Using Agile Information Systems Development Practices: Organizational Drivers and Individual Consequences

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Abstract

Driven by the need to respond flexibly to changes in today's fast-changing and technology-centric business environment, organizations increasingly adopt agile information systems development (ISD) practices. Especially the information technology (IT) function and its staff members are affected by major changes due to companies' agile transformation endeavors. On an organizational level, new, dichotomous forms of IT organizations are introduced which include a fast and flexible, agile mode and a secure and reliable, traditional mode to serve digital and traditional business models. On an individual level, agile ISD practices place new demands on those involved in developing software as responsibilities, tasks, and duties change significantly. This thesis addresses the two aforementioned pillars of organizational drivers and individual consequences of adopting agile ISD practices. Three studies shed light on how the increasingly prevalent use of agile ISD practices has an impact on IT workers and IT structures.

The first strand of this thesis investigates the integration and advancement of agile ISD in IT organizations. Triggered by digital business models and the need to not only serve the business functions but be at the forefront of (digital) business, IT organizations usually employ a bimodal IT (or two-speed-IT), one agile and flexible and one traditional and reliable. Against this backdrop, the first study uses a detailed case study of a sales company to demonstrate how structures within IT functions evolve according to sales channel strategies and how agile ISD is integrated in the existing organization. The results show that when the company pursued a multichannel strategy, a bimodal IT in two separate organizational divisions was most suitable to support traditional channels with a reliable IT and digital channels with an agile and fast IT. However, when the company went beyond multichannel and introduced an omnichannel strategy, it integrated both IT modes to form a single IT function working with agile ISD practices to be able to provide a holistic and up-to-date customer experience across all sales channels.

The second strand of this thesis investigates implications of using agile ISD practices for staff members of the IT function, particularly software developers and IT project managers (IT PM), on an individual level. Since agile ISD, according to the prevailing opinion in science and practice, is beneficial for all parties involved, research so far has mainly neglected to take a balanced and more nuanced view considering positive and negative aspects of its usage. Against this background, the second study examines how agile ISD practices – encompassing agile software development (SD) and project management (PM) practices – affect developers' work-

related levels of fatigue and turnover intentions during phases of normal and high workload. The results demonstrate that while agile SD practices generally reduce fatigue and turnover intentions, agile PM practices increase fatigue and turnover intentions in high workload situations.

The third study looks at identity tensions which IT PMs experience when confronted with the usage of Scrum, an agile PM method which promotes self-managed teams, hence, does not consider an IT PM role in its framework. The findings reveal five fundamental role identity tensions for IT PMs. Responsibilities, duties, collaboration, communication, and control patterns in the relationships towards top management and agile ISD team changed. They cause new, unclear, and contradicting role expectations and role designs for IT PMs in agile ISD settings resulting in severe role identity tensions the IT PMs have to cope with.

Overall, this thesis showcases the role and importance of agile ISD by providing a more comprehensive understanding of how applying agile ISD practices affects the individuals and organizations involved. In doing so, this thesis answers calls for research that urge scholars to take a more nuanced perspective when studying agile ISD. The studies in this thesis contribute to research on agile ISD by (1) demonstrating how a bimodal IT function and the application of agile ISD practices evolve according to specific business decisions, by (2) moving beyond predominant notions of agile ISD practices use as a largely positive phenomenon and provide a balanced view on the consequences for developers, and by (3) highlighting the hitherto largely neglected team-adjacent role of IT PMs in agile ISD settings and uncovering fundamental identity tensions they face. Furthermore, this thesis offers valuable insights for practitioners by pointing out potential pitfalls of agile ISD adoption and recommending how to avoid them. Likewise, this thesis guides decision-makers how to organize and structure the IT function, and the agile IT in particular, to provide the most suitable support for business strategies and staff members alike.

