side* OR concern* OR dilemma* OR disadvantag* OR cons OR complication* OR deficiency OR risk* OR challeng* OR stress* OR negative* OR reduc* OR shortcoming* OR obstacle OR headache))
Search Period	2006 to 2022
Inclusion Criteria	Full research articles that report on the issues of ASD methodologies.
Quality Appraisal	Quality assessment with quality criteria derived from Dybå and Dingsøyr (2008), only including studies scoring at least 50% of the awarded quality points (Hoda et al., 2017).
Identified Articles	70 relevant academic research articles.
Review Structuring	Concept-centric classification of issues into joint issue categories. Allocation of issue categories to six superordinate levels of manifestation. Examination of relationships among issues described in the literature and quasi-quantification based on occurrence of identified relationships. Development of propositions on the dark side of ASD and suggestions for future efforts.
Lens of Analysis	Adapted success factor framework by Chow and Cao (2008), with inverted success factor dimensions into issue dimensions of team & developers, process, customers, technical, organizational and non-performance of ASD projects.
Main Limitations	Causality among issues cannot be established solely based on the analysis of statements from the sample and requires a confirmatory analysis, inherent limitations of literature reviews such as researcher bias, particularly due to the single-author nature of this study, omission of relevant studies, and subjective interpretation of extracted statements.

For the last literature-based study, Paper VI adopts a qualitative systematic review (Paré et al., 2015) with a multipronged analysis approach to understand *how* and *when* different outcomes result from the application of ASD, while Paper I-III primarily address the question of *what* this spectrum of outcomes entails. Finding answers to the questions of "how, why and when ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107) requires multiple perspectives on ASD and its associated outcomes. Thus, a multipronged approach with different lenses of analysis appears necessary to manage the complexity of the investigated phenomenon. These lenses include the socio-technical systems theory (Bostrom & Heinen, 1977), the theoretical core concept framework for ASD (Baham & Hirschheim, 2022), and 12 project context factors (Clarke & O'Connor, 2012; Hoda et al., 2010; Kruchten, 2011). All lenses of analysis are described in the following.

In analogy to most other literature reviews in this dissertation, Paper VI relies on the guidelines by Kitchenham and Charters (2007) for the literature search and selection of relevant articles. As Paper VI focuses on both the benefits as well as the issues of ASD methodologies, two separate searches are performed using the search strings in Table 3.4. The employed databases include IEEE Xplore, SpringerLink, ACM Digital Library, ScienceDirect, AIS eLibrary, Taylor & Francis, EBSCO Business Source Ultimate, Wiley Online Library, and the Web of Science. To keep

the description short, the individual steps of the process behind the search and selection are not reiterated here, as they match all the procedures of Paper II and Paper III. Overall, Paper VI identifies 77 relevant articles on the benefits and 45 articles on the issues of ASD methodologies.

The multipronged literature analysis approach consists of six individual steps. First, text fragments describing benefits or issues of ASD are extracted from the literature sample. Second, these text fragments are coded with open coding techniques (Saldaña, 2021) to determine benefits and issues. The third step relies on the dimensions of the socio-technical systems theory (Bostrom & Heinen, 1977), i.e., actors, structure, technology, and task. Here, benefits and issues affecting the social component of ASD are allocated to the actors and structure dimensions, while outcomes that concern the technical side of ASD are assigned to the technology and task dimensions. Doing so allows to determine which constituent of ASD is particularly affected by a certain identified outcome. In the fourth analysis step, all text fragments on the outcomes are interpreted regarding the central characteristic(s) of agility that contributed to their occurrence. This analysis step employs the four theoretical core concepts of incremental design and iterative development (ID2), inspect and adapt cycles (IA), working cooperatively/collaboratively/in close communication (WC), and continuous customer involvement (CCI), embedded in the proposed agility framework by Baham and Hirschheim (2022). Subsequently, the frequencies of identified relationships between an outcome and the core concept(s) that contribute to it are calculated, with the scores being visualized with stacked bar plots using the R-package ggplot2. This approach intends to gain an understanding of which core characteristic of agility in ASD methodologies contributes to which outcome. Note that such a quasi-quantitative approach only allows for limited inferences of relationships (Paré et al., 2015). Still, it can serve as a foundation for studies to investigate and confirm relationships among the core concepts of agility in ASD and its outcomes in future efforts.

For the last step, the analysis utilizes 12 contextual factors derived from Clarke and O'Connor (2012), Hoda et al. (2010), and Kruchten (2011), see Section 2.4, to determine an ideal contextual setting for ASD projects, i.e., an "agile sweet spot" (Kruchten, 2011, p. 355). To conceptualize this sweet spot, different manifestation forms of the contextual factors are defined. For example, for the factor of project distribution, the nuances of co-located, partly distributed, and fully distributed are determined. Based on the context descriptions extracted from the selected studies, the specific characteristics of their contextual setting, and whether they reported benefits and issues in relation to the manifestation forms of the examined contextual factors, an ideal sweet spot for ASD methodologies is derived. The analysis results are subsequently transferred into a sweet spot model that highlights ideal contexts for ASD and points out contextual settings as well as manifestation forms that should be avoided due to their problematic nature.

For the main limitation of this type of study, a causality between ASD core concepts and outcomes cannot be confirmed, as the relationships are qualitatively derived from the literature. Similarly, the proposed sweet spot model for ASD methodologies requires empirical validation, as the beneficial nuances of contextual factors that define an ideal setting are based on a qualitative interpretation of prior findings. Still, the selected multipronged analysis approach allows for detailed insights into *how* and *when* ASD methodologies deliver certain outcomes, which are to be confirmed in future research. Table 3.4 on the next page offers further characteristics of Paper VI.

Table 3.4: Characteristics of Paper VI

Criteria	Systematic Literature Review
	Paper VI
Objective	Investigate how central characteristics of agility in ASD methodologies, embedded in the four theoretical core concepts, contribute to both benefits as well as issues and examine how an ideal contextual setting for ASD projects is characterized.
Type of Review	Qualitative systematic review
Review Procedure	Three-step procedure for systematic literature reviews in SE research, as suggested by Kitchenham and Charters (2007) for the identification of relevant literature, followed by a multipronged qualitative content analysis approach using the three lenses of analysis below.
Included Databases	IEEE Xplore, SpringerLink, ACM digital library, ScienceDirect, AIS eLibrary, Taylor & Francis, EBSCO Business Source Ultimate, Wiley Online Library and the Web of Science.
Search Terms and Search String	Main search string: ((“agile software development” OR agile method* OR agile practi* OR “agile development” OR "agile information systems development") NOT (“agile manufacturing” OR “agile supply chain” OR “agile engineering” OR “organizational agility”)) AND (string on benefits OR string on issues) Search string component on benefits: (“business value” OR “valu*” OR benefi* OR advantage* OR perform* OR achiev* OR profit* OR increase* OR success* OR accept* OR adoption* OR gain) Search string component on issues: (problem* OR issue* OR downside* OR weakness* OR difficulty OR difficulties OR drawback* OR dark side* OR concern* OR dilemma* OR disadvantag* OR cons OR complication* OR deficiency OR risk* OR challeng* OR stress* OR negative* OR reduc* OR shortcoming* OR obstacle OR headache)
Search Period	2006 to 2023
Inclusion Criteria	Full research articles that report on benefits or issues of ASD methodologies.
Quality Appraisal	Quality assessment with quality criteria derived from Dybå and Dingsøyr (2008), only including studies scoring at least 50% of the awarded quality points (Hoda et al., 2017).
Identified Articles	122 relevant academic research articles (77 on benefits, 45 on issues).
Review Structuring	Open coding of statements from the literature to identify benefits and issues. Allocation of benefits/issues to the four dimensions of the socio-technical systems theory. Analysis of the causal role of the four theoretical core concepts of agility for the outcomes. Calculation of frequency of relationships and visualization via ggplot2. Context factor analysis and reconceptualization of the “agile sweet spot” (Kruchten, 2011). Definition of a research agenda for future efforts on ASD’s outcomes.
Lens of Analysis	Four dimensions of the socio-technical systems theory (Bostrom & Heinen, 1977). Theoretical core concept framework for agility in ASD (Baham & Hirschheim, 2022). 12 context factors (Clarke & O’Connor, 2012; Hoda et al., 2010; Kruchten, 2011).
Main Limitations	Causality between the core concepts of agility in ASD and outcomes cannot be fully established with a solely literature-based approach and requires a confirmatory study in the future, inherent limitations of literature reviews such as researcher bias, potential for omission of relevant studies and subjective interpretation of statements.

3.3 Qualitative Research: Semi-structured Expert Interviews

Qualitative interviews represent a common technique to acquire data on a phenomenon of interest in qualitative research (Myers & Newman, 2007). Conducting qualitative interviews involves an interviewer seeking to obtain in-depth insights from “key informants, subjects whose positions in a research setting give them specialist knowledge about other people, processes, events, or phenomena that are relevant to the research” (Recker, 2021, p. 117). These interviews can be structured, semi-structured, or unstructured (Bhattacherjee, 2012), with semi-structured interviews being the most frequently employed type in IS research (Myers & Newman, 2007). Semi-structured interviews rely on a predefined protocol to guide the interview and to ensure that a consistent set of questions is asked (Bhattacherjee, 2012). At the same time, this allows for some “flexibility to

probe for details" (Recker, 2021, p. 118), thereby adding a further level of depth to the inquiry. Furthermore, interviews can be descriptive, exploratory, or explanatory (Bhattacherjee, 2012; Recker, 2021). Especially descriptive interviews enable researchers to obtain "a rich description of a phenomenon as perceived by the interviewees" (Recker, 2021, p. 117), with multiple perspectives that can be aggregated through analysis techniques to generate new conceptualizations of the focal topic. Since this type of research primarily relies on "individual people as the unit of analysis" (Bhattacherjee, 2012, p. 82), similar to quantitative surveys, expert interview studies represent a cross-sectional qualitative analysis technique (Wilde & Hess, 2007).

While virtually any individual can act as an informant in interviews, experts or "key informants are particularly valuable sources of information" (Recker, 2021, p. 117) to investigate a phenomenon of interest. As such, experts possess "technical, process and interpretative knowledge that refers to a specific field of action, by virtue of the fact that the expert acts in a relevant way (for example, in a particular organizational field or the expert's own professional area)" (Bogner et al., 2009, p. 54). Conducting interviews with experts or key informants specifically targets this knowledge advantage that they have (Meuser & Nagel, 2002), which distinguishes them from regular informants, who lack expertise in a given subject matter. Thus, with the help of experts in qualitative interviewing, profound insights into an examined topic can be obtained, e.g., to advance theory development or to understand the phenomenon in question in greater depth.

Besides these strengths and preferable advantages, qualitative interviews are also subject to several limitations and potential pitfalls (Myers & Newman, 2007). These include, among others, artificial interview situations, a lack of trust between interviewer and interviewee, and potentially misunderstood questions (Myers & Newman, 2007). Further concerns comprise limited generalizability, inaccurate statements, recall issues, as well as potential researcher subjectivity (Recker, 2021), biased interviewees, and the time- and resource-intensive execution of interviews (Bhattacherjee, 2012). Therefore, it is necessary to follow established guidelines to ensure rigor when conducting qualitative interviews and enable the derivation of reliable findings (Recker, 2021). These include, for instance, the utilization of an interview protocol that adheres to specific rules when formulating the questions (Bhattacherjee, 2012). To add, representing a variety of voices in the sample, reducing social dissonance and making interviewees feel comfortable during the interview, being flexible when asking questions, mirroring the way interviewees express themselves, and ensuring confidentiality of records (Myers & Newman, 2007) is recommended. Thus, despite interviews being a qualitative research technique with an inherently higher degree of subjectivity compared to quantitative methods (Recker, 2021), when following the abovementioned guidelines, qualitative interviews are an effective instrument to explore complex and emergent phenomena.

In this dissertation, Paper V conducts a semi-structured expert interview study (Bogner et al., 2009) that adopts the guidelines by Myers and Newman (2007). This study examines the consequences of key issues that negatively affect the delivery of business value in ASD methodologies. The study furthermore investigates how practitioners mitigate these issues with measures to sustain business value delivery. From a methodological standpoint, conducting a qualitative interview study seems appropriate, since prior literature only identifies which issues generally occur in ASD, for instance, Paper III, or Alahyari et al. (2017), who only mention certain barriers that can affect business value delivery, without providing insights into the consequences for the delivered business value. Also, identifying applicable adaptation measures to mitigate typical problems in practice represents an objective for which qualitative interviewing is particularly suitable

(Seaman, 1999). Therefore, an interview study with ASD experts who experience such issues in practice and need to find ways to mitigate them to sustain business value delivery appears adequate to generate further knowledge in this regard. As its conceptual foundation, the study adopts prior insights on the dark side of ASD from Paper III. It focuses on six key issues (delivery pressure, lacking customer involvement, meeting overhead and interruptions, required rework, technical debt, and volatile and unclear requirements) that seem critical due to their influence on other issues or their frequency in the literature. Therefore, Paper V is a follow-up study of Paper III.

The first step entails the development of an interview protocol to guide the interviews, following the suggestions by Bhattacherjee (2012). This interview protocol is divided into three subsections. In the first section, general information about the experts is inquired, which includes the role of the expert, country, industry, experience with ASD, number of employees in the organization, and applied ASD methodologies. In the second section, questions about the consequences of the six issues for business value delivery are asked. The third and final section asks about the measures that practitioners adopted to successfully mitigate the issues and to sustain business value delivery. The interview protocol can be accessed via the link provided in the footnote[1].

In the second step, for the recruitment of experts, a combination of purposive (expert) and convenience sampling is applied (Bhattacherjee, 2012; Kitchenham & Pfleeger, 2002; Palinkas et al., 2015). Doing so enables a targeted selection of adequate experts with knowledge in the field of ASD, while also ensuring a manageable recruitment with regard to availability. The target group includes software developers, coaches, Scrum Masters, Product Owners, or other informants with expertise in the context of ASD methodologies. The experts are recruited via LinkedIn or referred after an interview by the respective interviewee, also known as snowball sampling (Bhattacherjee, 2012; Kitchenham & Pfleeger, 2002). In total, 19 experts from seven countries are recruited.

The third step entails the execution of the interviews and the collection of data. The interviews are performed online using Microsoft Teams and recorded with the consent of the experts. Using the recording file, all interviews are transcribed into a textual format and translated into English.

In the fourth step, the collected data is analyzed following the suggestions for qualitative data analysis by Saldaña (2021) and Kuckartz (2018) by performing a three-step analysis procedure using inductive and deductive techniques. For the first part of the analysis, different consequences of the six investigated issues for business value delivery stated in the interviews are derived from the data using the tool MAXQDA 2024. Subsequently, these statements are coded with open coding techniques (Saldaña, 2021) and allocated to the issue that caused the consequence. Based on these defined codes for consequences, joint categories are formulated that imply similar consequences. For the second analysis step, the measures applied by the experts to mitigate the examined issues are extracted from the statements, then coded, and subsequently grouped with conceptually similar measures in joint categories. Finally, the findings are prepared and the procedure is documented (Kuckartz, 2018). During the analysis procedure, a code book is created, which continuously evolves with the analysis steps (Reyes et al., 2021). This codebook can be accessed via the link[1] below and is included in the supplementary material. As a result of the qualitative analysis, 34 business value-reducing consequences and 48 practicable measures to mitigate the six investigated issues are presented in a tabular format.

[1] https://doi.org/10.6084/m9.figshare.28190441

The limitations of the selected research approach in Paper V include, besides those described before, a limited generalizability of findings from interview studies (Recker, 2021). The generalizability may be further affected by a potential regional bias, as most participants stem from the DACH region (Germany, Austria, and Switzerland). The study partly addresses these generalizability concerns by also interviewing experts from other regions, finding comparable statements. To avoid concerns related to construct validity and reliability in the analysis (Runeson & Höst, 2008), the data is coded separately to enable unbiased interpretations. Potential misinterpretations of statements are avoided via member checking, which further contributes to the validation of the findings (Birt et al., 2016). Together, these and other measures help to ensure a reliable derivation of insights from the collected qualitative data. Table 3.5 features all characteristics of Paper V.

Table 3.5: Characteristics of Paper V

Criteria	**Qualitative Interview Study**
	Paper V
Objective	Examine how practitioners address typical issues in ASD methodologies that affect the delivery of business value with practicable measures and assess the consequences of these typical issues for a continuous business value delivery if they are not adequately mitigated.
Data Source	19 interviews with experts from the ASD methodology domain
Interview Method	Semi-structured expert interviews
Interview Instrument	Semi-structured interview protocol with three sections
Interview Setting	Online, recorded with Microsoft Teams, 32 to 58 minutes in duration, average 43 minutes.
Sampling Strategy	Both purposive and convenience sampling, recruited via LinkedIn, or through referrals.
Theoretical Foundation	Six key issues identified in Paper III (delivery pressure, lacking customer involvement, meeting overhead and interruptions, required rework, technical debt, and volatile and unclear requirements), corroborated by barriers to value creation in Alahyari et al. (2017).
Explored Themes	Typical issues of ASD methodologies and consequences for the delivery of business value. Measures applied by experts to address typical issues and to sustain business value delivery.
Control Variables	Role of expert, country, industry, experience with ASD, number of employees in the organization and applied ASD methodologies.
Data Analysis Techniques	Qualitative content analysis with three inductive and deductive analysis steps, following recommendations by Saldaña (2021) and Kuckartz (2018).
Analysis Tool	MAXQDA 2024
Quality Assurance	Separate analysis and coding of data by two authors and additional participant validation.
Main Limitations	Subjective interpretation of the statements, potential issues with translation, generalizability concerns due to a potential regional bias as participants mainly stem from the DACH region, and further inherent limitations of the selected research approach, such as contextual specificities that cannot be captured and the inability to verify claims by the interviewees.

3.4 Quantitative Research: Multiple Regression Analysis

Multiple regression analysis is a multivariate quantitative data analysis technique that investigates relationships between several independent variables and a single dependent variable (Hair et al., 2009). This type of analysis examines how changes in the independent variables influence the dependent variable, allowing researchers to "describe and explain relationships between variables" (Backhaus et al., 2021, p. 58), "predict or estimate the values of a dependent variable" (ibid., p. 58), and thereby draw conclusions about cause-and-effect mechanisms. For multiple regression, a linear relationship among these variables is hypothesized, while other forms of regression, such as polynomial regression analysis, focus on curvilinear relationships (Hair et al., 2009). These are not in the focus of this dissertation, however. Multiple regression relies on metric (i.e.,

continuous) empirical data (Backhaus et al., 2021), for instance, acquired through surveys, observations, or experiments. Consequently, regression analysis is a valuable tool to confirm or reject developed hypotheses about relationships among variables in a real phenomenon using empirical data. This technique also falls in line with the hypothetico-deductive scientific process that quantitative methods are associated with (Recker et al., 2017). Furthermore, regression analysis can also be used in an exploratory fashion, see for example, Chow and Cao (2008), who study the influence of critical success factors on perceived success of ASD methodologies. Another example is Paper IV, which explores how different social/PM ASD practices influence beneficial outcomes. The process behind the multiple regression analysis performed in Paper IV is outlined in the following and adopts the recommendations by Hair et al. (2009).

In the first step of multiple regression analysis, the "appropriateness of the research problem" (Hair et al., 2009, p. 166) to be investigated is assessed. Following the proposed research model in Paper IV, an examination of how the realization of social agile principles, such as communication, self-organization, business-IT alignment, and reflection, depends on the application of social/PM ASD practices, represents a typical dependence relationship research problem that can be investigated with multiple regression analysis (Hair et al., 2009). This also holds true for examining how these principles influence different dimensions of success in ASD, e.g., developer or economic benefits. The first step also involves defining the dependent and independent variables in the investigated relationship (Hair et al., 2009). As Paper IV first investigates relationships among social/PM ASD practices and social principles, followed by a second analysis of how social agile principles influence outcomes, the independent variables in the first step are the social/PM ASD practices daily meetings, retrospective meetings, pair programming, co-location and shared leadership. The dependent variables are the social agile principles of communication, self-organization, business-IT alignment, and reflection. For the second analysis, these social agile principles represent the independent variables, where the dependent variables include satisfaction, compatibility, and complexity for developer benefits. Productivity, requirement correctness, lead time, and timeliness, meanwhile, entail the economic benefits affected by the included independent variables. Based on the generic formula of a regression model (Backhaus et al., 2021), which is defined as $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_J X_J + \varepsilon$, where Y represents the dependent variable, X_J implies the independent variables in the model, β_0 symbolizes the intercept, β_J expresses the standardized regression coefficients of the independent variables, and ε shows the error term as the disturbance in the model estimated (Backhaus et al., 2021), two regression models are defined:

- *Social agile principle$_j$ = f (daily meetings, retrospective meetings, pair programming, co-location, shared leadership)* and:
- *ASD success dimension$_j$ = f (communication, self-organization, business-IT alignment, reflection)*

The second step entails the definition of a study sample that is of substantial size to allow for the derivation of reliable results, with preferably more than 100 observations and a "minimum ratio of observations to variables [of] 5:1" (Hair et al., 2009, p. 173). To obtain a representative sample, surveys are a common technique, which collect "data about a population from a random sample of that population through questionnaire-type instruments" (Recker, 2021, p. 101). Paper IV relies on a survey using a questionnaire with items that were derived from prior literature together with newly defined items. To operationalize the constructs (i.e., social/PM ASD practices, agile principles, and success dimensions), a 7-point Likert scale is used (Hair et al., 2009; Likert, 1932).

Since the items need to adequately measure the investigated constructs, reliability scores are obtained via the calculation of Cronbach's Alpha values for internal consistency (Recker, 2021). Most constructs are measured above the recommended threshold of 0.70 (Nunnally, 1978), with one construct (lead time, $\alpha = 0.67$) still above the "lower limit of acceptability" (Hair et al., 2009, p. 91). Note that most constructs rely on multi-item scales, while for the social/PM ASD practices, a single-item scale is employed, which can be considered "as predictively valid as multi-item measures" (Bergkvist, 2014, p. 245). The survey is administered via LimeSurvey and advertised via LinkedIn as well as the chair's homepage for 18 months. The survey instrument can be accessed in German[2] as well as in English[3] via the links in the footnote. In sum, 235 responses are collected, of which 197 are included in the multiple regression analysis procedure. The sample thus meets the previously described minimum sample size of at least 100 cases for effective regression analysis and the ratio of 5:1 between observations and variables (Hair et al., 2009).

For the third step, several assumptions of multiple linear regression models must be fulfilled. Among others, these include "linearity of the phenomenon measured, […] constant variance of the error terms, […], independence of the error terms, […], [and] normality of the error term distribution" (Hair et al., 2009, p. 179). Residual scatter plots and normal probability plots can help to identify violations of these assumptions (Backhaus et al., 2021), which are all fulfilled by Paper IV. To account for unequal variances, i.e., heteroscedasticity (Hair et al., 2009), Paper IV employs a robust sandwich estimator technique (HC3) recommended by Hayes and Cai (2007), thereby contributing to the robustness of the estimation in the fourth step. As another assumption, multicollinearity must be evaluated, which suggests that "there must not be a linear relationship between the regressors" (Backhaus et al., 2021, p. 109), i.e., the independent variables. This assumption can be checked via variance inflation factor (VIF) analysis, where VIF values for each variable should be below the threshold of $VIF < 10$ (Hair et al., 2009). In Paper IV, no issues with multicollinearity are detected, thus allowing for the execution of multiple regression analysis.