Zusammenfassung

Die Notwendigkeit, flexibel auf Veränderungen im heutigen, sich schnell wandelnden und technologiezentrierten Geschäftsumfeld zu reagieren, führt dazu, dass Unternehmen zunehmend agile Verfahren zur Entwicklung von Informationssystemen (Information Systems Development (ISD)) anwenden. Insbesondere die Informationstechnologie (IT)-Abteilung und ihre Mitarbeiter sind von großen Veränderungen betroffen, die sich aus der agilen Transformation von Unternehmen ergeben. Um digitale und traditionelle Geschäftsmodelle zu bedienen, werden auf organisatorischer Ebene neue, dichotome Formen von IT-Organisationen eingeführt, welche einen schnellen und flexiblen, agilen Modus sowie einen sicheren und zuverlässigen, traditionellen Modus umfassen. Auf individueller Ebene stellen agile ISD-Verfahren neue Anforderungen an die Mitarbeiter in der Softwareentwicklung, da sich Verantwortlichkeiten, Aufgaben und Pflichten erheblich ändern. Die vorliegende Dissertation befasst sich mit den beiden oben genannten Bereichen, den Treibern aus der Organisation heraus und den Konsequenzen für die Mitarbeiter bei der Einführung agiler ISD-Verfahren. Drei Studien beleuchten, wie sich die zunehmende Verbreitung agiler ISD-Verfahren auf IT-Mitarbeiter und IT-Strukturen auswirkt.

Im ersten Teil dieser Dissertation werden die Integration und Weiterentwicklung von agiler ISD in IT-Organisationen untersucht. Angesichts digitaler Geschäftsmodelle und der Notwendigkeit, nicht nur interner Dienstleister, sondern auch Wegbereiter für (digitale) Geschäftsmodelle zu sein, verwenden IT-Organisationen in der Regel eine bimodale IT (auch bekannt als IT der zwei Geschwindigkeiten), eine agile und flexible IT und eine traditionelle und zuverlässige IT. Vor diesem Hintergrund wird in der ersten Studie anhand einer detaillierten Fallstudie eines Vertriebsunternehmens aufgezeigt, wie sich die Strukturen innerhalb von IT-Abteilungen entsprechend der Vertriebskanalstrategien entwickeln und agile ISD in die bestehende Organisation integriert wird. Die Ergebnisse zeigen, dass für eine Multikanalstrategie eine bimodale IT in zwei getrennten Organisationsbereichen am besten geeignet war, um traditionelle Kanäle mit einer zuverlässigen IT und digitale Kanäle mit einer agilen und schnellen IT zu unterstützen. Als das Unternehmen über die Multikanalstrategie hinausging und eine Omnikanalstrategie einführte, integrierte es beide IT-Modi zu einer einzigen IT-Abteilung, die mit agilen ISD-Verfahren arbeitete, um ein ganzheitliches Kundenerlebnis über alle Verkaufskanäle hinweg anbieten zu können.

Im zweiten Teil dieser Dissertation werden die Auswirkungen des Einsatzes agiler ISD-Verfahren auf die Mitarbeiter der IT-Abteilung, insbesondere auf Softwareentwickler und IT-Projektmanager (IT PM), auf individueller Ebene untersucht. Da die agile ISD nach vorherrschender Meinung in Wissenschaft und Praxis für alle Beteiligten vorteilhaft ist, ist von der Forschung bisher noch kein ausgewogenes und differenziertes Bild zu positiven aber auch negativen Aspekten des Einsatzes agiler ISD-Verfahren gezeichnet worden. Vor diesem Hintergrund wird in der zweiten Studie untersucht, wie sich agile ISD-Verfahren – agile Softwareentwicklungs (SD)-Verfahren und agile Projektmanagement (PM)-Verfahren – auf das Ermüdungslevel bei der Arbeit und die Kündigungsabsichten von Entwicklern bei normaler und hoher Arbeitsbelastung auswirken. Die Ergebnisse zeigen, dass agile SD-Verfahren im Allgemeinen die Ermüdung und die Kündigungsabsichten verringern, während agile PM-Verfahren bei hoher Arbeitsbelastung die Ermüdung und die Kündigungsabsichten erhöhen.

Die dritte Studie befasst sich mit Identitätsspannungen, die IT PMs erleben, wenn sie mit der Anwendung von Scrum konfrontiert werden. Diese agile PM-Methode fördert selbstorganisierte Teams und berücksichtigt daher in ihrem Rahmenwerk keine IT PM-Rolle. Die Ergebnisse zeigen fünf grundlegende Spannungen in der Rollenidentität von IT PMs auf. Verantwortlichkeiten, Pflichten, Zusammenarbeit, Kommunikation und Kontrollmuster in den Beziehungen zum Top-Management und zum agilen ISD-Team haben sich verändert. Sie führen zu neuen, unklaren und widersprüchlichen Rollenerwartungen und Rollendesigns für IT PMs in agilen ISD-Umgebungen, was zu erheblichen Spannungen in der Rollenidentität führt, mit denen IT PMs umgehen müssen.

Insgesamt zeigt diese Dissertation die Rolle und Bedeutung von agiler ISD auf, indem sie ein umfassenderes Verständnis dafür vermittelt, wie sich die Anwendung agiler ISD-Verfahren auf die beteiligten Personen und Organisationen auswirkt. Damit folgt sie der Forderung nach einer differenzierteren Sichtweise bei der Untersuchung agiler ISD. Die im Rahmen dieser Dissertation durchgeführten Studien tragen zur Forschung über agile ISD bei, indem sie (1) aufzeigen, wie sich eine bimodale IT-Abteilung und die Anwendung agiler ISD-Verfahren entsprechend spezifischer Geschäftsentscheidungen entwickeln, (2) über die vorherrschenden Vorstellungen vom Einsatz agiler ISD-Verfahren als weitgehend positives Phänomen hinausgehen und eine ausgewogene Sicht auf die Konsequenzen für Entwickler bieten, und (3) die bisher weitgehend vernachlässigte an das Team angrenzende Rolle von IT PMs in agilen ISD-Kontexten hervorheben und grundlegende Identitätsspannungen aufdecken, denen sie sich gegenübersehen. Darüber hinaus bietet diese Dissertation wertvolle Erkenntnisse für die Praxis,

indem sie auf mögliche Fallstricke bei der Einführung agiler ISD-Verfahren hinweist und Empfehlungen gibt, wie diese vermieden werden können. Ebenso gibt sie Entscheidungsträgern Hinweise, wie sie die IT-Abteilung und insbesondere die agile IT organisieren und strukturieren können, um die Geschäftsstrategien und Mitarbeiter bestmöglich zu unterstützen.

Table of Contents

List of Tables

List of Figures

List of Abbreviations

AVE	Average variance extracted
CDO	Chief digital officer
CIO	Chief information officer
CR	Composite reliability
DB	Deutsche Bahn
EDT	Ego depletion theory
IS	Information systems
ISD	Information systems development
IT	Information technology
IT PM	Information technology project manager
MC	Multichannel
OC	Omnichannel
PANAS	Positive and negative affect schedule
PLS	Partial least squares
PM	Project management
PO	Product Owner
RQ	Research question
SAFe	Scaled Agile Framework
SD	Software development
SEM	Structural equation modeling
SM	Scrum Master
StD	Standard deviation
VIF	Variance inflation factor
XP	Extreme Programming

Chapter 1: Introduction

1.1 Motivation and Research Questions

Rapidly changing market conditions, ubiquitous emergence of new digital technologies, shorter innovation cycles, and constant advancements in the development of information technology (IT) heavily impact our lives and the way we do business. Firms increasingly offer digital products and services which often leads to fundamental changes in value creation and capture (Matt et al. 2015; Vial 2019). New market entrants are implementing digital business models gaining significant market share in some industries. Established organizations, hence, need to transform their business to be able to serve customers' digital needs and remain competitive (Hess et al. 2016). Confronted with these challenges, companies invest in digital technologies to build up agility and ambidexterity capabilities that enable digital business transformation (Li et al. 2018; Sambamurthy et al. 2003; Vial 2019). For developing these capabilities and implementing the new technological requirements in the company, the functional division responsible for IT (IT function) becomes indispensable. As such, the IT function is the main driver for digital transformation and obtains an increasingly important strategic role for businesses (Bharadwaj et al. 2013; Fitzgerald et al. 2013; Urbach et al. 2017).