The fourth step entails the estimation of the regression model and the subsequent evaluation of the goodness of fit (Hair et al., 2009). Several estimation techniques exist to estimate the relationships between the investigated variables, with the ordinary least squares (OLS) estimation approach as the most widely applied method (Backhaus et al., 2021) that is also used in Paper IV. Here, OLS regression first examines how the application of social/PM ASD practices contributes to the realization of social agile principles. Secondly, it assesses how these social agile principles contribute to developer or economic benefits. As stated before, a robust sandwich estimator (HC3) was used in STATA to address heteroscedasticity (Hayes & Cai, 2007). To assess the predictive accuracy of the different models, the adjusted coefficient of determination R^2 is reported (Hair et al., 2009). R^2 ranges from values of zero to one and indicates the "total variation in *Y* that is explained by the independent variables, [i.e.,], the higher [R^2], the better the fit" (Backhaus et al., 2021, p. 78). Following Cohen (2013) for the interpretation, $R^2 < 0.02$ suggests small effect sizes ($f^2 = 0.02$), $R^2 < 0.13$ ($f^2 = 0.15$) indicates medium-sized effects, while $R^2 < 0.26$ ($f^2 = 0.35$) represents large effect sizes with regard to the predictive power of the model. Besides reporting the goodness of fit, the standardized beta-coefficients of each independent variable ($\beta_i X_J$) and their alpha-significance levels, also known as p-values, are interpreted (Backhaus et al., 2021). Interpreting and comparing the standardized beta-coefficients of independent variables allows "to reflect the relative impact on the dependent variable of a change in one standard deviation in

[2] German survey instrument: https://doi.org/10.6084/m9.figshare.16988395
[3] English survey instrument: https://doi.org/10.6084/m9.figshare.16988893

either variable" (Hair et al., 2009, p. 196), e.g., how strong different social/PM ASD practices contribute to the realization of a social agile principle or a benefit of ASD. Meanwhile, assessing the alpha-significance level via the p-value allows to determine the significance of examined relationships between independent and dependent variables, with p-values < 0.05 indicating a significant relationship (Backhaus et al., 2021). Lastly, the results are prepared in a tabular format.

Concerning potential limitations of the selected research approach and the survey itself, as multiple regression analysis is a cross-sectional quantitative analysis method (Wilde & Hess, 2007), establishing causality among social/PM ASD practices, social agile principles, and beneficial outcomes can be difficult. Furthermore, while the sample size of 197 responses can be considered sufficiently large (Hair et al., 2009), larger sample sizes would be preferable. Also, most participants stem from the DACH region (Germany, Austria, and Switzerland), which may introduce a regional bias into the findings. Other limitations include the specific focus on social/PM ASD practices, which omits potentially applied technical/SE ASD practices that may have also contributed to the observed beneficial outcomes. Still, this study can provide an initial starting point of insights into how social/PM ASD practices contribute to the benefits of ASD methodologies, to be extended by future research efforts. Table 3.6 features further characteristics of Paper IV.

Table 3.6: Characteristics of Paper IV

Criteria	**Quantitative Multiple Regression Analysis Study**
	Paper IV
Objective	To examine how social/PM ASD practices influence social agile principles and determine how these social agile principles contribute to developer benefits and economic values.
Data Source	Survey study with 235 responses, of which 197 were included in the analysis.
Data Acquisition	LimeSurvey, survey shared via E-Mail, LinkedIn, and chair homepage.
Survey instrument	7-point Likert scale-based questions with multi-item measures for social agile principles and ASD success dimensions, combined with 7-point Likert scale-based questions using single-item measures for the applied social/PM ASD practices.
Research Model	Information systems development success model (Siau et al., 2010)
Data Analysis Techniques	2-step multiple linear regression analysis (Backhaus et al., 2021; Hair et al., 2009) using OLS estimation with a robust sandwich estimator (HC3), as suggested by Hayes and Cai (2007).
Dependent Variable(s)	Step 1: social agile principles (communication, self-organization, business-IT-alignment, reflection) Step 2: ASD success dimensions (developer benefits along satisfaction, compatibility and complexity, economic values along productivity, requirement correctness, lead time and timeliness)
Independent Variables	Step 1: social agile practices (daily meetings, retrospective meetings, pair programming, co-location and shared leadership) Step 2: social agile principles (communication, self-organization, business-IT-alignment, reflection)
Control Variables	Age, gender, project distribution and team size.
Analysis Tool	STATA
Main Limitations	Limited set of success criteria investigated, small sample size with potential regional bias, and cross-sectional-single-informant study design only allows for limited causal inference.

4 Main Research Results

This cumulative dissertation includes six research papers that investigate the benefits related to the business value of ASD methodologies, the issues that form their dark side, and the mechanisms behind these different outcomes. The dissertation is divided into three parts, each addressing the research questions related to the overarching objective of their respective section. Part I features three papers, with Paper I and II reviewing literature on the benefits of ASD methodologies and the different practices contributing to these beneficial outcomes. Paper III reviews prior findings on the frequently neglected issues of the methodologies to provide a dual-sided, balanced perspective on ASD's outcomes. Paper I, II, and III thereby address the first research question. Part II contains two empirical studies (Paper IV and V), with Paper IV first focusing on social/PM ASD practices and their role in achieving different benefits related to the business value of ASD methodologies. Additionally, mitigation measures that practitioners adopt to overcome typical issues encountered in daily practice, which imply negative consequences for the delivery of business value, are examined (Paper V). These two studies address the second and the third research question. Lastly, Part III is based on a literature-based study that investigates how the core characteristics of agility in ASD methodologies relate to different benefits and issues, while also shedding light on the important role of contextual factors in ASD projects (Paper VI). This part provides answers to the fourth and the fifth research question. In the following, the main findings of each paper included in this dissertation and their contributions to the research questions are outlined. Figure 4.1 summarizes the investigated aspects of ASD methodologies and the central insights contributed by the six papers.

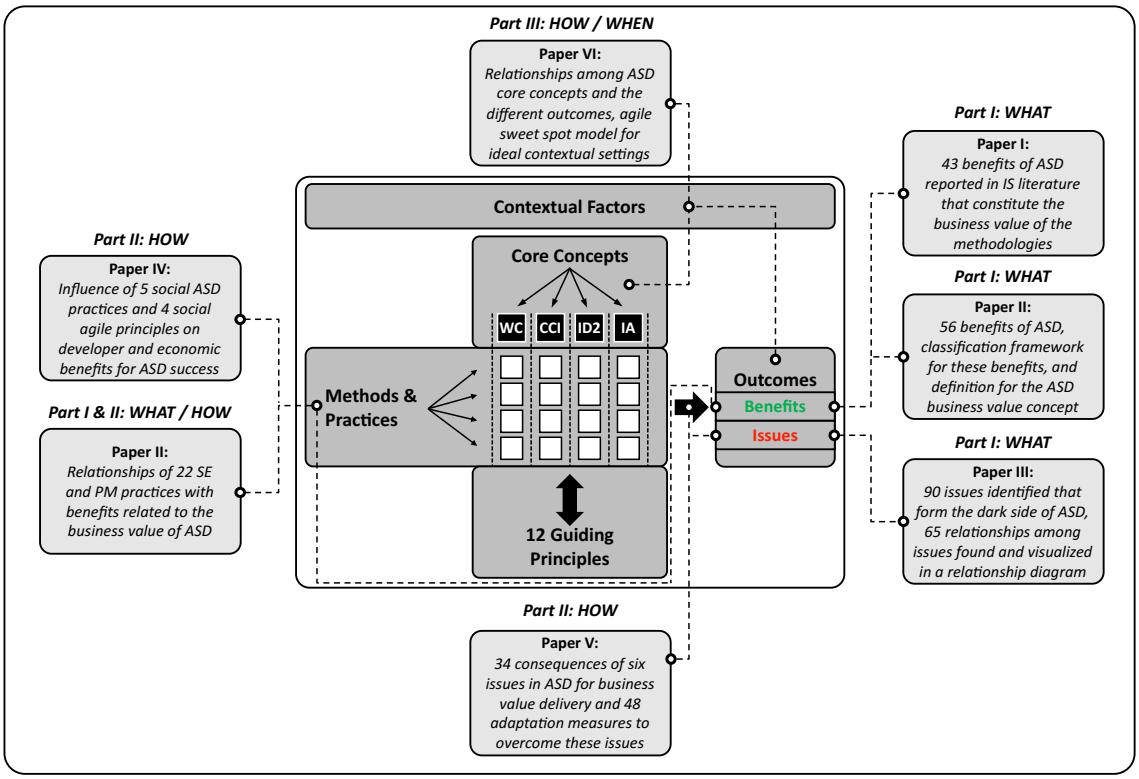

Figure 4.1: Aggregated Overview of Findings from the Six Papers in this Dissertation

4.1 Paper I: IS-focused Literature Review on the Business Value of ASD Methodologies[4]

The objective of Paper I is to provide an initial perspective on the business value concept of ASD methodologies by reviewing and synthesizing prior findings on their benefits. Thus far, business value in the specific context of ASD has mostly remained vague and inconclusive, as "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" (Alahyari et al., 2017, p. 272). Additionally, while business value has been thoroughly defined in related IS literature and is often viewed from a mostly economic-financial standpoint (Schryen, 2013), the business value of ASD methodologies is considered to be "not only dollars" (Racheva et al., 2010, p. 131). However, the specific benefits that constitute the concept still remain to be clarified. Providing such clarity appears vital, though, since ASD methodologies are introduced in organizations to achieve certain benefits and need to prove their worth. In addition, establishing a consolidated perspective on the concept would enable future research efforts on ASD to clearly specify what business value entails in their respective studies and allow for more consistent, as well as comparable, assessments of the beneficial outcomes. Thus, developing an initial overview of the benefits of ASD methodologies and assessing the current state of knowledge on the concept in the IS domain is an important step to guide future studies, as well as practitioners, and lay the foundation for other studies in this dissertation.

In line with the review approach suggested by vom Brocke et al. (2009), this systematic literature review assesses 34 articles from the IS literature that illustrate beneficial outcomes resulting from the use of ASD methodologies. It identifies 43 distinct benefits that are classified into 14 superordinate business value categories, which relate to five dimensions of manifestation, according to the employed lens of analysis by Chow and Cao (2008). In so doing, Paper I structures the benefits that primarily affect the team and individual developers, the development process, the organization itself, and different aspects of success, e.g., product quality or timeliness. Table 4.1 summarizes the most frequently identified benefits in the literature review in an aggregated fashion, extracted from the comprehensive overviews in Paper I and sorted by their frequency of occurrence.

The analysis of extant literature and the concept-oriented classification of findings that follows Gioia et al. (2013) and Wolfswinkel et al. (2013) shows that a broad spectrum of distinct benefits has been identified in prior research. For each of the five levels of manifestation of benefits (except organization), three or more specific superordinate categories are identified, suggesting that not only the spectrum of benefits is generally multifaceted, but also the way these benefits affect the constituents of ASD projects largely varies. As such, improvements in *employee wellbeing*, *job perception*, and *motivation* are found as primary benefit categories for the individual developers, while the team particularly profits from *improved team interactions* and *cohesiveness*, as well as improvements in *capability building*. Concerning the SD process, ASD is found to facilitate improved *process flexibility* and *performance*, while reducing overall *complexity*. Regarding the development success realizable with ASD methodologies, improvements in *timeliness*, *product quality*, *customer demand fulfillment*, and in a few instances, *on-budget delivery* are identified.

[4] Meckenstock, J.-N., Hirschlein, N., Schlauderer, S., & Overhage, S. (2022). The business value of agile software development: Results from a systematic literature review. *ECIS 2022 Proceedings*, Timisoara, Romania. https://aisel.aisnet.org/ecis2022_rp/24

Table 4.1: Aggregated Findings on Benefits Identified in Paper I

Identified Benefit of ASD	Superordinate Value Category	Level of Manifestation	Exemplary Contributions	∑
Improved Team Collaboration	Interactions	Team	Cao and Park (2017) Vidgen and Wang (2009)	**13**
Better Customer Requirements Meeting	Customer Demand Fulfillment	ASD Success	Anderson et al. (2017) Vidgen and Wang (2009)	**12**
Improved Employee Satisfaction	Employee Wellbeing	Individuals	Fitzgerald et al. (2006) Tripp et al. (2016)	**11**
Improved Communication	Interactions	Team	McHugh et al. (2011a) Hummel and Epp (2015)	**11**
Improved Team Knowledge Dissemination	Capability-Building	Team	Balijepally et al. (2014) Fruhling and Vreede (2006)	**9**
Improved Overall Software Quality	Product Quality	ASD Success	Balijepally et al. (2014) Fruhling and Vreede (2006)	**9**
Reduced Time to Market	Timeliness	ASD Success	Gerster et al. (2018) Karrenbauer et al. (2019)	**7**
Continuous Process Refinement	Process Flexibility	Process	Balijepally et al. (2014) Rodríguez et al. (2014)	**6**
Increased Employee Motivation and Engagement	Employee Wellbeing	Individuals	Cao and Park (2017) Elbanna and Murray (2009)	**5**
Improved Team Cohesion	Capability-Building	Team	Balijepally et al. (2014) Fruhling and Vreede (2006)	**5**
Improved Responsiveness to Requirements Change	Process Flexibility	Process	Balijepally et al. (2014) Karrenbauer et al. (2019)	**5**
Increased Efficiency	Process Performance	Process	Karrenbauer et al. (2019) Fitzgerald et al. (2006)	**5**
Reduced Work Exhaustion	Employee Wellbeing	Individuals	Ghobadi and Mathiassen (2016) Venkatesh et al. (2020)	**4**
On-Budget Delivery	Cost	ASD Success	Lee and Xia (2010) Parsons et al. (2008)	**3**

In more detail, the most frequently identified benefits relate to the team and individuals, followed by the benefits that concern the success of ASD projects. As such, especially improvements in *employee satisfaction* (n=11), *team collaboration* (n=13), as well as *communication* (n=11), and *knowledge dissemination* (n=9) underscore that ASD methodologies emphasize "individuals and interactions" (Beck et al., 2001), as proclaimed in the Agile Manifesto. Other prominent benefits include a better *meeting of customer requirements* (n=12), *higher software quality* (n=9), and *reduced time to market* (n=7). These benefits suggest that delivering high-quality software within short time frames to the customer, as is, for instance, prescribed in the Scrum Guide (Schwaber & Sutherland, 2020), represent similarly proven beneficial outcomes of ASD methodologies. Meanwhile, benefits concerning the overall development costs (i.e., *on-budget delivery*) are only rarely reported (n=3). Further insights, including a concept-centric classification of the findings, can be found in the supplementary material file, which is accessible via the link in the footnote[5].

Overall, the literature review shows that viewing the business value of ASD methodologies from a solely financial perspective does not represent the actual potential for value creation. Instead, business value in the context of ASD is a multidimensional concept with beneficial outcomes for a wide range of constituents that can profit from the use of ASD methodologies. Consequently, Paper I underlines that "business value is more than just numbers" (Racheva et al., 2010, p. 141).

[5] https://doi.org/10.6084/m9.figshare.19403489

Also, the identified benefits all seem to jointly contribute to the overall success of ASD, since improvements for some constituents, such as the developers or the team, then seem to lead to beneficial outcomes for the resulting success. As an example, Elbanna and Murray (2009) describe that through enhanced business-IT alignment, achieved with the use of ASD, the "business ability to innovate and to extend the system to cover more business processes and departments" (p. 11) was improved, which contributes to an overall higher innovativeness of organizations. Furthermore, Paper I observes relationships between specific applied ASD practices and resulting beneficial outcomes. In this vein, refactoring contributes to code improvements (Fitzgerald et al., 2006), testing positively affects defect density (Fitzgerald et al., 2006), while daily and retrospective meetings foster improved communication and trust within the SD team (Hummel et al., 2015; McHugh et al., 2011a). While Paper I did not specifically inquire about such relationships, this observation falls in line with Racheva et al. (2009), questioning whether any relationships exist between ASD practice use and the resulting business value. As these relationships are not clarified by Paper I due to a different focus of the study, doing so is suggested as an opportunity for future research. Lastly, to combine the observations of Paper I regarding the multidimensionality of the business value concept, the interplay of the identified benefits, and their relationships with ASD practices, an ASD business value creation model is proposed in Figure 4.2 to guide future efforts.

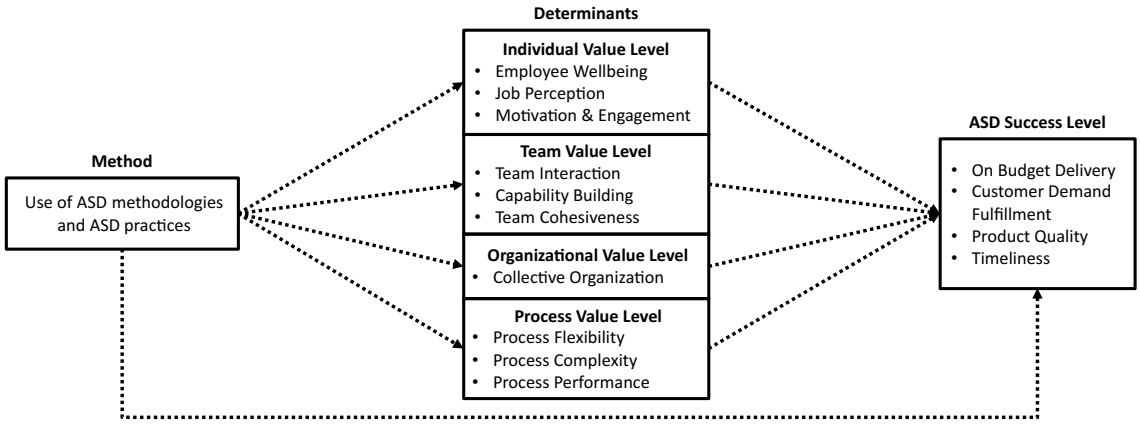

Figure 4.2: ASD Business Value Creation Model

In conclusion, Paper I provides an initial perspective on the benefits associated with the business value concept in the context of ASD methodologies by summarizing extant findings from the IS research domain. In doing so, Paper I contributes towards addressing the first research question, i.e., providing insights into the beneficial side of the outcome spectrum of ASD. Paper I also shows that IS research has made significant progress in investigating various benefits of ASD methodologies. Here, especially benefits related to *product quality*, *timeliness*, *team interactions*, and *employee wellbeing* highlight that business value in ASD extends beyond solely financial outcomes, which separates it from the traditional IS perspective on the concept of business value. However, while Paper I offers an initial perspective, investigations into how different ASD practices contribute to the business value concept and extending the literature coverage to other domains are aspects that still need to be addressed to develop a more comprehensive understanding. As a last aspect, extending the perspective on the outcomes beyond the business value concept by including the dark side of ASD is required to adequately represent the entire spectrum of potential outcomes. Consequently, these shortcomings of Paper I are addressed in Paper II and Paper III.

4.2 Paper II: Comprehensive Literature Review on the Business Value of ASD Methodologies[6]

The main objective of Paper II is to extend the findings from Paper I by covering evidence from SE research and management science. SE research, in particular, has contributed significantly more findings to the body of knowledge on ASD compared to IS literature (Dingsøyr et al., 2012). To add, in the last decade, studies on ASD published in SE journals have outgrown the number of studies published in IS journals (Baham & Hirschheim, 2022), which were not covered in the initial IS research-focused review in Paper I. Consequently, covering findings from all relevant domains, especially SE research, is necessary to provide a complete picture on the ASD business value concept and associated benefits. Besides the objective of exhaustive coverage of the literature on the business value of ASD, Paper II also investigates how different ASD practices contribute to specific benefits, which is an aspect for future research suggested in Paper I. Doing so seems worthwhile, as studies investigating "how exactly individual agile practices, or groups of practices, create value" (Alahyari et al., 2017, p. 272), were for long missing in the literature. Paper II addresses this gap by synthesizing the relationships among ASD practices and resulting benefits. This enables research to better understand the mechanisms with which ASD generates business value and assists practitioners with a target-oriented application of associated practices.

Guided by the recommendations of Kitchenham and Charters (2007), Paper II conducts a qualitative systematic review (Paré et al., 2015) of qualitative and quantitative empirical findings (Paré et al., 2023) on the benefits of ASD. The study analyzes 137 articles in a qualitative content analysis that follows the guidelines by Wolfswinkel et al. (2013). Besides synthesizing the findings on benefits and ASD practices that lead to them, the study also provides an overview of the current state of research on ASD and its benefits. As such, most studies stem from SE research (84/137, 61%) compared to 43 studies from IS literature (32%) and 10 publications from management science research (7%). This again emphasizes the predominant role of SE research in the context of ASD (Baham & Hirschheim, 2022). Furthermore, qualitative (73/137, 53%) and quantitative research approaches (59/137, 43%) are almost equally frequently applied, while mixed-method studies are rarer (5/137, 4%). Notably, only 39 studies use a theory in their examinations of ASD. In light of the long-existing "lack of theoretical glue" (Conboy, 2009, p. 344) in ASD research, however, the limited number of studies relying on a theory is not surprising, but instead presents opportunities for future research to inspect ASD from a more theoretically-founded stance.

In the qualitative content analysis, Paper II identifies 56 individual benefits of ASD, finding a larger range of beneficial outcomes than Paper I. These benefits are classified into 16 business value categories and allocated to five dimensions of manifestation (team and developers, process, product, customer, and financial dimension). The most frequently identified benefits are shown in Table 4.2, followed by a comparison of the primary benefits identified in Paper I and Paper II, and the extensions Paper II provides. As a structured overview, Paper II provides a classification framework that contains the identified benefits, subcategories, and levels of manifestation. The framework is shown in Figure 4.3 on page 47, while its full resolution can be found in the paper.

[6] Meckenstock, J.-N., Hirschlein, N., Schlauderer, S., & Overhage, S. (2025). Unraveling agile software development business value: A qualitative systematic review of agile practices and benefits. *Pacific Asia Journal of the Association for Information Systems*, 17 (5). https://aisel.aisnet.org/pajais/vol17/iss5/3

Table 4.2: Aggregated Findings on Benefits Identified in Paper II

Identified Benefit of ASD	Superordinate Value Category	Level of Manifestation	Exemplary Contributions	∑
Improved Communication	Team Interaction	Team and Developers	Paasivaara et al. (2008) Hummel et al. (2015)	**31**
Improved Software Quality	Product Quality	Product	Maruping et al. (2009) Fitzgerald et al. (2006)	**29**
Increased Productivity	Process Performance	Process	Tarhan and Yilmaz (2014) Sutherland et al. (2007)	**28**
Improved Job Satisfaction	Developer Wellbeing	Team and Developers	Tripp et al. (2016) Melnik and Maurer (2006)	**27**
Reduced Time to Market	Time and Availability	Product	Senapathi and Srinivasan (2012) Olszewska et al. (2016)	**27**
Better Customer Requirements Meeting	Customer Requirements	Product	Karrenbauer et al. (2019) Overhage and Schlauderer (2012b)	**24**
Improved Team Collaboration	Team Interaction	Team and Developers	Cao and Park (2017) Overhage and Schlauderer (2012b)	**21**
Improved Knowledge Dissemination	Developer Knowledge and Skills	Team and Developers	Vidgen and Wang (2009) Könnölä et al. (2017)	**20**
Improved Process Transparency	Complexity Management	Process	Heikkilä et al. (2015) Hossain et al. (2009)	**20**
Improved Developer Motivation and Engagement	Developer Wellbeing	Team and Developers	Paasivaara et al. (2008) Huck-Fries et al. (2019)	**15**
Continuous Process Refinement	Process Flexibility	Process	Rodríguez et al. (2014) Karrenbauer et al. (2019)	**15**
Improved Customer Collaboration	Customer Partnership	Customer	Ghobadi and Mathiassen (2016) Sommer et al. (2013)	**15**
Earlier Problem Identification	Problem Handling	Process	Asnawi et al. (2012) Kettunen et al. (2010)	**14**
Increased Customer Satisfaction	Customer Satisfaction	Customer	Vacari and Prikladnicki (2017) Senapathi and Srinivasan (2012)	**14**
Reduced Defect Density	Product Quality	Product	Fitzgerald et al. (2006) Korhonen (2010)	**13**
Frequent Customer Feedback	Customer Partnership	Customer	Asnawi et al. (2012) Surendra (2012)	**12**
Improved Team Cohesion	Team Cohesiveness	Team and Developers	Fruhling and Vreede (2006) McAvoy and Butler (2006)	**10**
Improved Responsiveness to Change	Process Flexibility	Process	Overhage and Schlauderer (2012b) Begel and Nagappan (2007)	**10**
Improved Risk and Uncertainty Management	Project and Process Management	Process	Heikkilä et al. (2015) Fitzgerald et al. (2013)	**9**
On-Budget Delivery	Cost	Financial	Lee and Xia (2010) Parsons et al. (2008)	**6**

In analogy to Paper I, Paper II identifies prominent benefits such as *improved communication*, *improved software quality*, *improved job satisfaction*, or *better customer requirements meeting*. Moreover, especially process-related benefits are more frequently identified in Paper II. In particular, *increased productivity*, *improved process transparency*, *earlier problem identification*, and *improved risk and uncertainty management* represent process-related benefits that were less common in Paper I. In addition, *reduced time to market*, *increased customer satisfaction*, *reduced defect density*, and *improved customer collaboration* were substantially more frequently reported in the literature. Financial benefits, however, are rarely found in Paper II, similar to Paper I.