For decades, the IT function was primarily responsible for secure and reliable provision of backend services within firms (Laudon and Laudon 2004). Due to the increasing pervasiveness of IT and the according visibility throughout organizations, this traditional role remains critical (Haffke et al. 2017a). However, in recent years, the expectations towards the IT function have increased significantly as it developed into a core source for business innovation by digitizing products, processes, and business models while still providing operational efficiency (Benlian and Haffke 2016; Haffke et al. 2017a). Being at the forefront of digitization endeavors to ensure a company's competitive advantage in the digital age, the IT function's capabilities need to grow beyond reliability, scalability, security and efficiency. The IT function additionally has to experiment with new technologies, explore digital opportunities, and react in real-time to customer demands (Bharadwaj et al. 2013).

In order to satisfy the need for both stable internal IT provision and flexible exploration of digital technologies, companies transform their IT functions implementing two modes of IT delivery: The "traditional IT" encompasses the safe and steady operation of the firm's core systems and the "agile IT" is responsible for fast and flexible digital innovation (Haffke et al. 2017a; Horlach et al. 2017). This concept of "bimodal IT" seeks to narrow the gap between IT

delivery and business needs enabling a more effective digitization support for the business. The concept has already received significant attention from practitioners. Gartner (2015) foresees a growing number of organizations implementing a bimodal IT with almost every second company having one implemented as early as in 2014. Mc Kinsey (Bossert et al. 2014) and Sebastian et al. (2017), in addition, outline the importance of bimodal IT as a prerequisite for harnessing the potential of digital technologies. Academic research on this topic, however, is rather scarce.

Previous literature has adopted a very static perspective on bimodal IT primarily discussing how it is set up with different organizational archetypes (Andersen et al. 2017; Haffke et al. 2017b; Horlach et al. 2017). Haffke et al. (2017a) provides first insights on the transformation journey of the IT function outlining general pathways along different bimodal IT archetypes and drivers coming from within the IT function. Most recently, Toutaoui et al. (2022) discovered tensions and underlying paradoxes within the IT function between the traditional and the agile IT. However, little is known how IT transformations are influenced by important business decisions made entirely separately from the IT, such as changes in the sales strategy, on the IT organization. As such, this thesis aims to deepen our understanding of the implications of business decisions on the IT transformation journey by posing the following first research question:

RQ1: How do business decisions drive and shape the transformation of corporate IT functions with bimodal IT settings?

As said above, bimodal IT settings include a traditional IT mode and an agile IT mode. While in the traditional IT development cycles are usually long and sequential using methods such as the Waterfall method, the agile IT generally makes use of agile information systems development (ISD) methods, such as Scrum or Extreme Programming (XP) (Beck 2000; Haffke et al. 2017b; Schwaber and Beedle 2002). Agile ISD methods have their origin in the Agile Manifesto which advocates being responsive to change, applying short iterations, and communicating constantly with the customer (Fowler and Highsmith 2001). As such, they enable companies to meet the constantly changing requirements in technology-centric and volatile markets (Ramasubbu et al. 2015; Rigby et al. 2016). With bimodal IT structures in established organizations and all-agile IT functions in (digital) startups, the adoption of agile ISD methods constantly increases. Indeed, a recent report finds that 86% of IT functions adopted agile principles and practices by now (Digital.ai 2021).

Agile ISD methods consist of various agile ISD practices that address the need for new work arrangements for faster product delivery and more efficient management of changes in requirements and priorities (Digital.ai 2021; Tripp et al. 2016). An example for agile ISD practices are daily standup meetings in which all team members very shortly report accomplishments, obstacles, and short-term plans (Schwaber and Beedle 2002). Another more technical practice would be refactoring which requires team members to do their best to remove code redundancy and unused functionality and refresh obsolete designs (Fowler and Beck 1999). These practices are very different from those in traditional ISD methods that focus on processes, tools, comprehensive documentation, and detailed long-term plans (Nerur et al. 2005). Hence, agile ISD practices fundamentally shape the team members' way of working, especially for developers, and place new and different demands on them.