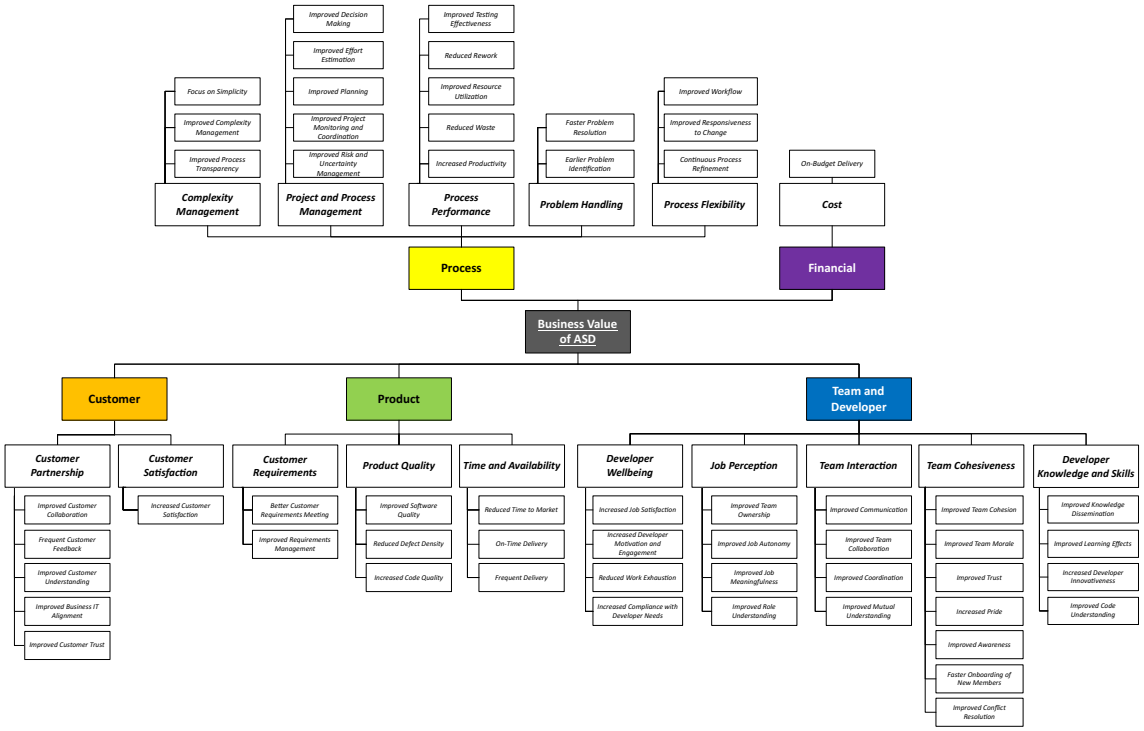

Figure 4.3: ASD Business Value Classification Framework

Considering the most prominent beneficial outcomes identified in this study, Paper II again underscores that ASD methodologies provide benefits especially for the development process, product deliverables, the customer, and the team, but only limited financial benefits. To add, the spectrum of 56 benefits featured in the classification framework corroborates the multidimensionality of the ASD business value concept that was initially indicated in the IS-focused review in Paper I. It extends these findings with an additional 13 benefits, as well as providing the largest collection of benefits related to ASD yet, e.g., compared to Santos and de Carvalho (2022). Based on these insights, a definition for the business value of ASD is derived in Paper II, which emphasizes the multidimensionality of the concept, highlights its primary beneficiaries, and the characteristics of the attainable benefits. Thereby, it combines findings from Paper I and II together with perspectives on value from Biffl et al. (2006, p. IX). With the definition and the systematization of benefits, Paper II enables a clearer conceptualization of the notion of ASD business value for future research, since the concept previously remained "slippery and highly volatile" (Racheva et al., 2009, p. 153). Paper II defines the business value of ASD methodologies as follows:

The business value of ASD is constituted by the multidimensional spectrum of valuable aspects resulting from the use of ASD methodologies and associated practices that imply positive implications for developers, teams, processes, products, stakeholders, or organizations involved in ISD in the form of tangible or intangible, economic or social, monetary or utilitarian, or aesthetic or ethical, beneficial consequences.

In addition to the comprehensive systematization of benefits associated with the business value concept of ASD methodologies, Paper II finds considerable differences in how social/PM and technical/SE ASD practices vary regarding the beneficial outcomes they primarily provide. As such, social/PM ASD practices, e.g., sprint reviews, on-site customers, daily meetings, co-location, and retrospective meetings (Gupta et al., 2019; Hummel et al., 2015), primarily imply beneficial outcomes for the development team and the relationship with the customer. Especially

benefits related to *team interactions*, *developer knowledge and skills*, and *customer partnership* appear mostly associated with practices belonging to the social component of ASD methodologies that primarily focuses on PM activities. Technical practices that relate to SE tasks, which include code refactoring, unit testing, incremental design and development, test-driven development, and pair programming (Baham & Hirschheim, 2022; Gupta et al., 2019), meanwhile primarily seem to stimulate *product quality*, *process performance*, *customer requirements*, and *time and availability-related* aspects of ASD. While both types of ASD practices can also yield beneficial outcomes for other categories, Paper II finds a mostly clear distinction of the relationships between a specific ASD practice type and their most commonly corresponding outcomes. With the systematization of the relationships in Figure 4.4, which corresponds to the second objective of Paper II, an improved understanding of how ASD practices differ regarding their benefits can be facilitated. At the same time, it highlights that both social/PM and technical/SE practices need to be considered to realize the full spectrum of benefits of ASD methodologies. The full resolution of Figure 4.4 is shown in the paper itself. Further insights can be accessed via an online appendix[7].

Type of Practice	ASD Practice	Financial	Customer		Product			Process					Team and Developer				
		Cost	Customer Satisfaction	Customer Partnership	Customer Requirements	Product Quality	Time and Availability	Process Performance	Project and Process Management	Complexity Management	Problem Handling	Process Flexibility	Developer Wellbeing	Job Perception	Team Cohesiveness	Team Interaction	Developer Knowledge and Skills
ASD Software Engineering Practices	Customer Acceptance Test					[36]				[36]							[36]
	Collective Code Ownership							[29,68]					[29]				[29]
	Continuous Integration					[27]	[42]		[6]	[6]	[61]	[42]					
	Agile / Unit Testing				[28]	[1,8,11]		[60]			[8,9,28,36,60,124]	[29]					[8,60]
	Incremental Design / Iterative Development		[111,129]	[39,56,111,116,121,129]	[4,40,57,131]		[60,103,132]	[52]	[53,58]	[95]	[61]	[11,27,103]		22	[133]		[81]
	MVPs and Prototype			[39,137]	[25,29]			[29,57]									
	Pair Programming					[18,28,97,105]	[28]	[28,53,97,101]	[53]				[29]		[29,116]	[48,116,131]	[29,49,56,116,131]
	Pair Rotation		11		32					34						[131,132]	[131,132]
	Refactoring					[3,18,27,29]					[28]						
	Simple Design					[3]		[29]									
	Test Driven Development			[44]		[1,11,18,32,128]		[29]			[21]						
ASD Project Management Practices	Continuous Prioritization				[6,93,94]	[111]		[30]		[39]							
	User Stories			[103]	[21,39,101,130]	[21]	[21]										
	Sprint Review			[35,48,56,61,101,137]		[96,103]			[11,95]	[44]			[15,21, 110]	56		[44,48]	
	On-Site Customer Involvement		[8]	[9,49,94,103,118,125]	[3]	[57,111]											[8,92]
	Small Teams			[85]											[85]	[85]	
	Self-Organization												[39]	[118]	[81]	[84]	[57,78,93,131]
	Retrospective Meetings		18		15			28			[61]	[6,15,39,49,106,110,123]	[68,102]		[81,123]	[38,44,48]	[81,93]
	Colocation							[85]							[14]	[49,53,56,100]	
	Daily Meetings			[25]					[56,116]	[6,64,71,92,93,95]	[6,15]		[102]	[8]	[11,44,81]	[6,11,48,49,56,81,92,93,95,96,101,131,132]	[81]
	Iteration Planning Meeting			[35,49]					[131]					[95,125]	[81,133]	[44]	[81]
	Task Board								[56]		[92,93]						

Figure 4.4: Systematization of ASD Practices and Beneficial Outcomes

In conclusion, Paper II offers a comprehensive perspective on the business value concept in the context of ASD, extending the previous findings of Paper I with a significantly larger coverage of relevant literature on the focal topic. With the ASD business value classification framework, Paper II contributes towards answering the first research question by capturing the beneficial outcomes of ASD methodologies. It also underlines the dominant role of the SE research community in the ASD domain, suggesting that further efforts from IS research are required. Moreover, Paper II provides a profound systematization of relationships among ASD practices and resulting benefits, thereby aggregating previously scattered evidence. This systematization can guide practitioners in selecting practices that align with desired benefits, while enabling research to further investigate how "different configurations of PM-focused and [SE]-focused agile practices" (Tripp & Armstrong, 2016, p. 9) contribute to specific outcomes. That said, Paper II in parts also provides

[7] https://doi.org/10.6084/m9.figshare.30235003

initial insights that address the second research question, i.e., how business value can be achieved with the application of specific ASD practices. Thus, Paper II will also be referenced in the discussion of the second research objective. Still, Paper II leaves room for future investigations to confirm the identified relationships among ASD practices and resulting benefits. Similarly, assessing the issues of ASD methodologies was not performed in Paper II, which is subsequently addressed in Paper III, as Paper II only offers a one-sided perspective on the benefits of ASD.

4.3 Paper III: Comprehensive Literature Review on the Issues of ASD Methodologies[8]

Paper III pursues the objective of clarifying the dark side of ASD methodologies by identifying and systematizing the issues that the use of ASD can entail. Doing so appears necessary for two reasons. First, prior literature studies, such as Paper I and Paper II, only inspected the benefits of ASD, thus leaving the issues of these methodologies unaccounted for. To establish a comprehensive foundation, however, assessing both the positive and the negative side of the spectrum of outcomes is required. While other literature reviews have investigated various aspects of ASD, e.g., method tailoring (Campanelli & Parreiras, 2015), the role of communication (Hummel et al., 2013), or job satisfaction (Huck-Fries et al., 2025), literature studies that specifically focus on issues in ASD are rare, as can be inferred from Hoda et al. (2017). Second, practice reports adopt a primarily positive stance on ASD, e.g., the Annual State of Agile Reports (Digital.ai, 2021, 2024; VersionOne, 2020), and rarely discuss issues, creating a somewhat misleading image of the methodologies. Similarly, early research even questioned if "agile techniques [have] been the silver bullet for software development" (Murphy et al., 2013, p. 75). The issues, however, are often not as prominently featured by research and practice, compared to the benefits that ASD can provide. Consequently, Paper III sheds light on the dark side to uncover the broad spectrum of issues and complement existing findings from Paper I and II on the business value of ASD.

Following the guidelines by Kitchenham and Charters (2007), Paper III performs a qualitative systematic review (Paré et al., 2015) of qualitative and quantitative empirical studies (Paré et al., 2023) on the issues that form the dark side of ASD methodologies. The review assesses 70 articles via a qualitative content analysis in line with Gioia et al. (2013) to identify and systematize issues reported in prior literature. Using inverted dimensions of an adapted ASD success factor model by Chow and Cao (2008) as its lens of analysis, Paper III first identifies 90 distinct issues that are classified into 18 coherent issue categories and then allocated to six levels of manifestation to determine the primarily affected aspect of ASD. In so doing, the study shows how teams and developers, the process, the customer, the organization, technical aspects of development, and the deliverables of ASD projects can be negatively affected. Second, Paper III investigates apparent relationships among these 90 issues to understand the complexity of the spectrum of negative outcomes. 65 relationships are identified that emphasize which issues seem particularly influential regarding how they provoke other issues to occur or reinforce them. This examination leads to the creation of a relationship diagram shown in Figure 4.6, which visualizes the interplay of issues in ASD methodologies. Meanwhile, Table 4.3 contains the most frequently identified issues.

[8] Meckenstock, J.-N. (2024). Shedding light on the dark side – A systematic literature review of the issues in agile software development methodology use. *Journal of Systems and Software*, 211. https://doi.org/10.1016/j.jss.2024.111966

Table 4.3: Aggregated Findings on Issues Identified in Paper III

Identified Issue in ASD	Superordinate Issue Category	Level of Manifestation	Exemplary Contributions	∑
Iterative Delivery Pressure	Pressure Problems	Team and Developers	Hoda et al. (2012) McHugh et al. (2011b)	**19**
Reduced Productivity	Efficiency Problems	Process	de O. Melo et al. (2013) Hoda et al. (2011)	**19**
Inadequate Customer Involvement	Customer Behavior	Customer	Hoda et al. (2011) Ramesh et al. (2010)	**17**
Tight Deadlines / Time Pressure	Problematic Project Constraints	Customer	Behutiye et al. (2022) Annosi et al. (2016)	**16**
Inadequate Documentation	Incorrect Application of ASD Practices	Technical Issues	Behutiye et al. (2022) Ramesh et al. (2010)	**16**
Meeting Overhead	Efficiency Problems	Process	Mueller and Benlian (2022) Stray et al. (2016)	**15**
Delivery Delays	Outcome Problems	Product and Outcomes	Alahyari et al. (2019) Badampudi et al. (2013)	**14**
Volatile Requirements	Customer Behavior	Customer	Dasanayake et al. (2019) Hoda and Murugesan (2016)	**13**
Stress	Physical and Emotional Health Problems	Team and Developers	Annosi et al. (2016) Benlian (2022)	**12**
Inefficient Communication	Collaboration Problems	Team and Developers	Ramesh et al. (2010) Dasanayake et al. (2019)	**12**
Required Rework	Efficiency Problems	Process	Hoda et al. (2011) Hess et al. (2019)	**12**
Inadequate Effort Estimation	Planning and Estimation Problems	Process	Heikkilä et al. (2017) Heikkilä et al. (2015)	**12**
Feature / Requirement Dependencies	Requirements Engineering Problems	Process	Behutiye et al. (2022) Hannay and Benestad (2010)	**11**
Reduced Product Quality	Quality Problems	Product and Outcomes	Heikkilä et al. (2017) Olszewska et al. (2016)	**11**
Increased / Unbalanced Workload	Pressure Problems	Team and Developers	Laanti et al. (2011) Mueller and Benlian (2022)	**10**
Inadequate Requirements Prioritization	Requirements Engineering Problems	Process	Ramesh et al. (2010) Hoda et al. (2011)	**10**
Staff Fluctuations	Inadequate Support	Organizational Context	de O. Melo et al. (2013) Elbanna (2014)	**10**
Technical Debt	Quality Problems	Product and Outcomes	Martini et al. (2015) Paasivaara et al. (2018)	**9**
Developer Frustration	Physical and Emotional Health Problems	Team and Developers	Mueller and Benlian (2022) Moe et al. (2012)	**8**
Increased Cost	Outcome Problems	Product and Outcomes	Hoda et al. (2011) Ramesh et al. (2010)	**8**
Lack of Customer Feedback	Customer Behavior	Customer	Hoda et al. (2011) Ramesh et al. (2010)	**7**
Difficult Requirements Meeting	Quality Problems	Product and Outcomes	Hoda et al. (2011) Elbanna (2014)	**7**
Negligence of Refactoring	Incorrect Application of ASD Practices	Technical Issues	Mangalaraj et al. (2009) Martini et al. (2015)	**7**

Similar to Paper II, Paper III highlights the predominant role of the SE research domain in ASD, as 73% (51/70) of all articles stem from this community. Only 14 publications were published in the IS domain (20%), corroborating the observation that ASD still remains less represented in IS research (Baham & Hirschheim, 2022) compared to the more dominant SE research community. Management science research, meanwhile, only accounts for 5 articles (7%) in the sample.

For the results of the first analysis step, the qualitative content analysis shows that ASD methodologies can imply a large range of issues that negatively affect the different constituents of ASD projects. Similar to the ASD business value concept, also the associated dark side embodies a multifaceted spectrum of outcomes that require dedicated consideration. As such, especially the team and developers can experience critical issues, such as constant *delivery pressure*, *stress*, *unbalanced workloads*, *frustration*, or *inefficient communication*. Additionally, the promise of ASD to continuously deliver working, valuable software within short time frames (Beck et al., 2001) can be difficult to uphold in light of several critical issues, including *delivery delays*, *reduced product quality*, *technical debt*, or *difficulties to meet requirements*. Besides, the underlying development process may also suffer from a range of issues. In particular, *reduced productivity*, *required rework*, and *meeting overhead* suggest that the process efficiency attainable with the methodologies can be seriously hampered. Lastly, an improper execution of ASD practices is often reported, as necessary *refactoring* is frequently *neglected*, while even the *limited documentation requirements* prescribed in ASD are often significantly undermined. While only a fraction of all identified issues is briefly addressed here, the range of potential problems suggests that taking the dark side of ASD seriously is important, as these methodologies do not represent a panacea for SD work and may pose significant challenges. Figure 4.5 presents the spectrum of issues identified in Paper III. The full resolution of this visualization can be found in the paper.

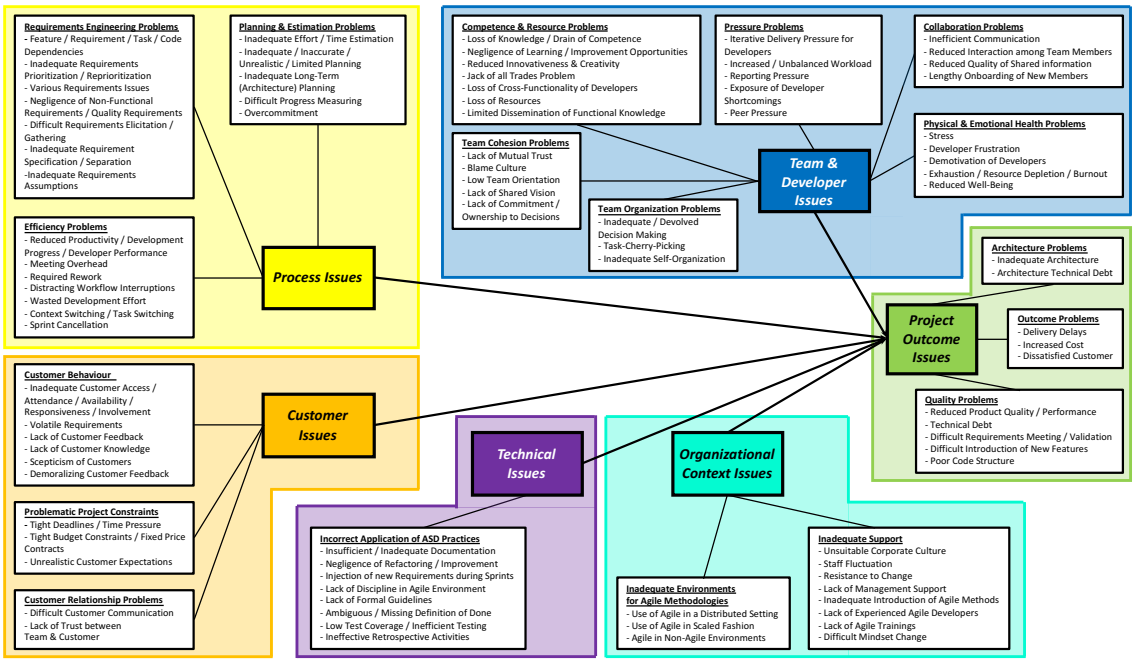

Figure 4.5: Overview of 90 Identified Issues in Paper III

For the second analysis step, Paper III reveals a subset of issues that require particular consideration due to their relationships with other issues and the potential to imply further aggravating consequences. Figure 4.6 on the following page visualizes these relationships, while the full-size resolution of the relationship diagram is shown in the paper itself. As such, *inadequate customer access/involvement*, *volatile requirements*, *tight deadlines*, combined with *delivery pressure for developers*, *meeting overhead*, *staff fluctuations*, and *inadequate architectures* are particularly critical. Especially the issues on the customer side, including *inadequate customer involvement*, *volatile requirements*, and *tight deadlines*, can contribute to a range of further problematic con-

sequences, including *delivery delays*, *reduced productivity*, *delivery pressure for developers* causing *stress*, or *inefficient communication*. Additionally, *meeting overhead*, as well as *staff fluctuations*, contribute to *productivity losses* and subsequently *delayed deliveries*. Regarding the most frequently encountered consequences of these antecedent issues, usually the team, the process, and the deliverables are negatively affected. Developers particularly suffer from the constant *pressure to deliver software* after each iteration, as evidenced by the relationship with *stress*. The *time pressure* can also cause the accumulation of *technical debt* and degradation of *product quality*. Concerning the development process, *development productivity* represents the most frequently affected aspect in ASD, while it is also one of the most frequently reported issues in Paper III, see Table 4.3. As a further process-related consequence with efficiency-reducing characteristics, additional *required rework* can result, which appears to contribute to *increased development costs*. Similarly, *delivery delays* and *reduced product quality*, which belong to the project outcome issue dimension, as is also the case for *increased cost*, suggest that all aforementioned issues can degrade the performance of ASD projects. Therefore, recognizing and mitigating these issues is key to upholding the promises of ASD methodologies for valuable software, sustainable pace, efficient communication, customer advantage, and motivated individuals (Beck et al., 2001).

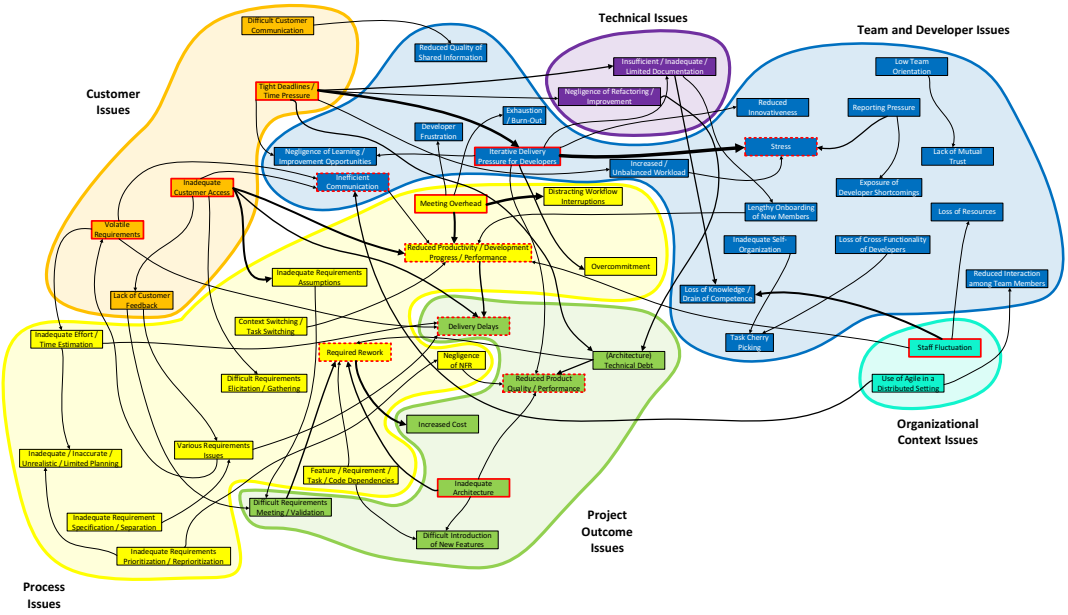

Figure 4.6: Relationship Diagram of Issues in ASD Methodologies

In conclusion, Paper III provides a comprehensive perspective on the dark side of ASD by summarizing extant empirical findings on the issues that occur when applying the methodologies. In combination with findings presented in Paper I and II, Paper III addresses the first research question by clarifying the spectrum of outcomes of ASD. The study highlights that *tight deadlines* and *delivery pressure*, *volatile requirements*, *meeting overhead*, and *inadequate customer involvement* represent critical issues that need to be avoided, particularly due to their substantial influence on downstream consequences. These include *delivery delays*, *increased development cost*, *reduced product quality*, *stress for developers*, or *additional rework*. Overall, Paper III thus emphasizes the importance of a sustainable pace in ASD as well as constant customer involvement, and the need to mitigate key issues to avoid further negative consequences. Still, Paper III leaves the latter aspect of issue mitigation unaddressed, which therefore represents the key objective of Paper V.

4.4 Paper IV: Quantitative Survey Study on the Benefits of Individual Social/PM ASD Practices[9]

The objective of Paper IV is to explore how social/PM ASD practices influence different dimensions of success in terms of developer benefits and economic value. Thus far, ASD practices, e.g., pair programming, have mostly been examined in isolation with regard to their beneficial influences, for instance, on team performance (Kude et al., 2019). This, however, does not imply an examination of relationships between a "combination of agile practices […] and the perceived business value" (Racheva et al., 2010, p. 141). Similarly, limited empirical evidence exists about how social/PM ASD practices, as the subset of ASD practices that promotes "social interaction, collaboration and direct communication of ISD team members" (Hummel et al., 2015, p. 280), contribute to ASD project success and, thereby, business value. To add, social/PM ASD practices have mostly been investigated with respect to their influences on developer benefits such as communication (Hummel et al., 2015) or "psychological safety, transparency [and] productivity" (Hennel & Rosenkranz, 2020, p. 11). Other aspects, e.g., requirement correctness, time to market, or productivity, remain less explored. Consequently, investigating social/PM ASD practices and how they contribute to both economic and developer benefits represents a worthwhile effort.

Paper IV employs the ISD success model by Siau et al. (2010), which proposes that using a systems development methodology and its different components in the SD process leads to different beneficial outputs/outcomes that characterize ISD success. In this vein, Paper IV also adopts ideas from a related study by Kude et al. (2019), who propose that the use of pair programming as a specific ASD practice contributes to improved backup behavior among participating developers, which in turn leads to improved team performance. Based on these ideas, Paper IV explores how a selection of social/PM ASD practices jointly contribute to the realization of several social agile principles, which in turn lead to the attainment of different beneficial outcomes that characterize the success of ASD. The selected social/PM ASD practices include daily meetings, retrospective meetings, pair programming, co-location, and shared leadership. Regarding the social agile principles, communication, self-organization, business-IT alignment, and reflection are included. Concerning the ASD success dimensions, Paper IV explores satisfaction, compatibility, as well as complexity as developer benefits, and productivity, requirement correctness, lead time, and timeliness as dimensions of economic value. Figure 4.7 shows the research model for Paper IV.

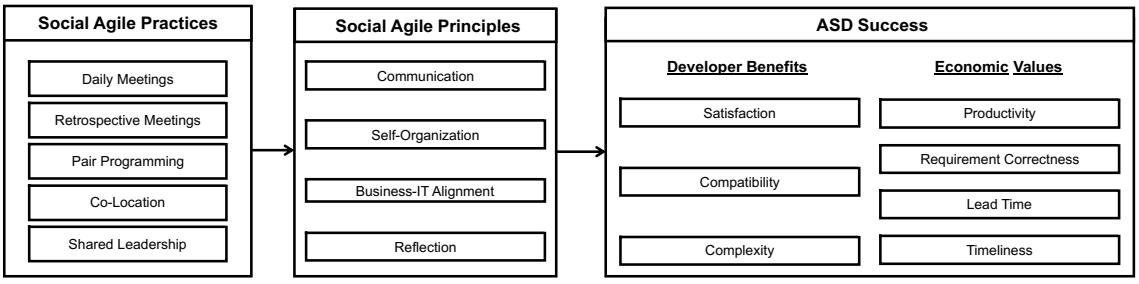

Figure 4.7: Research Model for Paper IV

[9] Meckenstock, J.-N., Schlauderer, S., & Overhage, S. (2022). How do individual social agile practices influence the development success? An exploratory study. *Wirtschaftsinformatik 2022 Proceedings*, Nürnberg, Germany. https://aisel.aisnet.org/wi2022/it_strategy/it_strategy/7

Paper IV analyzes data from a survey study with 235 respondents from the SD domain, of whom 197 were usable for statistical analysis. The research model is evaluated in two steps using multiple regression analysis (Hair et al., 2009), which hypothesizes linearity of relationships among the included independent and dependent variable(s). This regression analysis is performed in an exploratory fashion, similar to Chow and Cao (2008). In the first step, all social/PM ASD practices are regressed onto the social agile principles to determine how they contribute to their realization in ASD. Subsequently, the influence of the four social agile principles on the different ASD success dimensions is evaluated. Figure 4.8 visualizes the regression results from the first analysis step, while Figure 4.9 shows the results of the second analysis. The full regression tables for both analysis steps are located in the body of Paper IV itself.

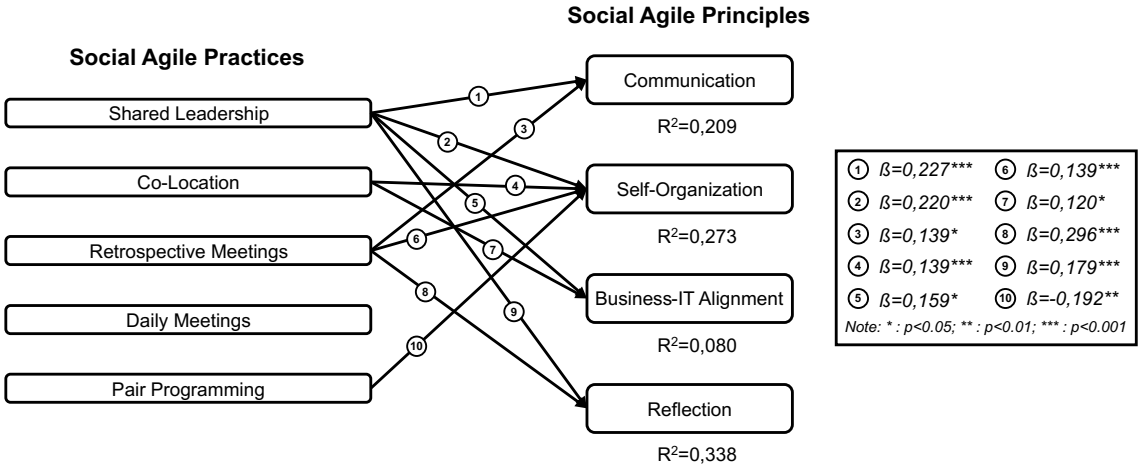

Figure 4.8: Regression Analysis Results: Social/PM ASD Practices → Social Agile Principles

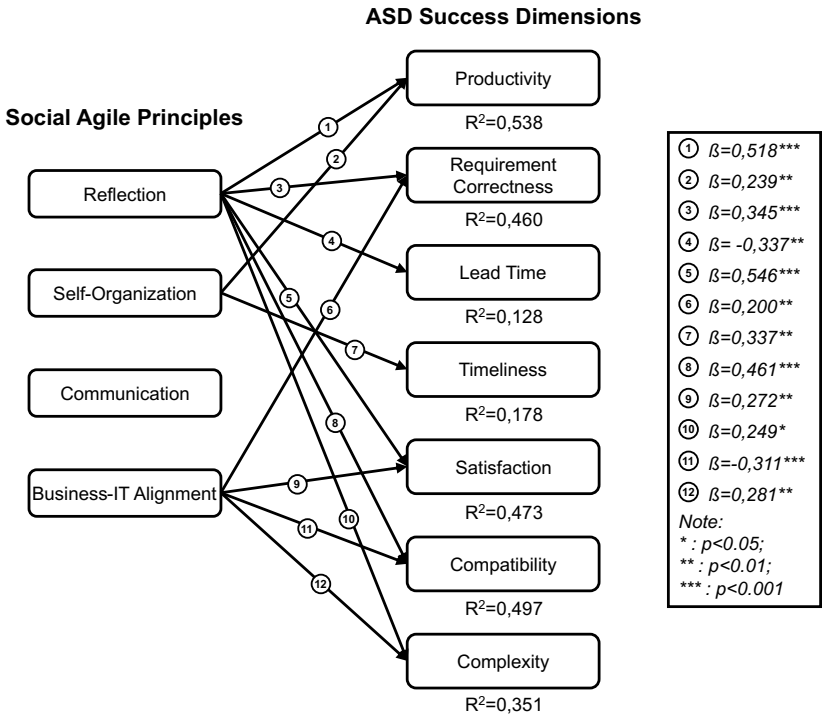

Figure 4.9: Regression Analysis Results: Social Agile Principles → ASD Success Dimensions

For the first analysis step, the regression results provide empirical evidence that applying social/PM ASD practices supports the realization of social agile principles, with certain differences in their respective influence. Shared leadership seems to be a key practice that positively stimulates all investigated social agile principles, particularly due to its inherent continuous collaborative nature. Retrospective meetings are found to be important drivers of communication, reflection, and self-organization, given their focus on solving issues in the team and fostering continuous process improvement. Co-location of the team, including the customer, meanwhile, appears essential to enable efficient self-organization, but also fosters business-IT alignment. Especially regarding the latter aspect, co-location with clients allows for a closer relationship between the technical side of SD and the business. Surprisingly, pair-programming with two members in close collaboration appears to imply a negative effect on self-organization, potentially due to the separation of the team into smaller units that hampers overall coordination. Lastly, no significant relationships between social agile principles and daily meetings were identified. While daily meetings are a key practice in ASD, they also seem to be associated with a substantial range of issues, including overhead (Stray et al., 2016), interruptions to developers' workflow (Wiesche, 2021), or exceeded time limits (Stray et al., 2013). These issues may provide reasons as to why daily meetings do not significantly contribute to the realization of social agile principles in Paper IV.

For the second step, the regression analysis suggests that reflection, business-IT alignment, and self-organization are essential for the realization of success in ASD. Reflection is found to reduce the complexity of SD and positively influences the compatibility and satisfaction of developers with the work performed. Similarly, reflecting on tasks seems helpful to improve productivity in fulfilling these tasks and fosters requirements meeting, while also enabling a reduced time to market. Business-IT alignment seems similarly important in meeting the business requirements, while significantly contributing to developer benefits, such as perceived complexity, compatibility, and satisfaction. In addition, self-organization is found to foster productivity and timeliness of deliveries. Surprisingly, communication is not a significant predictor for any of the success dimensions, despite being a central element of ASD (Hummel & Epp, 2015; Hummel et al., 2015). However, communication may also have "no or even negative effects on performance and SD success" (Hummel et al., 2013, p. 7). A post-hoc analysis performed on this unexpected result finds that communication is only significant in cases of low business-IT alignment, not when it is already highly established, while communication is generally considered as a driver of business-IT alignment (Luftman et al., 2017). Thus, communication could rather be seen as an essential promoter of business-IT alignment, which in turn contributes to different benefits in ASD.

In sum, Paper IV empirically shows that certain ASD practices represent important drivers of different social principles in ASD that contribute to the realization of success, both from an economic perspective and with regard to developer benefits. While Paper IV only provides initial findings on the relationships among ASD practices and beneficial outcomes, it contributes towards answering the second research question by studying how social/PM ASD practices lead to different beneficial outcomes of ASD. As such, especially retrospective meetings, shared leadership, and co-location appear essential. For the social principles in ASD, the importance of reflection, business-IT alignment, and self-organization is identified for the realization of ASD success. Daily meetings and the influence of communication as a predictor of business-IT alignment in ASD still require further investigation to clarify why these elements were not significant in this study. Also, Paper IV only focuses on social/PM ASD practices, while the effects of technical/SE ASD practices remain unaccounted for, which needs to be addressed in future studies.

4.5 Paper V: Interview Study on Issues and Countermeasures to Sustain Value Delivery in ASD [10]

The objective of Paper V is to assess how practitioners address issues that frequently occur in the use of ASD methodologies to avoid their negative consequences for a continuous delivery of business value. While ASD was found to deliver a range of benefits, for instance, in Paper I and II, practitioners of ASD methodologies often face six critical issues, which were identified in Paper III. These include *delivery pressure*, *lacking customer involvement*, *meeting overhead and interruptions*, *required rework*, *technical debt*, as well as *volatile and unclear requirements*. As a limitation of Paper III, only a few consequences of these issues are addressed, without a specific focus on the delivery of valuable software that is a key principle of ASD methodologies (Beck et al., 2001). In analogy, related studies that focus on business value in ASD only illustrate typical barriers to value creation, without discussing the consequences should these barriers not be overcome, e.g., Alahyari et al. (2017). Furthermore, a comprehensive collection of measures that practitioners adopt to overcome the issues and to sustain value delivery is lacking, as suggestions are only scattered across the literature. Building on Paper III, Paper V examines the consequences of six key issues for business value delivery in ASD and derives a set of measures to adapt to them.

Paper V conducts a semi-structured interview study with 19 experts from the ASD domain. Using an interview protocol, questions on the consequences of the six investigated issues are asked, followed by inquiries into the applied measures to mitigate them. The collected data is analyzed through a three-step content analysis with deductive and inductive steps, in line with Kuckartz (2018) and Saldaña (2021). A total of 34 value-reducing consequences that result from the six issues are identified and aggregated into nine consequence types. Additionally, 48 distinct measures applied by the experts are derived, which are classified into seven measure types. Figure 4.10 on the following page summarizes the most frequently reported consequences for each issue and mitigation measures that ASD practitioners employed to mitigate them. Meanwhile, all consequences and measures are featured in the published version of the paper.

For the main consequence types, Paper V identifies *additional efforts*, *lower process efficiency*, *waste issues*, negative consequences for *product quality* and *product capability*, *affected time to market*, *requirement issues*, *customer satisfaction*, and *emotional issues*. Several issues, e.g., technical debt, delivery pressure, and volatile requirements, lead to *additional efforts* such as *more time* and *costs*. Other consequences related to *process efficiency* and *waste*, especially *reduced productivity* and *a loss of time*, particularly stem from a lack of customer involvement or unclear requirements that create uncertainty. *Product quality* appears especially undermined by technical debt that is created during development under high delivery pressure, which is also found to degrade the *quality* of deliverables. Especially critical consequences, e.g., *security issues*, *reduced software quality*, or *additional cost*, suggest technical debt as a particularly critical issue. Meanwhile, *obsolete functionality* can result from a lack of customer involvement, which also partly contributes to volatile and *unspecific or incomplete requirements* that lead to *misalignment* from the *actual requirements*. Together, lacking customer involvement, volatile requirements, and

[10] Meckenstock, J.-N. & Wallmichrath, V. (2025). Adapt and overcome - How agile practitioners adapt to issues that impede the delivery of value: An interview study. *Agile Processes in Software Engineering and Extreme Programming. XP 2025*. Lecture Notes in Business Information Processing, vol. 545, Brugg-Windisch, Switzerland. https://doi.org/10.1007/978-3-031-94544-1_17

technical debt are also found to be a major cause for *delays of new features*. Besides consequences for the delivery of products, Paper V also identifies *emotional issues* that affect developers. *Stress* and related *health issues* are prominent consequences of delivery pressure, representing the most frequently reported repercussion in general, besides *product quality*. Lastly, rework is rarely reported as an issue but is rather essential for value creation. In sum, Paper V identifies a considerable range of consequences that can result from the six critical issues, if not adequately mitigated.

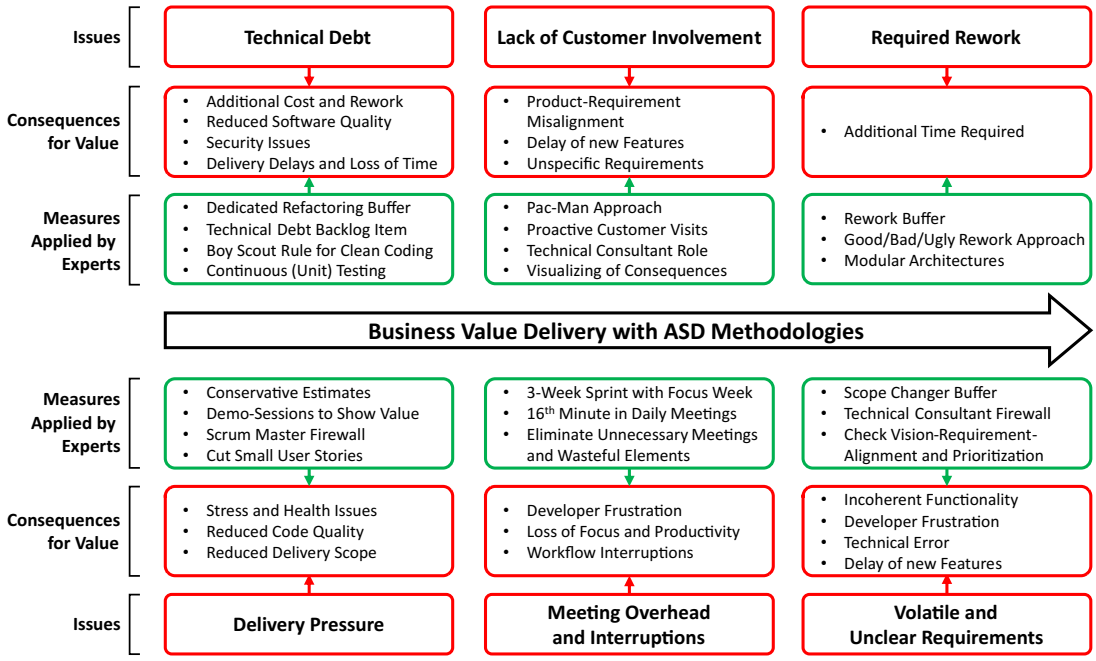

Figure 4.10: Findings of Paper V on Issues, Consequences and Mitigation Measures

To mitigate these issues, practitioners employ a range of measures that are classified into *customer approach measures*, *procedural changes*, *requirements engineering practices*, *tool support*, *process artifacts*, and *technical measures. Customer approach* measures, such as demo sessions to show value and keeping the customer interested through small deliveries (Pac-Man approach) or visualizing the consequences of the issues, help to address lacking customer involvement or delivery pressure. *Procedural changes* are frequently applied to deal with meeting overhead and delivery pressure, for instance, by eliminating meetings, extending the sprint length to three weeks with a core focus week, or adding a 16th minute to the end of a daily meeting. To deal with issues such as volatile requirements and delivery pressure, different *requirement engineering practices*, e.g., continuous prioritization, small stories, and vision-requirement-alignment checks, can be applied. Furthermore, *supporting* ASD with *tools*, e.g., asynchronous communication means, or AI-based code analysis tools, helps to address several key issues. Together with *technical measures*, especially technical debt can be mitigated, for instance, via code reviews, continuous testing, or guidelines for coding, including the Boy Scout rule that suggests to always leave the software code better than before. To add, different *process artifacts*, such as rework buffers, scope change buffers, and refactoring buffers, were found to be meaningful in dealing with technical debt, unclear requirements, and rework. As a further measure to mitigate several issues, relying on dedicated *roles* as firewalls, e.g., Scrum Masters, Product Owners, and also technical consultants, helps to address low customer involvement, delivery pressure, and volatile requirements.

In sum, Paper V empirically examines the spectrum of consequences of typical issues that affect the delivery of business value in ASD. It offers insights into how technical debt, a lack of customer

involvement, delivery pressure, and volatile requirements can be highly problematic by finding a range of consequences that can result if the issues are not addressed. Paper V also highlights how required rework should not be seen as an issue per se, but instead is an inherent element of business value delivery. To sustain delivery, Paper V lastly develops a practical set of measures that can help practitioners in dealing with these issues, thereby addressing the third research question.

4.6 Paper VI: Literature Review on the Core Concepts of Agility in ASD and Contextual Factors[11]

Paper VI pursues two objectives to address the questions of "*how, why* and *when* ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107). First, Paper VI investigates how the key characteristics of agility in ASD contribute to the different outcomes, i.e., benefits and issues. Thus far, previous work, including Paper I-III, only addressed the question of *what* outcomes ASD can provide, thereby neglecting how these outcomes appear to be shaped by the central attributes of agility. With recent advances by Baham and Hirschheim (2022) to conceptualize agility in ASD from a theoretical standpoint and thereby contributing to the establishment of "theoretical glue" (Conboy, 2009, p. 344), finding answers to the questions of *how* and *why* appears now better realizable. Therefore, examining the outcomes of ASD from the perspective of the four theoretical core concepts (Baham & Hirschheim, 2022) behind agility in ASD methodologies seems promising. These four theoretical core concepts comprise incremental design and iterative development (**ID2**), inspect and adapt cycles (**IA**), working cooperatively/collaboratively/in close communication (**WC**), as well as continuous customer involvement (**CCI**) (Baham & Hirschheim, 2022). Section 2.2 provides a more in-depth characterization of the four core concepts (page 17).

For the second objective, Paper VI investigates *when*, i.e., in which specific contextual settings, ASD methodologies operate best. In this vein, "scholars […] stress the importance of understanding ASD's project context" (Baham & Hirschheim, 2022, p. 107) to advance the understanding of how ASD works. While SD projects are generally very context-sensitive (Clarke & O'Connor, 2012; Hoda et al., 2010), ASD projects should ideally be performed within an "agile sweet spot" (Kruchten, 2011, p. 355). In the current state of knowledge, however, this sweet spot is only vaguely defined. Therefore, by assessing *when* ASD methodologies work best and defining the characteristics of an ideal context setting, the role of contextual factors can be better understood.

Paper VI adopts the ASD core concepts framework by Baham and Hirschheim (2022) to assess how the key characteristics of agility in ASD influence its outcomes. To classify the outcomes, Paper VI uses the four dimensions of the socio-technical systems theory (Bostrom & Heinen, 1977), i.e., actors, structure, technology, and task. The underlying research method is a qualitative systematic review (Kitchenham & Charters, 2007; Paré et al., 2015) of 122 studies, coupled with a qualitative content analysis following Saldaña (2021) to identify benefits and issues of ASD. Using a multipronged approach, Paper VI first examines how the four ASD core concepts contribute to benefits and issues, classified along the four dimensions of the socio-technical systems theory. Second, Paper VI focuses on 12 contextual factors introduced in Section 2.4 that influence the outcomes of ASD projects, derived from prior works by Clarke and O'Connor (2012), Hoda

[11] Meckenstock, J.-N., Hirschlein, N., Schlauderer, S., & Overhage, S. (2025). Agile's anatomy: How agile's core concepts and contextual factors influence benefits and issues. *IEEE Access*, 13. https://doi.org/10.1109/ACCESS.2025.3614373

et al. (2010), and Kruchten (2011). Based on the different characteristics of the examined contextual factors, a revised "agile sweet spot" (Kruchten, 2011, p. 355) is developed to determine *when* ASD methodologies ideally operate. The following paragraphs first delineate the findings on the relationships between the four core concepts and the benefits or issues identified in the analysis. Then, the aspects of an ideal context for ASD methodologies are described.

For the first objective of the study, the analysis reveals that benefits in the ***actors*** dimension appear particularly fostered by **WC** and **IA**. Working in close collaboration and inspecting the work done collaboratively helps to disseminate knowledge, increases the satisfaction of developers, and supports a productive form of working. Involving the customer in iterative development (**ID2** and **CCI**), meanwhile, is crucial for increased customer satisfaction. Regarding the issues, excessive iterative development (**ID2**) and frequent inspections (**IA**) cause delivery pressure, stress, and demotivation, as well as frustration of developers. Especially the constant need to deliver (**ID2**) can be problematic. Moreover, lacking customer involvement (**CCI**) is found as a key reason for reduced productivity, as the teams strongly depend on the client to make progress in development. Finally, working in close collaboration (**WC**) is rarely found to be a driver of issues. Figure 4.11 shows the identified relationships among ***actors*** benefits and issues with the causal core concepts.

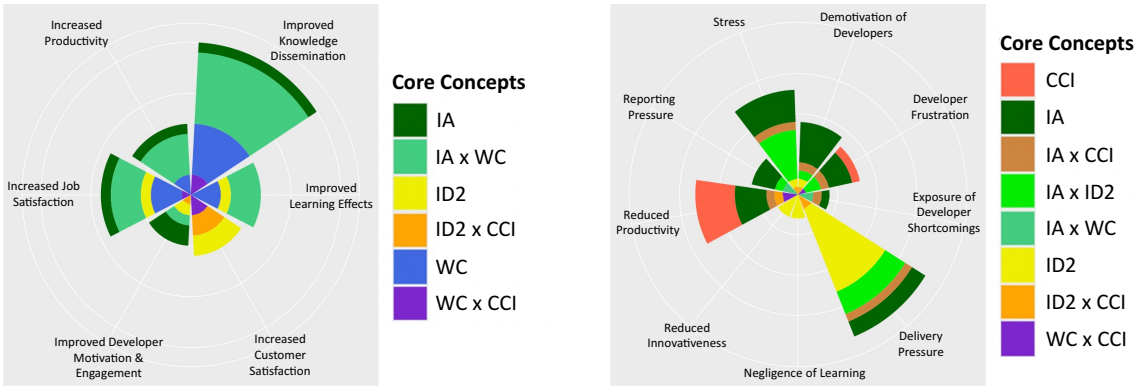

Figure 4.11: Relationships of ASD Core Concepts and Outcomes in the Actors Dimension

With regard to the benefits in the ***structure*** dimension among the actors in ASD methodologies, the study finds that working closely and inspecting the work done (**WC** and **IA**) is essential. Improvements in communication, collaboration, and team cohesion are examples of benefits for the interaction structure of the SD team that depend strongly on an adequate execution of these core concepts. Additionally, for an improved customer relationship and customer feedback provision, frequent inspections together with the customer after an iteration (**CCI**, **IA**, and **ID2**) are required. Especially continuous customer involvement (**CCI**) is an essential element of ASD that stands out in this regard. Hence, it is not surprising that almost all issues in the interaction structure among actors in ASD relate to an inadequate customer involvement (**CCI**). Examples include a lack of trust between the team and the customers or lacking customer feedback. **CCI**, therefore, represents a key core concept for the benefits for the structure among the actors as well as for the actors themselves. Figure 4.12 shows the relationships among benefits and issues in the ***structure*** dimension with the core concepts that contribute to them.