In addition to the practices, characteristics and roles are different in agile ISD teams compared to traditional ISD teams. Agile ISD teams are small, cross-functional, self-managed, and collectively responsible for the product (Beck 2000; Maruping et al. 2009b; Schwaber and Sutherland 2017). This is in stark contrast to the large functional teams working sequentially and in isolation to develop a product in traditional ISD settings (Tripp et al. 2016). Developers as the key role in ISD teams have to deal with a different level of accountability, visibility, autonomy, and task diversity when working agile. But not only developers are affected by the implementation of agile ISD methods. New agile team roles, such as the customer representative, challenge traditionally critical roles, particularly the IT project manager (IT PM). The clearly defined responsibilities and tasks of the customer representative (also known as Product Owner (PO) from Scrum) in addition to the self-organizing nature of the team question the need for an IT PM responsible for goal setting, organizing, leadership, and control (Benlian et al. 2022). However, we still see IT PMs working in agile ISD settings (BCG 2018) and scholars repeatedly acknowledge their existence and importance (e.g., Maruping and Matook 2020). These IT PMs face an entirely different project setting and they have to deal with a complete redefinition of their team-adjacent role.

Despite these totally different ways of working, our understanding of the implications of the use of agile ISD practices for individuals working in agile ISD settings is very fragmented. Extant research on the individual level has primarily focused on the consequences for developers. However, while showing positive implications for developers, such as lower work exhaustion and higher level of satisfaction resulting from the use of specific sets of practices (e.g., Tripp et al. 2016; Venkatesh et al. 2020), a view acknowledging benefits and burdens

(e.g., stress or depletion) of the use of different agile ISD practices is lacking (Benlian 2022). The provision of a balanced and nuanced view on developer implications has so far received little academic attention. In addition, the strong research focus on developers entails a limited understanding of other roles in agile ISD settings. Especially, consequences for roles particularly affected by changes in their responsibilities, such as the IT PM, are under-researched. While scholars have tried to define the blurry role of IT PMs in agile ISD contexts (e.g., Shastri et al. 2021; Tjørnehøj 2019), they have missed out on examining any effects this lack of clarity has for IT PMs, such as tensions or insecurities leading to dissatisfaction or turnover of skilled, long-tenured employees.

Taken together, this thesis seeks to provide much needed insights on the role-related individual implications of the use of agile ISD practices by posing the following second research question:

RQ2: How does the use of agile ISD practices affect key roles in the context of agile ISD?

To address these research questions, three empirical studies were conducted, and the findings were published in three peer-reviewed information systems (IS) outlets. In the following, I provide theoretical foundations on structures of IT functions, agile ISD, and the psychological concepts used throughout this thesis. This is followed by the presentation of the positioning, structure, and synopsis of this thesis.

1.2 Theoretical Foundations

This section introduces key literature and theoretical concepts used throughout this thesis. The first subsection begins with a review of literature on the transformation of the IT function and bimodal IT structures as one enabler of IT transformation. Subsequently, key research on methods, practices, and roles implemented in agile ISD settings is summarized. Finally, I introduce the theoretical concepts of ego depletion and work-related role identity which I used when examining individual-level outcomes of agile ISD practices use.

1.2.1 Transformation of the IT Function and Bimodal IT

Driven by the higher relevance of digital business models and capabilities, the IT function assumes a central and indispensable role in modern organizations (Sebastian et al. 2017; Urbach et al. 2017). Its impact goes beyond providing traditional services to ‘keep the lights on’ and now additionally includes activities to enable digital products and processes (Benlian and Haffke 2016; Haffke et al. 2017a). As such, the IT function at the same time needs to be stable and robust and, because it is at the forefront of an organization’s digitization endeavors, fast

and flexible. To meet these expectations, companies increasingly transform their IT using the concept of bimodal IT. A bimodal IT consists of two different IT modes: a traditional IT mode, responsible for safe and steady operations, generally using traditional software development approaches such as the waterfall model, and an agile IT mode, responsible for fast digital innovation, generally applying agile ISD approaches such as Scrum (Horlach et al. 2017; Toutaoui et al. 2022).