For the benefits in the ***technology*** dimension, **IA** and **ID2** are critical, especially in combination with the emphasized close collaboration in ASD (**WC**). Together, **IA**, **ID2**, and **WC** enable continuous process refinement, contribute to transparency, and help to find issues earlier.

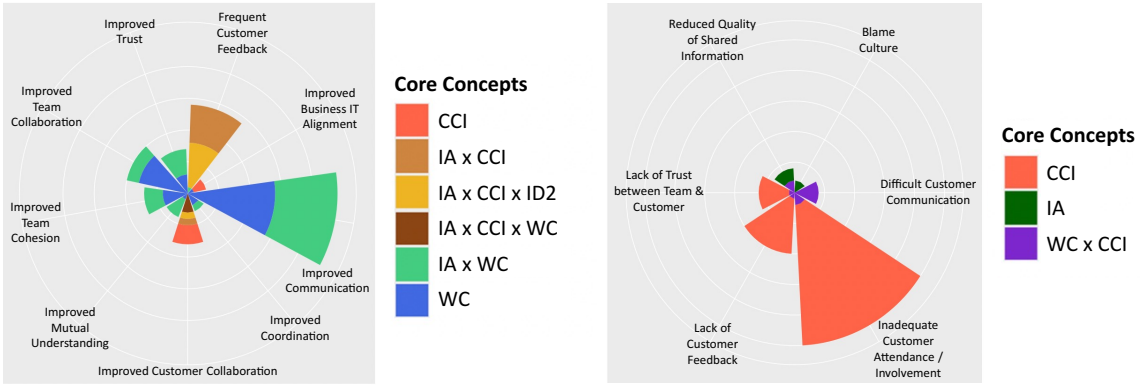

Figure 4.12: Relationships of ASD Core Concepts and Outcomes in the Structure Dimension

Regarding customer involvement (**CCI**), also an improved responsiveness to change appears realizable, while all four core concepts jointly seem to contribute to better project monitoring. Still, the frequent inspections embedded in **IA** can also be a potential cause for meeting overhead and interruptions of the workflow of the developers. Similarly, this can be attributed to the customer (**CCI**), who may disrupt their workflow. Taken together, the iterative form of development (**ID2**) and continuously inspecting the process, as well as the deliverables (**IA**), are of critical importance to achieve benefits in the SD process. Figure 4.13 shows the identified relationships between the ASD core concepts and the benefits, as well as the issues in the ***technology*** dimension.

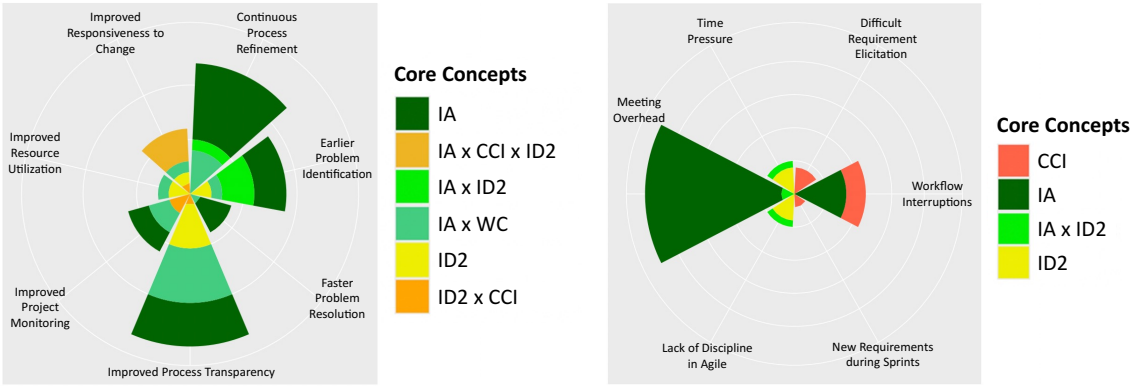

Figure 4.13: Relationships of ASD Core Concepts and Outcomes in the Technology Dimension

Lastly, benefits in the ***task*** dimension strongly depend on **IA** and **ID2** in combination, yet **CCI** and **WC** are also important for different benefits. **IA**, **ID2**, and **CCI** are key for reductions in time to market, meeting of customer requirements, and overall product quality. Frequently inspecting the code of the software in collaboration (**IA** and **WC**), meanwhile, contributes to code quality, while it also reduces the defect density in the deliverables. Together, **IA**, **ID2**, and **CCI** are critical to ensure task fulfillment, i.e., providing a valuable software product. On the downside, it should be noted that inadequate customer involvement (**CCI**) can be a prominent driver of issues. Here, requirement volatility, delivery delays, unrealistic expectations, and failing to meet the defined requirements can be attributed to an insufficient involvement of the customer (**CCI**). To add, **ID2**, which implies the constant need to deliver, can also cause issues for SD tasks. Especially technical debt that degrades the product quality, a lack of refactoring, and insufficient documentation can be caused by the high cadence embedded in iterative development (**ID2**). Figure 4.14 visualizes the identified relationships among the ASD core concepts and the different benefits, as well as the issues in the ***task*** dimension.

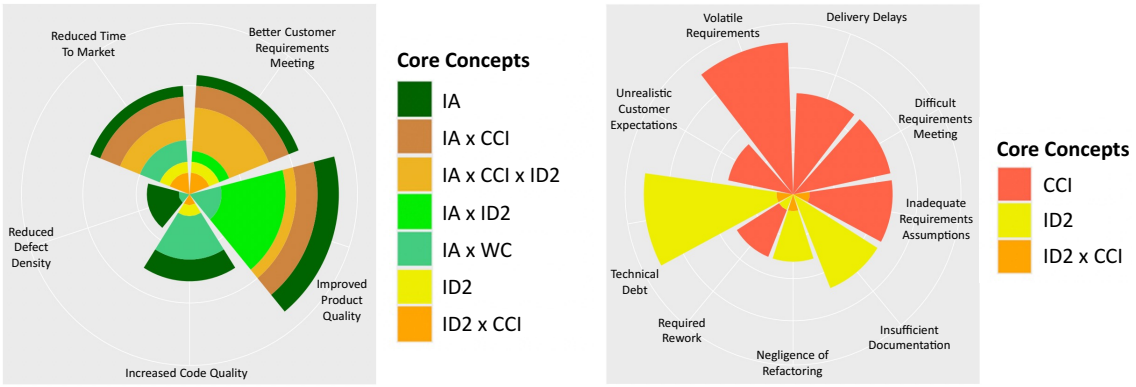

Figure 4.14: Relationships of ASD Core Concepts and Outcomes in the Task Dimension

In sum, for the first objective of Paper VI, the findings suggest **WC** as a key concept for almost any benefit achievable with ASD, especially for the actors and their interaction structure. Working closely with intense communication (**WC**) was also rarely found to be a reason for issues. To add, collaboratively inspecting the work done (**WC** and **IA**) appears critical to continuously improve the process, for instance, via retrospective sessions or daily stand-up meetings. Note that such meetings require adequate balancing, however, as sessions that entail **IA**-cycles can often imply different issues, such as interruptions of the workflow of developers, and reduced productivity. In analogy, the findings suggest that balancing the cadence of iterative development (**ID2**) is necessary. While contributing to improved code quality and faster deliveries, the high pace embedded in **ID2** can simultaneously induce stress on the developers due to delivery pressure or degrade the code quality due to the accumulation of technical debt. Therefore, balancing these core concepts is required to realize product-related benefits, and avoid immediate or long-term issues. In addition, customer involvement (**CCI**) is identified to be a core concept of critical importance, as task realization and interactions among actors strongly depend on client participation. Regarding the identified issues, most of them seem associated with lacking customer involvement in some form, suggesting that **CCI** is fundamental for business value creation in ASD. As a last insight, the analysis reveals that benefits of ASD are usually attained through the interaction of several of the core concepts, while most issues can be attributed to an inadequate execution of one specific core concept of ASD. Figure 4.11 to Figure 4.14 underline this impression, as interactions of **IA** and **WC**, **IA** and **ID2** or **IA** and **CCI** appear related to a substantial range of identified benefits. On the contrary, issues such as delivery pressure and technical debt seem clearly linked to **ID2**, while lacking feedback, volatile requirements, and delivery delays can be attributed to inadequate **CCI**.

In sum, through the identification of various relationships among the ASD core concepts that entail the characteristics of agility in ASD methodologies, and their resulting benefits as well as issues, Paper VI contributes insights into how ASD creates the broad spectrum of associated outcomes. The results address the fourth research question of the dissertation, finding that benefits are usually created through interactions of several core concepts, while issues seem mostly related to an inadequate execution of one specific core concept.

For the second objective, the analysis shows that some manifestation forms of the 12 contextual factors with critical relevance to ASD introduced in Section 2.4 appear more suitable than others. This suggests that certain contextual characteristics form an “agile sweet spot” (Kruchten, 2011, p. 355) for ASD methodologies, thus representing a setting in which they can ideally operate. The reconceptualized sweet spot for ASD is described next.

Figure 4.15 visualizes the ideal sweet spot for ASD methodologies through a green-shaded background. The 12 included contextual factors are separated into three groups based on their potentially problematic nature for ASD projects, with the specific manifestation forms of the contextual factors colored differently to signify their criticality. Thus, the further away from the green-shaded sweet spot, the less ideal these manifestation forms are for ASD. First, unstable teams with high turnover, high requirements volatility, old legacy systems, and low customer involvement are critical context factors that need to be avoided due to the potential issues they can cause for ASD projects. Second, fixed-price budgets, strict documentation requirements, and fully distributed, as well as very large teams beyond the recommended size of ten or fewer members (Schwaber & Sutherland, 2020), can be problematic. Third, highly complex, critical, and large projects conducted by inexperienced teams can be less ideal, but do not seem to be as critical as the previous contextual factors. Note that for some of the described contextual factors with potentially difficult characteristics, remedies exist that can allow ASD to operate reasonably well in these settings. Examples include documentation personnel for settings with strict documentation needs (Fitzgerald et al., 2006; Fruhling & Vreede, 2006) or staff rotations in distributed settings to mitigate the lack of colocation (Bose, 2008). Still, such settings are less ideal for ASD methodologies.

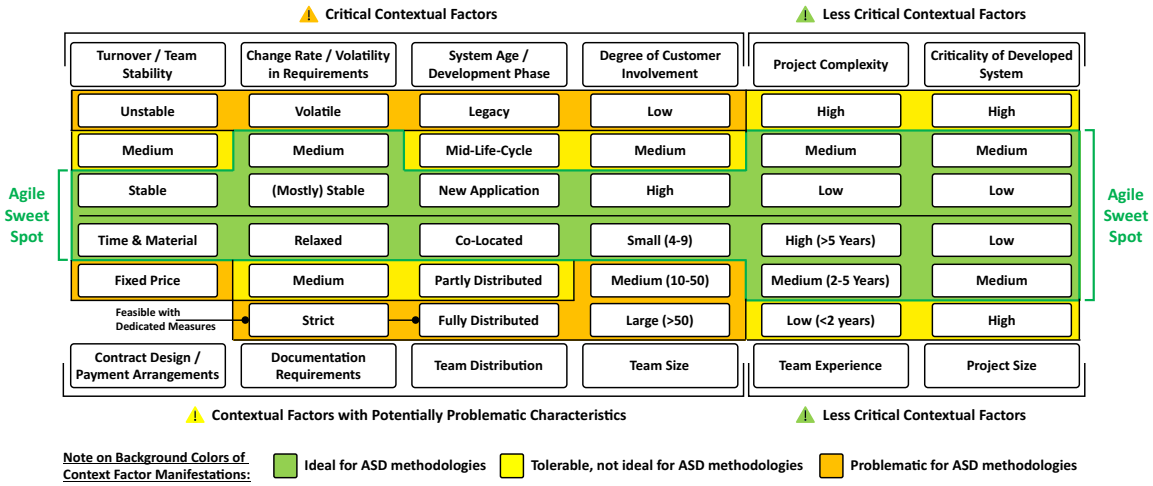

Figure 4.15: The Agile Sweet Spot for Contextual Factors in ASD Methodologies

For an ideal setting for ASD projects, which represents an "agile sweet spot" (Kruchten, 2011, p. 355), the study suggests that ASD ideally operates in projects characterized by low to medium complexity, size, and criticality, conducted by rather experienced development teams. These teams are ideally co-located and comprise a stable group of 4-9 team members. Furthermore, ASD works best under high customer involvement, where the customer continuously pays for resources on a time and material basis, and only demands relaxed documentation. Lastly, ASD projects ideally develop a new application without significant legacy with a manageable degree of requirement volatility for which ASD methodologies were initially created. While such contextual settings do not automatically promise successful development with ASD, adhering to those contextual characteristics that support ASD methodologies to operate in a more ideal window is advised.

In sum, for the second objective of Paper VI, the findings suggest that ASD methodologies are highly susceptible to the characteristics of the context in which they operate. To clarify these ideal context settings, the study reconceptualizes the previously vague model of an "agile sweet spot" (Kruchten, 2011, p. 355) for ASD. In so doing, Paper VI provides answers to the question of *when* ASD methodologies operate best, which addresses the fifth research question of this dissertation.

5 Contributions and Implications

5.1 Contributions to Theory

This dissertation consists of three parts, where each part addresses a specific research objective and research questions. The first part focuses on the benefits forming the business value of ASD and the issues that constitute its dark side, thereby addressing the question of *what* outcomes ASD methodologies entail. The second part examines *how* ASD practices contribute to the realization of business value, while also focusing on mitigation measures to address issues that impede its delivery. The third part investigates *how* and *when* ASD contributes to different outcomes, based on the characteristics of the concept of agility and the contextual settings in which ASD is used.

5.1.1 Understanding Business Value and Dark Sides of Agile Software Development

Thus far, a lack of conceptual clarity of the notion of business value in the context of ASD exists. As such, the concept of business value is mostly taken for granted in ASD research (Alahyari et al., 2017), remains volatile (Racheva et al., 2009), or lacks explicit definitions, which is also the case in the related domain of VBSE (Salleh et al., 2023). Dedicated studies on the concept of business value in ASD underscore this volatility and unclarity, as a heterogeneous range of beneficial outcomes is assessed (e.g., Heidenberg et al., 2012; Kautz et al., 2014; Racheva et al., 2010). To add, while various literature reviews on ASD methodologies have been published since their introduction (e.g., Campanelli & Parreiras, 2015; Inayat et al., 2015; Vallon et al., 2018), business value and beneficial outcomes have mostly been neglected by such reviews. This is also apparent in a tertiary study on ASD methodologies by Hoda et al. (2017), where comprehensive studies dedicated to the benefits of ASD are not represented. In a similar vein, a negligence of the issues of ASD is apparent, as studies on the dark side seem generally rarer than those investigating the beneficial outcomes. In this regard, systematic studies on the issues of ASD methodologies are also missing, which contributes to the fragmentation of knowledge on the undesirable outcomes of ASD. Consequently, the current literature base lacks a consolidated understanding of the outcomes that constitute the business value concept and the dark side of ASD methodologies.

To contribute to the closure of the literature gap on the business value of ASD methodologies, the first part of this dissertation offers two literature reviews on beneficial outcomes (Paper I and II). Based on the classification and systematization of findings from previous empirical studies, both studies together develop a comprehensive account of the suggested multidimensionality of the business value concept in the ASD context (Racheva et al., 2009). In doing so, Paper I and II highlight the most prominent benefits examined in prior research, suggesting which beneficial outcomes are central to the ASD business value concept. Notable benefits include improved communication, higher software quality, increased productivity, reduced time to market, or better customer requirements meeting, see Section 4.2. Along these and other beneficial outcomes, Paper I and II also corroborate evidence from the literature that suggests that “business value is not only dollars” (Racheva et al., 2010, p. 131) in the specific context of ASD methodologies. Instead, as shown in the ASD business value classification framework in Paper II, a substantial range of other beneficial outcomes besides financial aspects needs to be considered to adequately represent

the business value creation potential of the methodologies. Also, assessing the realized business value needs to adopt a multidimensional perspective regarding the beneficiaries that profit from the use of ASD methodologies. In this vein, the ASD business value classification framework highlights that ASD can especially benefit the developers and the team, the SD process, the product deliverables, and the customer in various ways. In contrast, financial outcomes, such as on-budget delivery, are only rarely reported in the literature. Hence, this dissertation emphasizes the need to evaluate the business value of ASD methodologies from a multidimensional stance, as was already indicated in earlier research efforts, e.g., Racheva et al. (2009). Together with a new, comprehensive definition developed in Paper II, the "slippery and highly volatile" (Racheva et al., 2009, p. 153) ASD business value concept is therefore more explicitly delineated by this dissertation, with a stronger emphasis on valuable aspects beyond financial benefits. Future research on ASD methodologies and VBSE can adopt this definition and the proposed classification framework to more explicitly define *what* business value entails in the context of their studies.

Besides providing more conceptual clarity on the business value of ASD methodologies, the literature review in Paper I proposes to investigate how certain ASD practices contribute to specific beneficial outcomes, as the study finds apparent relationships among applied practices and resulting benefits. This gap, which is addressed in Paper II, will be subsequently discussed in Section 5.1.2 within the second part of the theoretical contributions. Furthermore, Paper I and II suggest that certain benefits of ASD are better understood, while for some of the identified beneficial outcomes more research effort still seems required. Paper II and Table 4.2 can thereby serve as a foundation for future studies that investigate the spectrum of beneficial outcomes. Based on the identified benefits, Paper II highlights well-understood beneficial outcomes, while also pointing out those benefits that have received less attention. Here, less frequently examined aspects, e.g., business-IT alignment, reduced work exhaustion, or developer innovativeness, are benefits to be investigated in greater depth. Doing so would ensure that also the less prominent, yet important benefits, compared to commonly investigated aspects such as job satisfaction, software quality, or productivity, are more thoroughly understood by the ASD research community.

In sum, Paper I and II provide an extensive systematization of benefits forming the business value of ASD methodologies. Together, these studies offer insights into which benefits are well understood and which require more attention, and highlight the importance of aspects beyond financial benefits, thereby contributing to a better understanding of the debated concept in future research.

To address the lack of systematic insights into the negative outcomes of ASD, Paper III contributes a synthesis of issues identified in prior empirical literature. This systematization represents a key contribution of this dissertation, as the dark side of ASD methodologies appears more neglected, compared to the previously discussed business value concept. To add, prior reviews on issues, e.g., challenges of ASD requirements engineering practices (Inayat et al., 2015) or communication challenges in distributed ASD (Alzoubi et al., 2016), only systematized a select field of issues related to the methodologies. Studies with a wider perspective, such as Fitriani et al. (2016), also only focused on a limited set of issues reported in related literature. To mitigate this literature gap, Paper III offers a comprehensive review of issues that ASD can imply, which can provide a general impetus to more thoroughly investigate the downsides associated with the methodologies, as more studies in this direction also only seem to emerge more recently.

Like the business value concept assessed in Paper I and II, Paper III suggests that the dark side of ASD methodologies is a multidimensional phenomenon. In this vein, a large spectrum of issues is identified that negatively affect multiple constituents involved in ASD, especially the developers, the team, the product, and the SD process. To emphasize this, Paper III highlights the most critical issues in the literature base. Especially volatile requirements, inefficient communication, iterative pressure for developers, stress, technical debt, lacking documentation, and inadequate customer involvement were identified as problematic. In analogy to Paper I and II, Paper III also informs scholars about frequently investigated issues in prior research, thereby allowing for the identification of aspects that still require more in-depth consideration. In this vein, potential issues to be investigated further include peer pressure among developers, exhaustion of developers, effects of task and context switching, or the influence of lacking customer knowledge. Doing so would contribute to a deeper understanding of the spectrum of potential issues related to ASD.

Paper III also adds to the literature by conducting an analysis of relationships among these issues. In doing so, the study identifies issues that seem to be antecedents of other issues that occur subsequently. Thus far, research mostly illustrated *what* issues can generally occur, yet did not examine *how* certain issues stimulate the occurrence of other negative outcomes. With the relationship analysis, a more in-depth perspective on the dark side of ASD is enabled, revealing the core drivers of various common issues. Here, volatile requirements, inadequate customer access, delivery and time pressure, inadequate architectures, meeting overhead, and inadequate architectures can be pointed out as key antecedents. By looking into these critical issues and the different consequences they seem to provoke, research can better understand *how* and *why* subsequent issues emerge. To add, identifying the causes behind critical issues can help to develop means to mitigate them adequately and to avoid further negative repercussions, as is for instance conducted in Paper V. Furthermore, by focusing on several root causes that form issue chains of subsequently occurring problems, such as a lack of customer involvement and the constant time and delivery pressure, a large range of other issues appears less likely to occur. Adopting this perspective and identifying further root causes that contribute to the complexity of the spectrum of issues in ASD may thus provide a path for future efforts to better illuminate the dark side of the methodologies.

Lastly, Paper III identifies several shortcomings in the examined studies. First, Paper III finds that contextual factors are rarely described satisfactorily in the literature, with only a few of the studies thoroughly reflecting on how the context contributed to the identified issues. Several studies that feature a comprehensive account of the context, however, suggest the importance of the role of contextual factors that contribute to the identified issues. Hence, more focus on the context of ASD appears required to thoroughly evaluate how the observed outcomes come into existence. Also, Paper III finds that quantitative studies are considerably rarer than qualitative approaches. Paper II suggests a similar tendency, yet the ratio of quantitative to qualitative studies seems less pronounced. Still, qualitative approaches are generally more common in ASD research, which is a persisting trend found in related review studies, e.g., Jalali and Wohlin (2012), Vallon et al. (2018), or Behutiye et al. (2020). More quantitative studies should thus be conducted to investigate and confirm the mechanisms that contribute to the spectrum of outcomes in ASD.

In sum, Paper III provides a comprehensive systematization of issues that can help future efforts in better grasping the rather negative outcomes of ASD methodologies, especially supported by an analysis of the relationships of these issues. Combined with the findings from Paper I and II, this part addresses the question of *what* characterizes the business value and the dark side of ASD methodologies, thereby providing more conceptual clarity for both sides of the outcome spectrum.

5.1.2 Achieving and Sustaining Business Value in Agile Software Development

Examining how ASD practices create different beneficial outcomes is key to better understanding how ASD methodologies contribute to business value creation. Early ASD research, however, did not "clearly [indicate] how exactly individual agile practices, or groups of practices, create [business] value" (Alahyari et al., 2017, p. 272). Combined with a lack of systematization of findings that eventually assessed how specific ASD practices create business value, the question of which ASD practice contributes which benefits remained rather opaque, as findings seem only scattered across the literature. To add, prior studies on the benefits of certain groups of ASD practices, e.g., the group of social/PM practices, only focused on select benefits, e.g., communication (Hummel et al., 2015), or psychological safety and team performance (Hennel & Rosenkranz, 2020). In doing so, prior work seems to neglect other benefits such practices can have. Consequently, how different ASD practices contribute to the spectrum of beneficial outcomes related to the business value of ASD methodologies remains rather inconclusive. Besides examining how to contribute to ASD business value, also understanding how to sustain its delivery appears critical, especially in light of various issues identified in Paper III, or other barriers affecting business value creation found in Alahyari et al. (2017). However, prior studies did not provide in-depth insights into how business value delivery in ASD can be negatively affected by such issues, nor suggest measures to help mitigate them. To address these gaps in the literature, the second part of this dissertation includes two empirical studies (Paper IV and V), while also referring to findings on ASD practices in Paper II to assess *how* ASD practices contribute to business value, and *how* it can be sustained.

To provide more clarity on *how* ASD practices contribute to certain benefits, Paper II develops a systematization of 22 ASD practices, divided into social/PM and technical/SE ASD practices, and the benefits they provide for the constituents of ASD. The study finds significant differences between the two types of practices, where social/PM practices especially benefit the SD team, the individual developers, and the relationship with the customer. Technical/SE practices, meanwhile, deliver benefits especially for the product and the SD process. Hence, PM practices seem primarily related to rather social benefits, whereas SE practices particularly relate to the technical benefits of ASD, corroborating the socio-technical nature of ASD (Hoda, 2022). The systematization can inform future efforts about relationships among practices and outcomes that appear well understood, while pointing out less frequently identified relationships that require more consideration. To add, it can serve as a theoretical foundation for studies in the formulation of hypotheses regarding applied ASD practices and examined outcomes. Future research can also profit from the systematization when examining configurations of practices, rather than assessing them in isolation, and determine which combinations of ASD practices imply recipes for specific beneficial outcomes. Malik and Orr (2022) made a valuable step in this direction by investigating configurations of ASD components (i.e., communication, iterative and incremental development, as well as team autonomy and diversity), and their effects on successful work outcomes. By adopting the systematization, research could, in analogy, determine which combinations of ASD practices lead to specific benefits, such as higher product quality or reduced time to market. Doing so would enable a more nuanced understanding of how different configurations of ASD practices lead to specific benefits, instead of only inspecting their influence on successful work outcomes as a joint construct, as was done by Malik and Orr (2022). In sum, Paper II delivers systematic insights into how ASD practices differ regarding their benefits, thus providing a foundation for future efforts.

To examine "how […] individual agile practices, or groups of practices, create value" (Alahyari et al., 2017, p. 272), Paper IV assesses the benefits of a select group of social/PM ASD practices. This study adds to the literature by assessing how the social practices of ASD influence aspects beyond communication (Hummel et al., 2015) or psychological safety and team performance (Hennel & Rosenkranz, 2020). The results suggest that these practices can lead to several developer-related and economic benefits, e.g., lead time, requirement correctness, perceived complexity, or developer satisfaction, through the realization of social agile principles.

In this study, especially shared leadership as a social/PM ASD practice is identified as a key driver of social agile principles that contribute to a range of benefits. This observation adds to emerging research on agile leadership (Modi & Strode, 2020), offering insights into how this specific leadership style, where the team is jointly responsible for task completion (Strode, 2015), contributes to the benefits of ASD. In addition to improved focus and dedication of the team achieved with shared leadership (Moe et al., 2009), Paper IV identifies improvements in communication and the ability to self-organize as a team. Future efforts can build on these findings to examine how shared leadership and other leadership styles suit ASD in the realization of benefits and the mitigation of issues, for instance, in different contexts, as suggested by Modi and Strode (2020).

Paper IV also makes an unexpected finding on the role of communication, which was suggested as a key benefit of social/PM ASD practices in Hummel et al. (2015) and is a common benefit found in Paper II. According to Paper IV, communication does not affect any of the examined benefits. This seems surprising; however, related work also suggests that "communication is no 'silver bullet' for successful [ASD]" (Hummel et al., 2013, p. 7). Instead, Paper IV finds business-IT alignment resulting from social/PM ASD practices to be important for economic and developer-related benefits. Thus far, business-IT alignment has only received limited attention in ASD research, e.g., in Elbanna and Murray (2009) or Vacari and Prikladnicki (2017), with its role in benefit realization being even less regarded. Related research on business-IT alignment, however, finds alignment between business and IT to foster company performance (Luftman et al., 2017). Here, communication contributes to business-IT alignment, while communication on its own does not improve performance. This analogy, i.e., the lacking influence of communication on benefits in Paper IV, while business-IT alignment contributes to several of them, suggests that introducing business-IT alignment as a new concept in studies on the mechanisms behind ASD's outcomes could enable a new perspective. Also, enriching extant views on agility, e.g., the ASD core concepts framework by Baham and Hirschheim (2022) with the concept of business-IT alignment, in addition to communication and customer involvement, can contribute to the development of the "theoretical glue" (Conboy, 2009, p. 344) in ASD. Paper IV offers a starting point for such efforts.

In addition, Paper IV underscores the importance of reflection for benefit realization, which is embedded in ASD through various social/PM practices (Baham & Hirschheim, 2022). The findings corroborate previous works on the concept of reflection, e.g., by Babb et al. (2014), Dybå et al. (2014), or Talby et al. (2006), regarding its importance for continuous improvement or to enhance productivity (Babb et al., 2014). It also adds to the literature by pointing out that reflection, which is especially driven by retrospectives and shared team leadership, stimulates other benefits. In particular, developers profit from reflection, yet also economic aspects, such as reduced lead times, requirement correctness, and productivity, can be positively stimulated.

Taken together, Paper IV reveals business-IT alignment resulting from social/PM ASD practices as an important driver of benefits, underscores the role of reflection, while also pointing out the

importance of shared leadership. The study also enables a better understanding of the benefits that the specific type of social/PM ASD practices contribute, extending knowledge beyond previously examined beneficial outcomes. In sum, Paper II and Paper IV provide theoretical and empirical insights into *how* distinct ASD practices contribute to the realization of business value.

With regard to the second study included in this part of the dissertation, Paper V makes empirical contributions to knowledge on the dark side of ASD by identifying *how* issues affect the delivery of business value and examining *how* to sustain it with specific mitigation measures. Paper V informs research about the specific consequences that six key issues identified in Paper III can imply for business value delivery. The study focuses on meeting overhead, technical debt, volatile requirements, required rework, delivery pressure, and lacking customer involvement. While the relationship analysis in Paper III identifies some of their consequences, the specific consequences they may cause for the delivery of a valuable software product thus far remained less clear. Paper V offers deeper insights by revealing such consequences on a more fine-grained level of detail. In this vein, degraded product quality, missing product capabilities, wasted efforts, additional required work, and security issues in products are problematic consequences. With these findings, Paper V adds to the literature by elaborating on relationships between key issues and resulting negative consequences for business value delivery, which was also missing in related studies that discuss barriers to value creation (Alahyari et al., 2017). Such insights can aid future research in further examining the complexity of the dark side of ASD and how it can undermine the promise of the methodologies for a continuous delivery of valuable software products (Beck et al., 2001).

Paper V also enriches ASD literature with empirical insights into how critical issues can be mitigated by providing a set of practical adaptation measures. Previously, such mitigation measures to adapt to critical issues and to sustain business value delivery remained scattered in the literature base. The derived set of 48 mitigation measures provides more in-depth insights into how practitioners deal with value-diminishing issues or barriers, which was not discussed in prior works, e.g., Paper III or Alahyari et al. (2017). Here, procedural changes, technical measures, and dedicated roles acting as firewalls present new avenues for scholars to explore how ASD methodologies can effectively deliver business value when facing critical issues. Also, emerging research on resilience engineering in SE can be informed by the findings of Paper V. Resilience engineering aims to identify problems that can affect development progress and find adaptations or compensations for them, with the goal of improving the performance of SD processes (Lopez et al., 2023). For this goal, the proposed measures may serve as a foundation for research that assesses how problematic episodes in ASD methodology use can be overcome via resilience engineering.

Furthermore, Paper V contributes towards the resolution of diverging perspectives on the concept of rework in ASD between research and practice. Rework was found to be a frequent issue in Paper III and described as problematic in related works, e.g., due to its influence on development cost (Hoda et al., 2011; van Waardenburg & van Vliet, 2013). However, rework is deeply embedded in ASD, e.g., through refactoring in XP (Wells, 2001). As such, rework is performed to continuously provide new functionalities or to fix defects in the software (Fairley & Willshire, 2005), making it an essential aspect of ASD business value creation. Several experts interviewed in Paper V corroborate the importance of rework, suggesting it to be the only way to realize business value. This, however, only appears valid as long as it implies ‘good rework’ that advances the product and does not represent unnecessary gold plating of features, as similarly suggested in the rework taxonomy by Fairley and Willshire (2005). Consequently, Paper V clarifies the key role of rework for ASD business value, while also suggesting measures to deal with its less desirable forms.

Lastly, Paper V informs ASD method tailoring research about the benefits of micro-level tailoring (Fitzgerald et al., 2006). Most identified measures imply "micro-level tailoring of development practices at a finer level of granularity" (Fitzgerald et al., 2006, p. 204), suggesting that nuanced, small customizations of ASD play a key part in business value creation. For tailoring research, inspecting how small adaptations of ASD influence success seems promising, as prior research mostly focuses on how adding more ASD practices leads to SD success (Tripp & Armstrong, 2016). In addition, research assessed criteria according to which ASD is being tailored, and the two main approaches of contingency factor-based tailoring and method engineering (Campanelli & Parreiras, 2015). Smaller, micro-level adaptations of ASD and their contributions to business value creation appear less regarded, however. Consequently, Paper V can serve as a foundation for future studies in the ASD method tailoring research domain to assess how adaptations of ASD with small measures can mitigate issues and contribute to business value. In doing so, tailoring research may also examine how existing ASD frameworks could be enriched with the suggested measures. Taken together, Paper V provides empirical insights into *how* business value delivery can be sustained in ASD, while also adding to knowledge on the dark side of ASD methodologies by outlining the negative consequences of critical issues if they are not adequately mitigated.

In sum, the second part of this dissertation offers empirical and theoretical insights into *how* ASD practices contribute to business value, with a specific focus on social/PM practices in Paper IV. Combined with Paper V, also a perspective is given on *how* business value delivery can be sustained in light of critical issues, enriched with insights into the mitigation of the dark side of ASD.

5.1.3 Towards Explaining the Outcomes of Agile Software Development

Agility is a fundamental concept of ASD (Baham & Hirschheim, 2022), examined in various prior studies, e.g., Lee and Xia (2010), Batra et al. (2016), or Rathor et al. (2023). Research proposes that agility "[contributes] to perceived customer value (economy, quality, and simplicity), through its collective components" (Conboy, 2009, p. 340). Still, research struggles to determine how the core characteristics of agility contribute to beneficial and negative outcomes of ASD identified in Paper I-III, e.g., due to the "lack of theoretical glue" (Conboy, 2009, p. 344) for agility. Recent advances by Baham and Hirschheim (2022) to develop a theoretical core for agility can help to address questions such as "which aspects of ASD may impact outcomes" (Baham & Hirschheim, 2022, p. 109), or how agility contributes to "desired outcomes such as time to market and software quality" (ibid., p. 119). Similarly, considering the issues found in Paper III, assessing how the characteristics of agility contribute to issues in ASD also seems realizable. Developing insights in this direction would contribute to a better understanding of the relationship between agility and the outcomes of ASD. However, systematic studies in this direction are still lacking. Besides examining how the core characteristics of agility contribute to benefits and issues, also understanding the specific contexts in which ASD ideally operates is important. This seems especially critical, considering the decontextualization of ASD (Kruchten, 2007, 2011), context-reductionist strategies employed in research (Baham & Hirschheim, 2022), and the lack of detailed descriptions of the context in which studies on ASD are conducted (c.f., Jalali & Wohlin, 2012; Vallon et al., 2018). Consequently, as suggested in Baham and Hirschheim (2022), the third part of this dissertation aims to develop answers to "*how*, *why* and *when* ASD impacts outcomes" (p. 107).

Following this call, Paper VI presents a literature study that uses the theoretical core concepts framework by Baham and Hirschheim (2022) to understand *how* agility creates the outcomes of

ASD. For the aspect of *when*, i.e., in which contexts ASD ideally operates, Paper VI develops a model of key contextual factors that affect ASD methodologies and their outcomes. Together, the study offers contributions to research on agility and its "theoretical glue" (Conboy, 2009, p. 344), and illuminates the somewhat underexposed role of contextual factors in ASD methodologies.

With regard to agility and its contributions to benefits, the concept "working cooperatively/collaboratively/in close communication" (WC) is identified as a fundamental aspect of agility in ASD. Paper VI finds that almost every benefit requires well-functioning communication and collaboration among participating members, making it the backbone of ASD methodologies. This observation corroborates dedicated studies highlighting the importance of communication in ASD (e.g., Hummel et al., 2013; Hummel et al., 2015; Pikkarainen et al., 2008), while underscoring its key role in the realization of benefits. In addition, the concept of WC rarely causes issues. Paper VI also adds to the literature by distilling benefits of communication besides productivity increases, better software quality, or less time required (Hummel et al., 2013). As such, it finds that communication is critical for process transparency, team cohesion, and trust. Together, the findings thus emphasize how "communication and collaboration are at the heart of [ASD]" (Karhatsu et al., 2010, p. 298), making them both critical aspects to be ensured for business value creation.

Besides communication, Paper VI points out "continuous customer involvement" (CCI) as a central, yet also problematic concept if not adequately executed. In line with dedicated work on insufficient customer involvement (Hoda et al., 2011), this concept is identified as a major driver of issues occurring in ASD. Especially product-related aspects, the relationship among the team and the client, and productivity can be negatively affected. On the other hand, achieving benefits in ASD strongly depends on customers who are continuously involved, e.g., to meet requirements, provide software swiftly, and to respond to changes faster. Paper VI thus confirms the imperative need of ASD for customer involvement in the realization of benefits and the avoidance of issues.

Like Paper IV, Paper VI recognizes the benefits of continuous reflection. Embedded in the concept of "inspect and adapt cycles" (IA), reflection and inspection contribute to a range of beneficial outcomes, especially for product quality or process refinement. Combined with communication (WC), the core concept of IA also increases transparency, enhances productivity, and fosters knowledge sharing. Frequent inspections and reflection in ASD should thus be ensured, e.g., via retrospective meetings for continuous process improvement or demos to improve the product (Babb et al., 2014). However, too frequent inspections seem to be a cause of various issues, such as stress, meeting overhead, or demotivation and frustration of developers. This observation contributes to knowledge on reflective practices, suggesting that excessive reflection and inspection may also cause issues. In this line of thought, it seems that both the core concept IA and also "incremental design and iterative development" (ID2) can be a double-edged sword. Hence, Paper VI proposes that a balanced execution of agility characteristics is required, as is described next.

ID2 and IA generally need to be implemented to attain key benefits of ASD. However, ID2 and IA can also be 'too much of a good thing', if executed excessively. Too frequent inspections and a high iteration cadence can trigger undesirable outcomes, such as stress, delivery pressure, meeting overhead with reductions in productivity, technical debt, and a lack of documentation. In this line of thought, Hoda et al. (2012) suggest that iteration pressure implied by ID2, "in itself, is not detrimental to the team, in fact some amount of iteration pressure is necessary to motivate teams to deliver their goals. Short iteration lengths or an extremely high and unsustainable development velocity, on the other hand, can cause excessive iteration pressure" (p. 828). Similarly, inspections

in meetings (IA) are necessary, e.g., to create transparency of the development status (Hossain et al., 2009; Overhage & Schlauderer, 2012a), yet too many meetings cause interruptions (Stray et al., 2016; Wiesche, 2021). Based on these observations, Paper VI proposes that core concept execution and outcome realization could resemble an inverted U-shaped relationship. This implies that not implementing certain core concepts is problematic, while excessive execution is similarly harmful. Consequently, identifying an optimum degree of execution is required, i.e., a tipping point, to maximize benefits and avoid issues. In related literature, studies that adopt an inverted U-shape perspective on ASD are scarce yet, e.g., Iivari and Iivari (2011). In light of these findings, however, investigating the relationship among core concept execution and outcomes with a non-linear, inverted U-shape perspective may open new opportunities for future efforts to understand the interplay of benefits and issues in ASD, for which Paper VI can offer a valuable starting point.

Furthermore, this dissertation offers a first operationalization of the agility framework by Baham and Hirschheim (2022). In doing so, Paper VI contributes towards validating the proposed theoretical core, while also providing extensions. First, the study suggests that core concepts can also lead to undesirable outcomes, while Baham and Hirschheim (2022) primarily focused on the benefits of agility, thereby neglecting the dark side of ASD. This is a key aspect that should be considered when employing the framework. Second, the study proposes a potential non-linearity of core concept execution and outcome realization, contributing to a more profound characterization of agility in ASD. Third, Paper VI suggests that the core concepts are highly interlinked in their realization of outcomes. Baham and Hirschheim (2022) propose that ID2 and IA are "inextricably linked to one another" (p. 112), with WC and CCI also being closely related. However, Paper VI shows that the core concepts are more strongly interwoven than initially presumed, especially in the creation of benefits. As such, most benefits seem to result from the interaction of several core concepts. Contrastingly, an inadequate execution of core concepts, e.g., CCI or ID2, causes issues to occur. This finding informs studies that investigate how core concepts in combination contribute to benefits or issues, e.g., via qualitative configurational analysis (QCA), similar to Malik and Orr (2022). Consequently, Paper VI contributes towards enhancing the theoretical core concepts framework, informing future studies that utilize it to study how agility contributes to ASD's outcomes. Especially empirical studies can adopt these findings, as Baham and Hirschheim (2022) "did not empirically test the framework" (Rathor et al., 2023, p. 6) yet. Overall, Paper VI thus offers new insights into *how* agility contributes to the benefits and issues of ASD methodologies.

With respect to the critical role of contextual factors, the third part of this dissertation develops a framework of ideal contextual characteristics for ASD. The proposed framework extends the perspective on key contextual aspects beyond the limited set of factors investigated in previous studies, e.g., Kruchten (2011) or Hoda et al. (2010) by pointing out essential aspects that need to be considered. In this regard, the framework outlines the suitability of different context factor manifestation forms, detailing compatible settings for ASD, while highlighting factors that are problematic. In doing so, the framework also delineates and clarifies the "agile sweet spot" (Kruchten, 2011, p. 355) that thus far remained vague. Relying on this new sweet spot model can aid future research to better understand the influence of the contextual setting on the outcomes observed in their studies. With the reconceptualized sweet spot, Paper VI contributes toward answering *when*, i.e., in which contextual circumstances, ASD is well-situated to contribute to beneficial outcomes.

In addition, Paper VI and the contextual factor framework help to counteract the decontextualization of ASD (Kruchten, 2007, 2011). In light of the strongly varying degree of details provided on the context in the studies examined by Paper VI, which is an issue that continues to exist in

ASD research (c.f., Jalali & Wohlin, 2012; Vallon et al., 2018), this dissertation can serve as a reminder for future studies to more thoroughly report on their contextual setting. This especially concerns multiple case studies, which often report on the context in a fragmented manner. Here, the framework, which highlights the most critical contextual factors for ASD, can serve as a foundation for scholars to describe the setting of their studies in a more unified, detailed fashion. Doing so would overall help to better contextualize empirical findings from the ASD field and help to "better understand what works for whom, where, when, and why" (Dybå, 2013, p. 81) in ASD.

In sum, the third part of this dissertation adds to knowledge on agility in ASD methodologies and how the concept contributes to both benefits and issues. In addition, the dissertation serves to direct more attention to the critical role of context factors, which have often been neglected. Combined with the two other parts, each part of the dissertation offers theoretical contributions related to the main research questions and objectives. Table 5.1 summarizes the theoretical contributions.

Table 5.1: Main Theoretical Implications of this Dissertation

Parts	Theoretical Implications
Part I: Understanding Business Value and Dark Sides of Agile Software Development	• Systematic literature reviews on the benefits of ASD methodologies offer a definition and more conceptual clarity for the debated concept of business value of ASD. • Provides a comprehensive picture of the multidimensionality of the business value concept through a classification framework of benefits with five dimensions, while confirming that ASD business value goes substantially beyond financial benefits. • Illuminates the dark side of ASD methodologies through a literature review of issues, thereby systematizing the frequently neglected downsides of the methodologies. • Investigates relationships among issues to determine key drivers of the dark side, finding that several issues represent antecedents for subsequently occurring problems. • Identifies paths for future efforts based on gaps in the literature on outcomes of ASD.
Part II: Achieving and Sustaining Business Value in Agile Software Development	• Provides a systematization of relationships among social/PM and technical/SE ASD practices to the different benefits they contribute, according to the literature. • Finds that social/PM practices primarily benefit the team, developers, and customers, while technical/SE practices especially stimulate the product and the SD process. • Provides further insights into the benefits that social/PM ASD practices can provide. • Reveals business-IT alignment as a potentially central, but thus far overlooked factor for the realization of benefits with ASD methodologies, alongside communication. • Explores the consequences of key issues for business value realization to advance the understanding of the complexity of the dark side that affects ASD's value proposition. • Clarifies the key role of rework for business value to resolve diverging perspectives. • Develops a set of mitigation measures to inform research about how practitioners adapt to critical issues, which can serve as a foundation for future studies on the concept of resilience engineering in SD and ASD method tailoring research in general.
Part III: Towards Explaining the Outcomes of Agile Software Development	• Identifies the primary contributions of the four theoretical core concepts behind agility (Baham & Hirschheim, 2022) for both the benefits and issues in ASD methodologies. • Proposes communication/collaboration and customer involvement as indispensable core concepts that must be ensured for benefit realization and avoidance of issues. • Suggests that some core concepts, i.e., inspect and adapt cycles/iterative development have a potentially double-sided nature with regard to concept execution and outcome creation, which could be investigated with non-linear, inverted U-shaped perspectives. • Offers a first operationalization of the ASD core concepts framework, extension of the outcome perspective to also include issues, while showing interactions of concepts. • Conceptualizes a framework of critical contextual factors and manifestation forms that affect ASD methodologies, outlining an ideal sweet spot of contextual characteristics. • Offers a foundation for future research to more adequately reflect on the contextual setting in which studies are conducted, counteracting the decontextualization of ASD.

5.2 Implications for Practice

Besides the presented theoretical implications, this dissertation provides insights that concern the application of ASD methodologies in daily SD practice. Among others, especially developers, Scrum Masters, Product Owners, and customers can draw practical implications from this dissertation. These implications mainly relate to the business value understanding in the ASD context, an increased awareness of the critical issues of the methodologies, the importance of certain ASD practices, and the significance of an adequate contextual setting to allow ASD methodologies to operate properly. Each of the three parts holds individual practical implications laid out below.

The first part of this dissertation contributes several literature reviews offering insights for practitioners about the different outcomes that can result from the utilization of ASD methodologies. First, with the systematic overviews provided in Paper I and II for the business value perspective, organizations can better understand which benefits they may derive from the use of ASD. In this regard, the classification framework in Paper II can help to pinpoint where the manifold benefits of ASD are already being realized, while also helping to identify unused potential to maximize the business value these methodologies can deliver. To add, the classification framework outlines different adoption motives for new adopters by clarifying the benefits that the use of ASD can entail. This can be helpful for members of the business side to understand the value creation potential of ASD, as practical literature reports that a major obstacle to adoption is that "business teams simply don't understand what [ASD methodologies] can do" (Digital.ai, 2024, p. 15). Based on the benefits in the classification framework, several aspects can be derived that imply convincing arguments for the business to adopt ASD, for example, faster delivery, improved collaboration among business and IT, higher transparency of development, improved productivity, and better software quality. Together, Paper I and II can thus enable practitioners, especially from the business side, to better comprehend *what* ASD can offer in terms of their beneficial outcomes.

To add, Paper I and II propose to practitioners that ASD "business value is more than just numbers" (Racheva et al., 2010, p. 140). In this regard, another challenge in practice is the difficulty to communicate and to "[measure] the value to the business" (Digital.ai, 2024, p. 16). Here, most organizations employ business metrics, metrics for individual projects, IT and flow metrics, or objective and key results (Digital.ai, 2023, 2024) to determine the delivered business value. What these metrics entail often remains opaque, however, making it difficult to comprehend what is being measured. To add, the success of SD projects, and thus also the delivered business value, is often still assessed based on the iron triangle dimensions of time, cost, and quality (Atkinson, 1999), despite calls to consider more diverse criteria. In light of the benefits found in Paper I and II, adopting more differentiated perspectives may be helpful in making the actual business value more tangible for organizations, besides only focusing on quantitative financial figures. This dissertation thus suggests that organizations could extend their focus to aspects such as reductions in lead time, increased productivity, customer satisfaction, improvements in the quality of delivered products, better meeting of customer needs, or job satisfaction of developers. Doing so would help to adequately represent the business value creation potential of ASD to the business. In addition to more differentiated perspectives, the classification framework in Paper II could also be enriched with ASD-specific metrics from prior works by Kupiainen et al. (2015), Olszewska et al. (2016), or Choras et al. (2020) to develop a measurement tool for the business value of ASD in practical settings. Doing so could enable a more detailed assessment of the provided business value, thereby allowing for better communication and measurement of this value to the business.