Several forms of bimodal IT archetypes exist which essentially differ in the degree of separation between the two IT modes (Haffke et al. 2017a; Horlach et al. 2017): Companies obtain the lowest level of separation when they decide on a project-by project basis whether to use an agile or a traditional IT mode (project-by-project bimodal IT). When both modes are continuously used in separate subdivisions within the same IT function, organizations apply a subdivisional bimodal IT. The highest level of separation is achieved with two IT functions, one using agile ISD methods (often referred to as "Digital Division") and one using traditional ISD methods (divisionally separated bimodal IT). The fourth archetype is used by companies that reintegrate previously different modes into one single IT function working in an agile mode. This reintegrated bimodal IT, thus, usually follows one of the other three archetypes. Depending on changing company-specific and situational factors, for example, the integration of digital and non-digital services, different bimodal IT modes are most suitable. Accordingly, the IT function can pass more than one bimodal IT mode during its transformation (Haffke et al. 2017a) with the aim to leverage digital technology in the best way possible for a company's digital transformation to be successful (Sebastian et al. 2017).

1.2.2 Agile ISD Practices and Roles

The agile manifesto – the groundwork which all agile ISD methods and practices are based on – introduced twelve principles, which revolutionized the way of developing software (Fowler and Highsmith 2001). It emphasizes welcoming requirement changes, short development cycles, as well as shared decision-making and continuous collaboration. Various methods embracing the agile manifesto emerged in the last two decades including Scrum, XP, feature-driven development, Kanban, or crystal methodologies (Dybå and Dingsøyr 2008; Tripp and Armstrong 2014). The raison d'être of these methodologies is their varying degree of adherence to the manifesto and their different focus (Dingsøyr et al. 2012). Among the most popular approaches are XP and Scrum (Beck 2000; Digital.ai 2021; Rigby et al. 2016; Schwaber and Beedle 2002). While the former emphasizes technical aspects and automating mechanisms to guide the execution of the software development process itself, the latter focuses on managing

team and project work, establishing customer relationships, and obtaining feedback (Baham and Hirschheim 2021). In the following, I will focus on these two types of methods – agile software development (SD) methods (particularly XP) and agile project management (PM) methods (particularly Scrum) –, as I do in my studies.

Agile ISD methods each consist of a distinct set of practices and roles (Maruping and Matook 2020; Tripp et al. 2016). Agile ISD practices incorporate the specific ways in which the agile principles should be obtained. One example is the mandatory use of specific coding standards according to agile SD practices, such as XP (Beck 2000). XP also prescribes developers to use dedicated test code to automatically test the implications of changes to the system, so-called unit testing (Beck 2000). On the side of agile PM practices, Scrum dictates a range of meetings to be held in the course of a development cycle. For instance, in daily standups, the development team discusses the project's progress and current tasks, in retrospectives, the team identifies improvement opportunities by reflecting on the last development iteration (Schwaber and Beedle 2002).

The roles in agile ISD projects include the developers responsible for developing the software product, a customer representative responsible for the ongoing collaboration with the customer, and a coach responsible for process and team guidance (Maruping and Matook 2020; Schwaber and Beedle 2002). The developers work in self-organizing teams without a project manager which means they are collectively managing and improving processes, making decisions, delegating tasks and issues among team members, and communicating effectively to draw on a team's combined expertise (Kudaravalli et al. 2017; Maruping et al. 2009a; McAvoy and Butler 2009). The customer representative – in Scrum this role is the PO – keeps the team aligned with the customer's product vision by providing requirements and other information relevant for development and having the power to decide regarding approval of change requests (Maruping and Matook 2020). Finally, the coach – in Scrum this role is comparable to the Scrum Master (SM) – removes process impediments, guides the proper implementation of the methodology, and facilitates team functioning (Beck and Andres 2004; Schwaber and Beedle 2002).

1.2.3 Ego Depletion and Self-regulation

Throughout this thesis, I work with two theoretical concepts which I will introduce in the following. The first concept concerns ego depletion – a state of diminished availability of inner resources needed for self-regulation. Self-regulation refers to the act of exerting control over one's feelings, thoughts, or impulses and adapt behaviors based on various demands, for example when coping with stress (e.g., Baumeister et al. 2006). It relies on a limited resource,

just like energy, and is consistent across seemingly unrelated domains, such as controlling emotions or cognitive processing. Once these self-regulatory resources are used up, i.e., depleted, subsequent tasks in need of self-regulation are less successful than they would be without prior depletion (Baumeister et al. 2006). Like tiring a muscle, performing regulatory tasks results in intensified feelings of fatigue, in the sense of being mentally exhausted (Baumeister et al. 1998; Muraven et al. 1998). However, like energizing a muscle, for example through rest and sleep, self-regulatory resources can also be replenished (Muraven and Baumeister 2000). Besides resting, motivation as well as positive events and experiences help gaining regulatory resources again, hence, decrease feelings of fatigue (Baumeister and Vohs 2007; Gross et al. 2011; Tice et al. 2007).