Meanwhile, the systematic review of typical issues occurring in ASD presented in Paper III can raise more awareness among practitioners about the dark side that the methodologies can have. As such, recent practical reports, e.g., the State of Agile reports from 2018-2021 (Digital.ai, 2021; VersionOne, 2018, 2019, 2020), only placed limited emphasis on the critical issues that practitioners encounter in daily practice. Especially for new adopters, a somewhat misleading and one-sided representation of ASD methodologies and their potential outcomes seems to have resulted. Paper III helps to resolve this impression by pointing out various critical issues that can occur in practice. In this vein, practitioners are advised to pay attention to issues such as technical debt, volatile requirements, time and delivery pressure, lacking customer involvement, or meeting overhead, as they contribute to or reinforce other problems. Especially a lack of customer involvement needs to be ensured at all costs. This issue was found to be an antecedent of various other problems, if not adequately mitigated, corroborating the findings by Hoda et al. (2011) that highlight the importance of customer collaboration. As another practical contribution on the issues of ASD methodologies, Paper V, included in the second part of this dissertation, outlines the consequences for business value delivery caused by especially problematic issues. Critical consequences include products that are misaligned from the intended requirements, security issues, and lower code quality, as well as exhausted and stressed developers. This should alert developers, Scrum Masters, and customers to carefully manage these issues to ensure a sustainable delivery of business value.

In sum, the first part of this dissertation enables ASD practitioners, especially from the business side, to better understand the business value creation potential of ASD, while also creating more awareness for the issues that form its dark side, which can diminish the delivered business value.

The second part informs ASD practitioners about the importance of certain practices for the realization of benefits (mainly Paper IV and select parts of Paper II), while also supplying a range of measures to employ when facing different issues in practice (Paper V). First, Paper II shows practitioners, e.g., developers, which ASD practices contribute to which specific benefits. In this regard, social/PM and technical/SE practices are investigated, where the former primarily benefits the SD team and the relationship with the customer, while the latter especially entails beneficial outcomes for the product and the SD process. To tailor their individual use of ASD methodologies and achieve certain objectives or business goals (Campanelli & Parreiras, 2015), practitioners can refer to this systematization and ensure that key ASD practices for a specific benefit are applied.

Regarding essential ASD practices, Paper II and IV highlight the role of retrospective meetings. Paper II emphasizes this through various relationships identified among retrospectives and benefits, e.g., continuously improved SD processes, better team interactions, or higher team cohesion. Meanwhile, Paper IV finds retrospectives and the embedded reflection to be key drivers, particularly for developer benefits, but also for more economically relevant factors such as productivity. In practice, however, retrospective meetings are often abandoned, or reflection is not frequently performed (Babb et al., 2014; Dybå et al., 2014). Considering the benefits that retrospective meetings can contribute, practitioners are advised to continuously conduct these reflective practices. Problems arising in retrospective meetings may meanwhile be mitigated with suggestions by Matthies and Dobrigkeit (2020) to attain the manifold benefits of this important ASD practice.

As another ASD practice that requires dedicated attention, this dissertation proposes contrasting findings for the use of daily meetings. While Paper II identifies daily meetings to be a key practice to improve communication, collaboration, transparency, and problem management in ASD, Paper IV and V suggest a potential ineffectiveness of these meetings and identify several problems they

may cause. Especially overhead due to excessive meeting lengths, interruptions, a loss of focus, and lower productivity stand out in Paper V, similar to the issues found in related works by Stray et al. (2016), Cho (2008), or Wiesche (2021). To add, Paper IV finds no significant effects of these meetings on social principles in ASD, suggesting a rethink of how daily meetings are being conducted in practice. In this vein, Paper V provides practitioners with a range of measures that can help to address some issues that daily meetings and other ceremonies may have. As such, adding a 16th minute to the end of the daily meetings, limiting the number of participating members, or relying on a three-week sprint with a core focus week can imply potential remedies for typical issues of the meetings in ASD, thereby making them more effective. Other measures taken thus far, such as the refinement of the daily meeting to be less prescriptive through the elimination of the three guiding questions, as suggested in the current edition of the Scrum guide (Schwaber & Sutherland, 2020), can also contribute to improving the effectiveness of this key ASD practice.

Lastly, besides offering practical implications for the utilization of several key ASD practices, the second part of this dissertation provides practitioners with a set of 48 measures to mitigate typical issues. The measures identified in Paper V, including several that were already mentioned above, serve as a toolkit to address issues such as delivery pressure, lacking customer involvement, meeting overhead, technical debt, or volatile requirements. Applying the empirically derived measures can support practitioners in avoiding the negative consequences of these issues for a continuous delivery of valuable software. To add, the measures may help practitioners in dealing with issues in a more targeted fashion, rather than circumventing them with an ineffective deviation from the intended process, known as antipatterns (Brown et al., 1998). Instead of adopting such antipatterns that can have harmful consequences in the long run (Eloranta et al., 2016) and do not address the issue in question, these measures can offer a helpful remedy for commonly encountered issues.

In sum, the second part of this dissertation informs practitioners about which specific ASD practices contribute to which beneficial outcomes. Furthermore, it can remind practitioners about the importance of retrospective meetings, while also pointing out issues that may arise in daily meetings. Finally, with the set of practicable measures to manage typical issues in ASD methodologies, the second part can also support practitioners in ensuring a continuous delivery of business value.

The third part of this dissertation stresses the need for a sustainable execution of ASD in practice to realize benefits and avoid issues that can simultaneously occur. Besides, it again underscores the essential role of the customer for benefit realization. Regarding the need for sustainable development, Paper VI indicates that frequent inspections in ASD and highly-paced, iterative development can be a double-edged sword. While both contribute to a product that fulfills customer requirements (Anderson et al., 2017; Vidgen & Wang, 2009) and the continuous improvement of the SD process (Asnawi et al., 2012; Rodríguez et al., 2014), they can be accompanied by negative side issues. Too frequent inspections in meetings can imply stress and pressure for the team to report progress (Lagerberg et al., 2013; McHugh et al., 2011b). Similarly, excessive velocity and the need to constantly deliver software can put pressure on teams (Hoda et al., 2012) and result in technical debt (Elbanna, 2014; Martini et al., 2015). In light of these simultaneous benefits and undesirable issues, practitioners should lay particular emphasis on a sustainable form of development, as prescribed in the Agile Manifesto (Beck et al., 2001). Furthermore, as mentioned in the practical implications of the first part, Paper VI underscores customer involvement as a key component for the rapid development of a high-quality product that meets client requirements. This is also emphasized by the fact that most issues relate to inadequate customer involvement in some way, e.g., productivity losses (Hoda et al., 2011), volatile requirements (Dasanayake et al., 2019),

or delivery delays (van Waardenburg & van Vliet, 2013). Consequently, practitioners need to ensure that customers are actively engaged and aware of their critical role in ASD, for which measures from Paper V, combined with strategies by Hoda et al. (2011), can be helpful.

Finally, this dissertation provides practitioners, e.g., project managers, with a contextual factor model for ASD projects that can help them determine whether the setting in which they apply or intend to use ASD is suitable. The model outlines specific contextual aspects that can be harmful for ASD, where unstable teams, volatile requirements, legacy systems, excessive documentation needs, and low customer involvement are especially problematic. Based on the proposed sweet spot model, which highlights an ideal contextual surrounding for ASD, practitioners can aim to curate a setting that allows the methodologies to operate properly, while dedicating specific attention to less ideal contextual factors. Lastly, this model can create more awareness for the sensitivity of ASD to contextual settings, suggesting that it is not a one-size-fits-all solution for SD projects. Instead, ASD should ideally be used in small- to medium-sized, non-legacy SD projects with low to medium criticality and complexity, conducted by a stable, co-located, and more experienced team. Also, a highly involved customer paying for the resources spent, without demanding excessive changes in requirements and imposing strict documentation, is recommended.

In sum, the third part of this dissertation underscores the importance of a sustainable execution of ASD methodologies in practice, highlights the critical role of customer involvement, and provides practitioners with a better understanding of the sensitivity of ASD regarding contextual settings. Combined with the other parts, this dissertation offers several implications that can help to improve the practical use of ASD methodologies. Table 5.2 summarizes these practical implications.

Table 5.2: Main Practical Implications of this Dissertation

Parts	Practical Implications
Part I: Understanding Business Value and Dark Sides of Agile Software Development	• Literature reviews contribute to a better understanding of the benefits that using ASD entails, clarifying the business value of the methodologies for the business side. • Classification framework of benefits implies different adoption motives and allows to determine whether ASD methodologies unfold their full potential in organizations. • Studies suggest the need for differentiated perspectives on ASD business value beyond only financial benefits, while the classification framework of beneficial outcomes related to the business value of the methodologies can serve as a foundation for the development of a comprehensive measurement tool with metrics. • Consolidated knowledge on the issues of ASD methodologies helps to raise awareness of new adopters for the dark side that seems somewhat neglected in practical reports. • Study outlines the most critical issues that need to be managed closely, since they can be antecedents for a large variety of other issues that can be reinforced by them.
Part II: Achieving and Sustaining Business Value in Agile Software Development	• Systematization of social/PM and technical/SE ASD practices and benefits enables a holistic overview of which practices should be used for which benefit/business goal. • Findings highlight the benefits of retrospective meetings for developers and economic aspects of ASD, calling for a more frequent utilization in daily SD practice. • Daily meetings are found to provoke a range of issues, while potentially lacking effectiveness, suggesting the need to reconsider how these meetings are conducted. • Comprehensive set of 48 measures that can be employed to adapt to critical issues, thereby helping to prevent various adverse consequences for business value delivery.
Part III: Towards Explaining the Outcomes of Agile Software Development	• ASD needs to be applied sustainably, avoiding high iteration cadence and too frequent inspections to prevent compromising benefits due to issues emerging simultaneously. • Customer involvement is critical to realize benefits and avoid a large range of issues. • Contextual factor model can inform practitioners about the suitability of ASD for a given context and make them aware of critical factors that require dedicated attention.

6 Limitations

The findings of this dissertation are not without limitations. Potential threats to validity are explained along the dimensions of construct, internal, and external validity as well as reliability, following suggestions by Runeson and Höst (2008). Table 6.1, inspired by Uludağ (2022), summarizes the threats to validity and potential countermeasures that were employed to mitigate them.

Construct validity concerns relate to whether the investigated operational measures and concepts adequately "represent what the researcher [has] in mind" (Runeson & Höst, 2008, p. 153). Here, it is important to acknowledge that for Paper I, II, and III, which are secondary studies, some relevant articles may have been omitted, which may cause the concepts of business value and the dark side of ASD to be not adequately captured and represented in these studies. To mitigate this, a comprehensive selection of literature databases covering all relevant research domains for ASD (Baham & Hirschheim, 2022; Dingsøyr et al., 2012) is employed, including SpringerLink, AISEL, ScienceDirect, ACM, IEEE, and the Web of Science. While this was not the case in Paper I due to the explicit focus on IS literature, the follow-up study presented in Paper II helps to mitigate this concern due to its broader coverage of the relevant literature. Additionally, to reduce the potential for omission of studies, snowballing is conducted according to Wohlin (2014). These measures enable the thorough capture of findings on benefits and issues to adequately represent the concepts under study. Similar concerns may be acknowledged for Paper IV and Paper V. Paper IV potentially suffers from a limited selection of ASD success or benefits dimensions and the single-item questions for employed social/PM ASD practices. This study is designed as an exploratory study; however, the selected ASD success or benefits dimensions still seem to adequately represent a large proportion of relevant success aspects. Additionally, employing single-item scales to capture the use of ASD practices appears valid in such an exploratory setting. Consequently, this study enables an initial perspective into the beneficial outcomes of social/PM ASD practices, which can be useful for future research efforts. Paper V may meanwhile suffer from varying interpretations of the interviewed experts regarding the nature of the issues examined in the study. To ensure that responses adequately capture the investigated concepts, misunderstandings were clarified directly, while further ambiguities were later resolved through member checking (Birt et al., 2016). Lastly, capturing the interplay of the core concepts behind agility in ASD and the different outcomes can be difficult solely based on text statements extracted from the literature. To ensure that apparent relationships among ASD core concepts and the different identified outcomes are validly represented, collaborative, iterative analyses and refinements were performed by the participating authors to attain theoretical saturation (Strauss & Corbin, 1990).

Internal validity concerns can be an issue when investigating causal relationships among investigated factors, implying that a third potential factor that contributes to the investigated phenomenon is accidentally omitted or not accounted for (Runeson & Höst, 2008). This concerns all included studies, except Paper I, which does not investigate causal relationships. For Paper II, the analysis of which ASD practices contribute to which benefits only lists relationships reported in the literature, without considering additional contributing factors. This is an inherent limitation of the selected approach that needs to be considered, so that confirming such relationships is not possible with this literature-based method. Therefore, the provided overview can only offer indications. The explicit focus in Paper IV on individual social/PM practices falls in line with this limitation, so that causal inferences cannot be established. In this vein, it also needs to be acknowledged that technical/SE practices, which may have been applied alongside social/PM practices,

are not considered, so that their potential influence is not accounted for in the study. Furthermore, Paper III assesses relationships among issues, risking the omission of other contributing factors or issues that influence a certain problem. To mitigate this issue, only relationships that were mentioned in at least two separate publications are considered. This also helped to identify several core drivers of issues in ASD methodologies. Still, such inferences about causality need to be considered with caution. In Paper V, similar consequences for business value delivery may result from different issues, suggesting that confounding effects may exist in the interplay of issues and consequences. To mitigate this, cross-checking whether other issues seemed involved in the apparent causation of a negative consequence helped to clearly attribute an observed consequence to its origin. Lastly, Paper VI examines apparent relationships among the four ASD core concepts and beneficial or negative outcomes. While the ASD core concepts framework entails a comprehensive set of factors seemingly contributing to these outcomes, and interactions of several of the enclosed core concepts with regard to outcome creation can be recognized, further factors may also contribute here. Examples include self-organization, which was not explicitly defined as a core concept of agility (Baham & Hirschheim, 2022), yet still represents an essential aspect of several ASD methodologies (Hoda et al., 2012; Hoda et al., 2013). Since this aspect and potentially other relevant factors remain unaccounted for, deriving causal inferences from these insights needs to be handled cautiously. Still, the careful extraction of statements from the literature, the extensive coverage of characteristics relevant to agility captured in the ASD core concepts framework, and the calculation of frequencies of the identified relationships among the core concepts and ASD's outcomes can jointly provide valid indications of how ASD methodologies contribute to the broad spectrum of both benefits and issues.

For **external validity**, which relates to the generalizability of findings (Runeson & Höst, 2008), it needs to be acknowledged that several studies lack empirical validation, or the sample of participants in empirical studies can be regionally biased. For Paper I, II, III, and VI, it should be considered that empirical validations of the findings remain to be performed. Paper I also only covers a small set of 34 IS articles, which, however, is mitigated through Paper II, representing a follow-up study that covers significantly more literature. While not empirically validated yet, the comprehensive coverage of the literature (137 articles) suggests that the findings on the benefits in the classification framework proposed in Paper II seem generalizable for the overall context of ASD. This also holds true for Paper III and the issues investigated by this study, based on a large sample of 70 articles. While Paper II and III only capture limited insights into the contextual characteristics of the included studies, the large coverage of relevant literature and the frequencies of the identified benefits and issues suggest the findings are transferable to the general ASD context. Also, for Paper VI, which assessed the role of contextual factors in a second analysis step using 122 studies, the findings seem generalizable, especially considering the 148 individual cases extracted from the literature sample. Lastly, for Paper IV and V, a regional and industry bias needs to be considered. The samples of both studies primarily consist of participants from the DACH region (Germany, Austria, Switzerland), or India (only in Paper IV), indicating a potential regional bias. Also, most participants work in the IT/ICT industry, which may entail limited generalizability to other industries. In Paper V, semantically consistent statements were also identified from experts from other countries and industries, while a certain degree of saturation and consistency was apparent after around 10 interviews. These observations suggest that the findings are transferable to other regions and industries. For Paper IV, these biases cannot be fully ruled out, thus representing a limitation that needs to be considered in the interpretation of the results.

Lastly, **reliability** concerns relate to the analysis of data and whether different researchers would arrive at the same results (Runeson & Höst, 2008). Here, it is important to acknowledge that the analysis of qualitative data "always [involves] the researcher as the analytical instrument, so they are a more subjective form of research than quantitative research" (Recker, 2021, p. 123). As most studies in this dissertation, especially Paper I-III, V, and VI, rely on qualitative research methods, ensuring the reliability of the findings is essential. To do so, the studies follow established guidelines for literature reviews, i.e., vom Brocke et al. (2009) or Kitchenham and Charters (2007), data collection (Bogner et al., 2009; Myers & Newman, 2007), and data analysis, including the recommendations by Gioia et al. (2013), Wolfswinkel et al. (2013), or Saldaña (2021). Furthermore, all studies, except for the single-author publication (Paper III), involved several authors in the data collection and analysis steps, with substantial interrater reliability scores (Landis & Koch, 1977) obtained that suggest an unbiased and reliable analysis procedure. To further enhance reliability, all studies also provide supplementary materials to enable traceability of the research process, for instance, code books or study protocols (Recker, 2021). These supplementary materials are provided via online links and can be found within the fact sheet of each included paper. Lastly, for Paper IV, the scale reliability, i.e., internal consistency of some multi-item constructs (Recker, 2021), appears somewhat low. As an example, the Cronbach's Alpha value for lead time is determined at $\alpha = 0.67$. However, since Paper IV is an exploratory study and the construct validity still ranges above $\alpha = 0.60$, this value is still acceptable for exploratory studies (Hair et al., 2009; Nunnally, 1978). Consequently, the reliability of findings in Paper IV is not substantially affected.

Taken together, the results of this dissertation are primarily restricted in their generalizability, as well as the confirmability of causal relationships between investigated factors. As will be laid out in the following section, future research is required to confirm the identified relationships among the investigated factors, such as the ASD core concepts or applied ASD practices, and the different outcomes. To add, enhancing the generalizability of the findings through empirical validations appears necessary in future works, for which this dissertation can provide a valuable foundation.

Table 6.1: Key Limitations of Studies in this Dissertation and Mitigation Measures

#	Construct Validity	Internal Validity	External Validity	Reliability
P1	⊗ Limited scope on IS literature may not fully represent the nature of ASD business value → Paper II as a follow-up study with extended focus on SE/management science research	No causal relationships among factors were investigated in this study.	⊗ Lack of empirical validation of identified aspects, with only a small sample of 34 IS articles → Paper II to provide exhaustive coverage and enable better generalizability	⊗ Subjective bias in the analysis of data and derivation of conclusions on the concept of ASD business value → Multiple authors involved in literature search and analysis procedures
P2	⊗ Omission of potentially relevant studies on the concept may exclude potential benefits → Employed snowballing and comprehensive database searches	⊗ Relationships among ASD practices and beneficial outcomes neglects other influencing factors, in addition to the negative side issues that remain unaddressed	⊗ Classification framework thus far lacks empirical validation, lack of context analysis → Large sample of 137 studies to support better generalizability	⊗ Subjective bias in the analysis of data, and derivation of conclusions → Four authors involved in the literature search and analysis, high inter-rater reliability
P3	⊗ Omission of potentially relevant studies on the concept can affect validity → Employed snowballing and comprehensive database searches	⊗ Relationship analysis of issues is only literature-based and cannot account for additional factors → Relationships need to be mentioned in at least two studies	⊗ Differences in contextual settings can affect generalizability, findings lack empirical validation → Sample of 70 articles from over two decades of research	⊗ Single-author study may influence reliability of results → Senior researcher involved for cross-checking of results, followed established guidelines
P4	⊗ Limited selection of ASD success dimensions, single-item measures used for applied social/PM ASD practices → Common criteria for both sides of ASD success, exploratory study	⊗ Focus on social/PM practices may neglect influences of other practices → Deliberate scoping decision, yet investigating the role of technical/SE practices is an effort for future research	⊗ Limited generalizability due to a potential regional bias as most participants primarily stem from the DACH region and India	⊗ Single-informant study, single-item measure for ASD practices and low construct reliability for some constructs → Exploratory study, thus scale reliability is still deemed to be sufficient
P5	⊗ Differing interpretations of issues may influence answers of the experts → Member validation and clarifications for consistency	⊗ Potential for confounding effects of other issues for the consequences → Cross-checking of consequences and multiple issues	⊗ Limited generalizability due to region and industry bias → Other regions and industries interviewed, saturation after 10 interviews	⊗ Data analysis can be biased due to human assessment → Used established guidelines, member validation, analysis by two authors
P6	⊗ Relationships among ASD core concepts and different outcomes may not adequately represent mechanisms of outcome creation → Iterative interpretation and refinement to capture relationships among characteristics of ASD and their outcomes	⊗ Potential for other influencing factors beyond four core concepts, can only provide indications → Framework as a thorough representation of agility, calculated the frequency of relationships to assess how core concepts contribute to outcomes	⊗ Differences in contextual settings can affect generalizability of findings → Selected large sample of 122 studies and assessed 148 cases and their context descriptions to derive generalizable results for the sweet spot model	⊗ Potential bias in the selection of studies from both sides of the outcome spectrum, subjective interpretation of data → Involved multiple researchers in iterative analysis of data and study selection, followed established guidelines

⊗ Potential Limitation → Mitigation Measure

7 Future Research Directions

The contributions and limitations of this dissertation offer several opportunities for future research efforts. Overall, seven avenues and recommendations are derived, which are listed in Table 7.1.

First, Papers I-III primarily examine *what* outcomes result from ASD. However, *how* these outcomes are interrelated, or *how* especially benefits can be mutually exclusive, remains mostly unaddressed. For relationships among the benefits of ASD, initial insights are described in Alami and Krancher (2022) or Vidgen and Wang (2009). Such studies propose that improvements in communication and collaboration, achieved by Scrum and XP, foster knowledge sharing, which subsequently contributes to better software quality (Alami & Krancher, 2022) or facilitates learning of team members (Vidgen & Wang, 2009). Consequently, it appears that certain benefits are related to one another, which needs to be investigated further, especially considering the breadth of benefits found in Paper II. Paper III, meanwhile, offers a more in-depth perspective into the interplay of issues, finding that issues can be root causes or catalysts for others. Still, how the benefits and the issues of ASD are connected remains to be better understood. Gaining such knowledge seems necessary, though, as the benefits of ASD can be mutually exclusive. Examples include time to market vs. delivered quality or delivery efficiency vs. innovativeness, as suggested by Iivari (2021). In this vein, balancing competing benefits may require tradeoffs, which can imply negative outcomes, e.g., the build-up of technical debt (Iivari, 2021) when prioritizing speed over quality. Further insights in this direction are still missing. Here, using a paradox lens (Smith & Lewis, 2011) to assess the interplay of different outcomes of ASD seems promising. Especially assessing how certain benefits compete with each other that may only be balanceable with tradeoffs (Iivari, 2021), can advance the understanding of the interplay of outcomes in ASD.

Second, Paper VI suggests, considering both positive and negative outcomes stemming from the agility characteristics of frequent inspections and iterative development, that the relationship of using ASD practices and resulting business value could resemble an inverted U-shape. While both core concepts are essential to realizing a range of benefits, too many inspections in meetings and excessive iteration cadence can also trigger several issues. This indicates that utilizing ASD practices, which implement these key characteristics of agility, is generally necessary. However, 'too much of a good thing' may result in issues that overshadow the benefits that are actually intended to be realized with these practices. Thus far, studies proposing to investigate ASD with an inverted U-shaped perspective are scarce, e.g., Iivari and Iivari (2011). To add, studies that focus on how ASD contributes to benefits mostly assume a linear relationship among the applied ASD practices and beneficial outcomes, e.g., Kude et al. (2019), Schmidt et al. (2014), or Maruping et al. (2009), with Paper IV being no exception. Considering the observations in Paper VI, however, inspecting the utilization of ASD practices and resulting outcomes to follow an inverted U-shaped relationship could present a new perspective. This could help to explain why ASD practices contributing to agility seem to imply both beneficial and negative outcomes, depending on the intensity of use.