In the organizational and IS literature, the concept of ego depletion has lately been increasingly applied to explain what consequences self-regulation demands, hence feelings of fatigue, have at the workplace or when using technology (e.g., Chan and Wan 2012; Soror et al. 2015). For example, Lanaj et al. (2016) investigate the resource-draining effects of helping others at work, whereas Lee et al. (2016) studied the opposite, that is to say the energizing effect, by examining the resource-replenishment of self-regulatory resources by a specific technology design in online gaming.

1.2.4 Work-related Role Identity

The second important theoretical concept in this thesis is work-related role identity. Individuals maintain several identities at all times – for instance, *"in terms of a group or classification (such as being an American or female), in terms of a role (e.g., a stockbroker or a truck driver), or in terms of personal attributes (as in being friendly or honest)"* (Stets and Burke 2005, p. 45). This thesis focuses on role identities in the domain of an individual's occupation, hence, their professional or work-related role identity, such as being a team leader (Higgins 1987). When individuals participate in activities or memberships within their organization, they construct and internalize a set of self-meanings (Dutton et al. 2010). Accordingly, the position one takes on in relation to others in the context of work is defined by the duties, rights, and obligations associated with this position (Caza et al. 2018; Markovsky and Frederick 2020; Sluss and Ashforth 2008). In doing so, individuals create meaning and legitimacy in a particular work role – a work-related role identity (Caza et al. 2018). Prior literature has discussed, for example, how entrepreneurs shape and express their role (e.g., Lewis 2013) or how managers position themselves compared to the definition of their role (e.g., Cuganesan 2017).

Role identities continuously develop and are subject to an ongoing process that progressively resolves tensions when confronted with positive and negative options for development (Junglas et al. 2007; Phoenix and Rattansi 2005). These tensions can be defined as within-person conflicts between a person's existing role identity and potentially threatening new identities. Triggers are changes in central aspects of the work role that can take the form of a new role, different role expectations and designs, or conflicting roles or role descriptions (Caza et al. 2018). Role identity tensions can have serious consequences for employees because they may keep them occupied and lead to stress, frustration, and declining performance. Ultimately, organizations may lose employees which is why these tensions need to be identified early and tackled appropriately.

1.3 Thesis Positioning

Agile ISD practices are pervasively used across industries as a means for organizations to keep up with rapid technology developments and fast changing market dynamics (Digital.ai 2021; Ramasubbu et al. 2015). Accordingly, IS research is called to examine the organizational and individual implications of agile ISD (Toutaoui et al. 2022; Venkatesh et al. 2020). To answer these calls, this thesis strives to showcase organizational-level drivers and individual-level consequences of the use of agile ISD practices.

Figure 1-1 illustrates my overall research model and the positioning of the three research articles in this thesis. The core of this model is the use of agile ISD practices in ISD projects. The implementation of agile ISD within an organization's IT function depends on the overall organizational context and the business decisions which shape the structure of the IT function. The first article takes up the corresponding first RQ and examines how specific business decisions, in this case sales channel management decisions, influence the emergence and type of bimodal IT structures. The use of agile ISD practices within ISD projects in turn can have positive as well as negative consequences for the individuals involved. Articles 2 and 3 of this thesis thus seize the second RQ and investigate how the use of agile ISD practices impacts developers' levels of fatigue and turnover intentions as well as IT PMs work-related identity. By addressing the two research questions, I intend to contribute to agile ISD literature. In particular, I provide rich insights on the mechanisms leading to the introduction and specific allocation of agile ISD units within the IT function and a deeper understanding of individual-level consequences of agile ISD for team-internal roles, i.e., developers, and team-adjacent roles, i.e., IT PMs.