Third, to better understand how ASD practices and agility contribute to the outcomes identified in Paper I-III, QCA recently emerged as a novel approach that can help to "explain and explore complex phenomena" (Anton et al., 2022, p. 1), such as the creation of ASD business value. Generally, QCA investigates the "interplay between multiple conditions that influence an outcome and how these conditions can compensate for one another" (Mattke et al., 2022, p. 209), e.g., how applying certain combinations of ASD practices leads to benefits. In this vein, Paper II

finds relationships between different ASD practices and beneficial outcomes in the literature. To add, Paper VI proposes that the four core concepts behind agility contribute to benefits in different combinations, while an absence of certain core concepts creates issues. Departing from these insights, QCA could enable research to advance knowledge on the cause-effect mechanisms of ASD business value creation, with regard to the applied ASD practices and agility in general. Here, first steps that employ QCA to investigate how ASD contributes to successful work outcomes have recently been proposed by Malik and Orr (2022), which can serve as an orientation for these future efforts. Using QCA, researchers could furthermore investigate how different combinations of ASD practices lead to the same beneficial outcome, known as equifinality (Anton et al., 2022). Similarly, this technique can help to identify which ASD practices represent necessary conditions, i.e., those practices that must be applied for a certain benefit, and whether certain ASD practices may compensate for the absence of others. In this line of thought, also combining the QCA technique with the core concepts framework by Baham and Hirschheim (2022) presents a meaningful way to advance knowledge on the causal relationships of agility and outcomes. Doing so would furthermore contribute to the empirical validation of the framework that is still lacking (Rathor et al., 2023). Together, this dissertation suggests that QCA should be utilized more in future studies to examine the cause-effect mechanisms of ASD methodologies with regard to outcome creation.

Fourth, this dissertation recommends intensifying the use of quantitative approaches in future studies on ASD, especially in examinations of its outcomes. Quantitative insights into the samples of the two literature reviews in Paper II and III show that research on benefits and issues predominantly uses a qualitative approach, while confirmatory, quantitative studies are less represented. Generally, qualitative approaches are more common in ASD research, which is a persisting trend also identified by related reviews, e.g., Jalali and Wohlin (2012), Vallon et al. (2018), or Behutiye et al. (2020). More quantitative studies should thus be conducted to confirm the mechanisms that contribute to the spectrum of benefits and issues of ASD, as observed in qualitative studies.

Fifth, as pointed out as a limitation related to the generalizability of the findings of this dissertation, several of the proposed concepts and frameworks still require empirical validation. In this vein, the classification framework of benefits related to the business value of ASD (Paper II), the mitigation measures to sustain business value delivery when facing critical issues (Paper V), and the context factor model for an ideal sweet spot (Paper VI) should be tested and verified in empirical settings. Here, a suitable approach to validate the classification framework for ASD business value could entail Delphi studies, which would enable research to evaluate the conceptual validity and comprehensiveness of the framework. Meanwhile, multiple case studies could help to apply, test, and validate the 48 mitigation measures. Lastly, comparative multiple case studies can help to verify the contextual factors framework. Especially comparisons of the context along the proposed sweet spot model and evaluations of the observed outcomes would contribute to a validation of the model. Doing so would also advance knowledge on the role of context in ASD, as this aspect, despite the efforts made in this dissertation, still requires more attention in research.

Sixth, cybersecurity has become a critical concern of ever-growing importance for organizations (Chatterjee, 2021), which also represents an essential aspect in the development of software, as security is a fundamental non-functional quality requirement (Alsaqaf et al., 2018; Ramesh et al., 2010). However, due to teams being under pressure of having to deliver new software functionality and new business value rapidly, such critical cross-cutting concerns, including security, are often neglected in ASD methodologies (Ramesh et al., 2010). In this regard, a constant conflict among SD teams and security experts emerges, as developers are required to provide new features

rapidly, while the security teams need to ensure that security concerns are addressed. Here, however, "security must not be compromised by the strive for agile principles and lightweight processes; conversely, security processes should not decrease the effectiveness of the development processes" (Rindell et al., 2021, p. 1). Consequently, this field of tension raises the questions of how ASD methodologies and cybersecurity practices can be effectively integrated, and where in the development life cycle which security practices should be used, without compromising one aspect for the other. First suggestions on how ASD methodologies and cybersecurity frameworks can be integrated have been made (e.g., Handri et al., 2024), alongside recommendations of when the use of security activities in the SD lifecycle is most impactful (Rindell et al., 2021). Still, more efforts to understand and optimize the interplay of both aspects seem required, especially as cybersecurity preparedness, which is also of critical importance for the SD context, requires "business, technology, and cyberdefense leaders [to] come together to lead and support security initiatives" (Chatterjee & Leslie, 2024, p. 5). This suggests cybersecurity as an enterprise-wide task that not only concerns ASD teams but also requires the active participation of other parts of organizations. Thus, this dissertation calls for more research to examine how cybersecurity activities and ASD methodologies can be effectively combined and holistically approached by organizations to enable a timely release of valuable software with robust cybersecurity built in.

Lastly, considering the growing adoption of generative artificial intelligence (GenAI) technologies in the software business, as suggested in the recent MIT Technology Review Insights report (Walden, 2024), also the ASD domain and the business value that can be created with these methodologies experience a substantial change. First insights into the implications of GenAI tools, such as ChatGPT, Gemini, or Copilot, when adopted in the context of ASD have been developed, for instance, by Ulfsnes et al. (2024) or Nguyen-Duc and Khanna (2024). Such studies identify various benefits of GenAI tools that can enhance ASD. Examples include increased productivity or higher satisfaction and motivation due to reductions of repetitive tasks (Ulfsnes et al., 2024), as well as "empowering […] developers to write better code faster" (Nguyen-Duc & Khanna, 2024, p. 289). However, also several issues were identified when using GenAI in ASD. Examples include disrupted learning loops that may affect team performance (Ulfsnes et al., 2024) or cybersecurity issues and data breaches when using sensitive data of ASD projects (Nguyen-Duc & Khanna, 2024). Still, literature on GenAI and ASD methodologies has yet to reach a mature state. Consequently, future studies could investigate how GenAI enhances benefits of ASD, how known issues can be addressed better, or may uncover still unknown issues that GenAI tools can trigger in the specific context of ASD. With the in-depth insights offered into the diverse outcome spectrum of ASD methodologies, this dissertation can provide a valuable foundation for such efforts.

In sum, this dissertation makes several recommendations for future research focusing on business value creation with ASD, for which the findings can act as a starting point, while the limitations of the dissertation could also be addressed with the suggested research avenues in Table 7.1.

Table 7.1: Opportunities for Future Research Efforts

Potential Avenues for Future Research	Focus of Future Research Opportunities	Potential Research Questions for Studies	Potential Research Approaches for Studies
Further examine the interplay of different outcomes of ASD methodologies	• Interplay and relationships among benefits • Paradoxical tensions among benefits and tradeoffs to resolve them	• How do benefits contribute to other beneficial outcomes? • How can mutually exclusive benefits be balanced via tradeoffs?	• Qualitative relationship analyses among different outcomes of ASD, inspired by Paper III • Paradox lens, following Smith and Lewis (2011)
Investigate U-shaped relationships of ASD methodologies and ASD practice use with the different resulting outcomes	• Curvilinear relationships of ASD practice utilization and outcomes • Balanced execution of ASD practices and realization of agility to attain benefits and avoid issues	• Until which point do ASD practices provide benefits before causing negative outcomes? • How can the use of ASD practices be adequately balanced?	• Polynomial regression analysis with an inverted U-shaped relationship assumption
Apply configurational approaches in studies on ASD methodologies and their outcomes	• Combinations of ASD practices and agility characteristics for business value creation • Necessary conditions (e.g. practices) for benefit realization with ASD	• What are combinations of ASD practices that must be fulfilled for specific benefits? • Can ASD practices compensate for an absence of other practices?	• Qualitative comparative analysis (QCA), following guidelines by Pappas and Woodside (2021)
Conduct more quantitative and confirmatory studies on ASD methodologies	• More quantitative studies on ASD to compensate imbalance of qualitative vs. quantitative studies • Confirmatory studies to assess causal mechanisms of ASD and outcomes	• Various questions surrounding the use of ASD and associated practices, and their relationships with different outcomes to be assessed and confirmed quantitatively	• Quantitative approaches to examine causal relationships, e.g., different forms of regression analysis or structural equation modeling
Validate the developed concepts and frameworks in empirical studies	• Empirical validation of the set of mitigation measures, the benefits classification framework and the sweet spot model for ASD-based projects in a practical setting	• Are the measures effective to sustain business value delivery in ASD? • Is the proposed sweet spot generalizable to all industries that use ASD?	• Delphi studies (Okoli & Pawlowski, 2004) • Multiple case studies (Runeson & Höst, 2008)
Investigate the interplay of ASD methodologies and cybersecurity concerns	• Examine how ASD methodologies and cybersecurity efforts can be effectively integrated • Develop solutions to resolve tensions between the rapid delivery of software and emerging cybersecurity concerns	• How can ASD be effectively enriched with cybersecurity practices to ensure swift and secure deliveries of software? • How can organizations that employ ASD ensure cybersecurity preparedness along the entire SD lifecycle?	• Multiple case studies (Runeson & Höst, 2008) • Expert interviews (Kuckartz, 2018)
Assess the impact of GenAI in the context of ASD methodologies and business value creation	• Evaluate how using GenAI can enhance ASD • Assess issues that emerge when using GenAI in ASD methodologies	• What are the benefits of integrating GenAI in the use of ASD? • How can GenAI negatively impact ASD?	• Multiple case studies (Runeson & Höst, 2008) • Expert interviews (Kuckartz, 2018)

8 Conclusion

Since the introduction of the Agile Manifesto (Beck et al., 2001), ASD has become an indispensable development approach for the software industry, having received widespread adoption in practice (Digital.ai, 2024) and sparking a strong interest in research (Baham & Hirschheim, 2022; Dingsøyr et al., 2012). However, despite being practiced and researched for over two decades, knowledge on ASD's benefits and issues still lacks thorough systematizations. In addition, due to a "lack of theoretical glue" (Conboy, 2009, p. 344) for the fundamental concept of agility, and the decontextualization of ASD (Kruchten, 2007, 2011) in research, also insights into *how* and *when* ASD contributes to outcomes remained inconclusive. Therefore, the main objective of this dissertation is to provide scholars and practitioners with a comprehensive understanding of the spectrum of outcomes of ASD, and to inform them about how agility, different ASD practices, and contextual factors contribute to the benefits and issues that are associated with the methodologies.

With systematic reviews of empirical findings from the ASD domain, this dissertation offers a structured overview of the outcome spectrum of ASD methodologies. The reviews on the benefits of ASD clarify the multidimensionality of ASD's business value, while highlighting that financial effects are not a prominent benefit. Instead, ASD especially benefits the developers, the team, the SD process, the customer, and the product. Regarding ASD practices contributing to these benefits, the dissertation offers a systematization of ASD practices and beneficial outcomes, finding that social/PM practices especially benefit the developers, the team, and the customer. Technical/SE practices, meanwhile, particularly contribute benefits for the SD process and the product. To add, an empirical study on social/PM practices suggests that they stimulate several social agile principles, thereby fostering developer and economic benefits. Meanwhile, a literature study on the dark side of ASD reveals that issues are strongly interrelated, where several of them stand out as catalysts for other issues. In this regard, an empirical study investigates how such critical issues affect the delivery of business value, highlighting the consequences in case of an inadequate mitigation. To enable a mitigation of such critical issues and avoid their consequences, also a set of adaptation measures is derived. Furthermore, the dissertation sheds light on the key characteristics of agility that influence the outcomes of ASD. Communication is a key aspect that needs to be ensured for any benefit, while lacking customer involvement causes various issues. Furthermore, inspect and adapt cycles, as well as iterative development, can be a double-edged sword. Without them, most benefits are not realizable, while an excessive execution of these agility characteristics triggers critical issues, suggesting that agility must be adequately balanced. Lastly, the dissertation proposes a model of key contextual factors for ASD, together with a sweet spot that outlines an ideal context setting. The model suggests that ASD is highly sensitive to the context in which it is practiced, and that using it outside of its ideal operating window contributes to various issues. Finally, this model helps to counteract the decontextualization of ASD in research (Kruchten, 2007, 2011), reminding future studies to lay more emphasis on the key role of contextual factors.

In sum, this dissertation provides theoretical and empirical insights, combined with practical suggestions, on the diverse spectrum of benefits and issues associated with ASD methodologies. The findings inform research and practice about the characteristics of the business value of ASD methodologies and their dark side, while offering insights into how ASD practices, the concept of agility, and the characteristics of contextual settings contribute to the benefits and issues of ASD. Thereby, this cumulative dissertation can serve as a foundation for future studies that further investigate "if, how, why and when ASD impacts outcomes" (Baham & Hirschheim, 2022, p. 107).

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Part I: Understanding Business Value and Dark Sides of Agile Software Development

10 Paper I: IS-focused Literature Review on the Business Value of ASD Methodologies

Table 10.1: Fact Sheet Paper I

Fact	Description
Title	The Business Value of Agile Software Development: Results from a Systematic Literature Review
Authors	Jan-Niklas Meckenstock[1] jan-niklas.meckenstock@uni-bamberg.de Nico Hirschlein[1] nico.hirschlein@uni-bamberg.de Sebastian Schlauderer[1] sebastian.schlauderer@uni-bamberg.de Sven Overhage[1] sven.overhage@uni-bamberg.de [1]University of Bamberg An der Weberei 5 96047 Bamberg, Germany
Publication type	Conference Paper
Publication outlet	European Conference on Information Systems 2022
Status	Published
Full citation	Meckenstock, J.-N., Hirschlein, N., Schlauderer, S., & Overhage, S. (2022). The business value of agile software development: Results from a systematic literature review. *ECIS 2022 Proceedings*, Timisoara, Romania.
URL	https://aisel.aisnet.org/ecis2022_rp/24
Link to supplementary material	https://doi.org/10.6084/m9.figshare.19403489

The Business Value of Agile Software Development: Results from a Systematic Literature Review

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, p. 9), 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

11 Paper II: Comprehensive Literature Review on the Business Value of ASD Methodologies

Table 11.1: Fact Sheet Paper II

Fact	Description
Title	Unraveling Agile Software Development Business Value: A Qualitative Systematic Review of Agile Practices and Benefits
Authors	Jan-Niklas Meckenstock[1] jan-niklas.meckenstock@uni-bamberg.de Nico Hirschlein[1] nico.hirschlein@uni-bamberg.de Sebastian Schlauderer[1] sebastian.schlauderer@uni-bamberg.de Sven Overhage[1] sven.overhage@uni-bamberg.de [1]University of Bamberg An der Weberei 5 96047 Bamberg, Germany
Publication type	Journal Article
Publication outlet	Pacific Asia Journal of the Association for Information Systems
Status	Published
Full citation	Meckenstock, J.-N., Hirschlein, N., Schlauderer, S., & Overhage, S. (2025). Unraveling agile software development business value: A qualitative systematic review of agile practices and benefits. *Pacific Asia Journal of the Association for Information Systems*, 17 (5).
URL	https://aisel.aisnet.org/pajais/vol17/iss5/3
Link to supplementary material	https://doi.org/10.6084/m9.figshare.30235003

Unraveling Agile Software Development Business Value: A Qualitative Systematic Review of Agile Practices and Benefits

Abstract.

Background: Business value is a frequently debated topic in agile software development (ASD) research, yet which valuable aspects constitute this concept has not been systematically clarified, leading to a volatile conceptualization of business value in the context of ASD. In addition, the literature lacks a systematization of relationships between ASD practices and valuable aspects, causing a fragmented understanding of which practices yield which benefits. This study proposes a classification framework for the different aspects of the business value of ASD and assesses how ASD practices stimulate these valuable aspects to guide research and practice.

Method: A qualitative systematic review of 137 articles systematizes valuable aspects associated with the business value of ASD, while it also examines relationships between 22 ASD practices, separated into project management (PM) and software engineering (SE) practices, and the valuable aspects they provide.

Results: The study develops a classification framework to systematize the multidimensional ASD business value concept along 56 valuable aspects, grouped into 16 value categories, which are allocated to 5 dimensions of manifestation (product, process, team and developers, customers and financial dimension). It also highlights how ASD practices differ concerning their benefits, finding that SE practices primarily stimulate the process and the product, while PM practices aid the team and the relationship with customers.

Conclusion: This study contributes a more unified understanding of the business value of ASD, enabling research to better grasp the concept and comprehend how ASD practices contribute to the spectrum of valuable aspects. It also fulfills a prerequisite for future research efforts to investigate the realization of outcomes with ASD, while providing a research agenda to guide these efforts. For practice, the study offers new perspectives to assess ASD business value and enables a more value-targeted application of ASD with the systematization of relationships between ASD practices and valuable aspects.

Keywords: Agile Software Development, Business Value of Agile Software Development, Benefits of Agile Software Development, Agile Practices, Qualitative Systematic Review

12 Paper III: Comprehensive Literature Review on the Issues of ASD Methodologies

Table 12.1: Fact Sheet Paper III

Fact	Description
Title	Shedding Light on the Dark Side – A Systematic Literature Review of the Issues in Agile Software Development Methodology Use
Authors	Jan-Niklas Meckenstock[1] jan-niklas.meckenstock@uni-bamberg.de [1]University of Bamberg An der Weberei 5 96047 Bamberg, Germany
Publication type	Journal Article
Publication outlet	Journal of Systems and Software
Status	Published
Full citation	Meckenstock, J.-N. (2024). Shedding light on the dark side – A systematic literature review of the issues in agile software development methodology use. *Journal of Systems and Software*, 211.
URL	https://doi.org/10.1016/j.jss.2024.111966
Link to supplementary material	https://figshare.com/s/20c1a6307d761c08e2a3?file=43283166

Shedding Light on the Dark Side – A Systematic Literature Review of the Issues in Agile Software Development Methodology Use

Abstract.

Context: Agile software development (ASD) methodologies address problems of traditional approaches, but can also cause various issues. A systematization of the spectrum of negative facets and how they arise has not been developed, leaving the dark side of ASD opaque.

Objective: The paper systematizes findings on various negative facets to define what specific issues constitute the dark side of ASD. It also examines how relationships among these issues define the complexity of the downside.

Method: A literature review of 70 articles was conducted following Kitchenham & Charters (2007). The content analysis employed the coding procedure by Gioia et al. (2013) to systematize the negative aspects of ASD methodologies.

Results: The paper reveals 90 issues, grouped into 18 coherent themes. Six levels of manifestation point to the primarily affected constituents in ASD projects. In addition, 65 relationships among issues are explored, providing explanations for the complexity of the dark side of ASD.

Conclusion: The systematization shows what aspects constitute the dark side of ASD, emphasizing its multidimensional nature along issues such as reduced developer well-being, product quality and development productivity. The analysis of how its complexity is defined reveals that customer misbehavior and delivery pressure are significant origins of other issues.

Keywords: Agile Software Development Methodologies, Issues in ASD, Dark Side of ASD, Information Systems Development Agility, Systematic Literature Review

Part II: Achieving and Sustaining Business Value in Agile Software Development

13 Paper IV: Quantitative Survey Study on the Benefits of Individual Social/PM ASD Practices

Table 13.1: Fact Sheet Paper IV

Fact	Description
Title	How Do Individual Social Agile Practices Influence the Development Success? An Exploratory Study
Authors	Jan-Niklas Meckenstock[1] jan-niklas.meckenstock@uni-bamberg.de Sebastian Schlauderer[1] sebastian.schlauderer@uni-bamberg.de Sven Overhage[1] sven.overhage@uni-bamberg.de [1]University of Bamberg An der Weberei 5 96047 Bamberg, Germany
Publication type	Conference Paper
Publication outlet	17th International Conference on Wirtschaftsinformatik
Status	Published
Full citation	Meckenstock, J.-N., Schlauderer, S., & Overhage, S. (2022). How do individual social agile practices influence the development success? An exploratory study. *Wirtschaftsinformatik 2022 Proceedings*, Nürnberg, Germany.
URL	https://aisel.aisnet.org/wi2022/it_strategy/it_strategy/7
Link to supplementary material	https://doi.org/10.6084/m9.figshare.16988395 https://doi.org/10.6084/m9.figshare.16988893

How Do Individual Social Agile Practices Influence the Development Success? An Exploratory Study

Abstract. *Although agile software development (ASD) is widespread, the contributions of individual agile practices to development success are still largely unclear. In this paper, we explore the hidden cause-effect relationships between the application of social agile practices, the realization of social agile principles, and the resulting contribution(s) to ASD success. To capture ASD success, we consider both the effects on developer acceptance and economic business values. Based on an initial ASD success model and data from a survey of 197 developers, we found that social agile practices such as reflection, business IT alignment, and self-organization seem to particularly promote ASD success. We also found indications that the realization of these principles is primarily driven by practices such as retrospective meetings and shared leadership, whereas prominent practices like daily meetings and pair programming seem to have no effect. Our results thus call for reassessment of agile practices and their use in practice.*

Keywords: Agile Software Development, Agile Business Value, Agility

14 Paper V: Interview Study on Issues and Countermeasures to Sustain Value Delivery in ASD

Table 14.1: Fact Sheet Paper V

Fact	Description
Title	Adapt and Overcome - How Agile Practitioners Adapt to Issues that Impede the Delivery of Value: An Interview Study
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Adapt and Overcome - How Agile Practitioners Adapt to Issues that Impede the Delivery of Value: An Interview Study

Abstract. *Continuously delivering valuable software is a core principle of agile software development (ASD). In practice, value delivery is often impeded by several key issues, including low customer involvement, volatile requirements, technical debt, delivery pressure, excessive rework, or meeting overhead, which affect the product or the process. Despite their negative influence, the different consequences for the delivered value remain to be better understood. In addition, a collection of measures to help practitioners adapt to these issues is missing, as previous work only offers limited guidance on how to mitigate them. To address this situation, we conducted 19 semi-structured expert interviews to identify the consequences of key issues for value delivery and empirically derive measures to adapt to these issues. We find 34 value-reducing consequences, which primarily affect product quality and capabilities, delivery timeliness, and process efficiency. We also develop a collection of 48 measures to address the issues, including procedural changes, process artifacts and roles, technical means, and different ways to approach customers. With our work, we provide practitioners with actionable measures to adapt to issues encountered in daily practice and avoid their value-reducing consequences, thereby facilitating continuous value delivery. For research, we extend knowledge on the dark side of ASD by illustrating how key issues affect the delivered value, which was less regarded in related studies. In addition, we encourage future investigations into how micro-tailoring fosters sustained value delivery, along with examinations of resilience engineering in the context of ASD to improve the performance of software development processes.*

Keywords: Agile Software Development, Agile Business Value, Issues Impeding Value Delivery, Countermeasures to Sustain Value Delivery, Interview Study

Part III: Towards Explaining the Outcomes of Agile Software Development

15 Paper VI: Literature Review on the Core Concepts of Agility in ASD and Contextual Factors

Table 15.1: Fact Sheet Paper VI

Fact	Description
Title	Agile's Anatomy: How Agile's Core Concepts and Contextual Factors Influence Benefits and Issues
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Link to supplementary material	https://doi.org/10.6084/m9.figshare.29900132

Agile's Anatomy: How Agile's Core Concepts and Contextual Factors Influence Benefits and Issues

Abstract. *Agile software development (ASD) methodologies can deliver various benefits but may also provide issues for software development projects. While research has identified numerous benefits and issues, it remains unclear how ASD's core characteristics contribute to the different outcomes. Additionally, little attention has been paid to the project context factors that shape these outcomes. Building on the ASD core concepts framework by Baham and Hirschheim (2022) and 12 contextual factors, we conduct a qualitative systematic literature review of 126 studies to examine relationships between ASD core concepts, contextual characteristics, and the different outcomes (benefits and issues) of ASD. The implementation of core concepts like communication represents cornerstones for desirable benefits, while an inadequate realization of core concepts such as customer involvement can imply various issues. In addition, balancing their execution seems essential, as the highly-paced iterative nature of development and frequent inspections can imply negative consequences, besides their intended beneficial outcomes. Furthermore, we show that certain context factors, including high staff turnover, legacy systems, and volatile requirements can be problematic for ASD projects. Based on these insights, we develop a reconceptualized version of an agile sweet spot to determine an ideal setting for ASD projects. For academia, our work strengthens the theoretical core framework by identifying relationships among the core concepts and outcomes, while a research agenda guides future investigations into how ASD delivers its outcomes. Concerning practical implications, the findings can enable practitioners to improve the application of ASD by highlighting aspects that require dedicated attention to avoid issues.*

Keywords: Agile Software Development, Benefits of ASD, Issues of ASD, Project Context Factors, Literature Review, Research Agenda