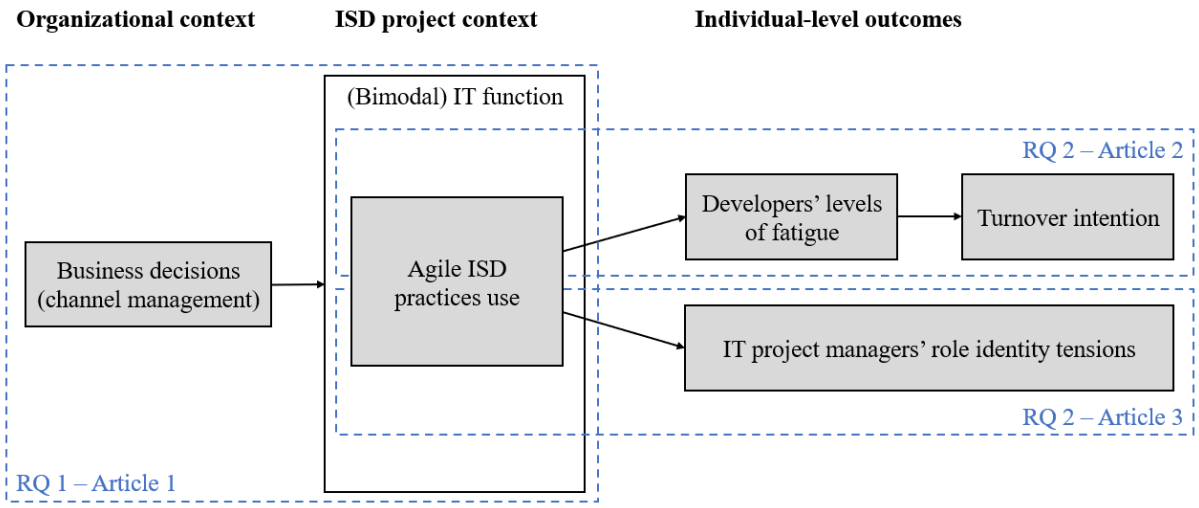


Figure 1-1: Research model

1.4 Thesis Structure and Synopses

This thesis is composed of six chapters. The introduction (Chapter 1) sheds light on the motivation of the thesis, derives its overarching research questions and informs about theoretical foundations. To address the proposed research questions, three studies were conducted and published in three articles in peer-reviewed IS outlets. The three articles are each presented in chapters 2 to 4, subject to minor deviations from the originally published version to ensure a consistent layout throughout the thesis. The final chapter (Chapter 5) presents the main contributions to research, summarizes implications for practice and provides directions for future research. Table 1-1 outlines the chapters and articles that form the body of this thesis. In the following, each of the three articles is summarized and the main findings and contributions to this thesis' research questions are presented. All articles use plural person pronouns (i.e., 'we'), as multiple authors were involved in their development.

Chapter 2 – Article 1: Business Decisions Triggering Bimodal IT Transformations

My first article addresses the first RQ that asks how business decisions drive and shape the transformation of corporate IT functions. The study uses an in-depth case study analysis to show how the evolution of different sales channel management strategies in the context of digital business models affect the organization of the IT function. The results demonstrate that a bimodal IT structure is needed to satisfy the dissimilar demands of digital and traditional offline sales channels equally. One part of the IT function works flexibly and fast using agile ISD practices and serving digital channels. Another part must provide reliable and secure system deployment for the traditional channels' backend services. When pursuing a multichannel sales strategy, in which digital and traditional channels are managed separately, a

divisionally separated bimodal IT with separated IT units – one using agile ISD practices and one using traditional methods – meets the needs of the respective channels best. When advancing to an omnichannel approach with a customer journey focus and a common data basis across all channels, reintegrating the IT functions into a single unit that uses agile IT practices brings about the necessary flexibility as well as consistent IT alignment and integration of IT systems. Overall, this study provides valuable insights how (bimodal) IT functions need to be organized and developed in order to support continuously evolving business strategies most effectively. These insights are particularly relevant because no digital business strategy, no matter how promising, can be successfully implemented if the focus, the structure, and way the IT function works is not aligned accordingly.

Chapter 2	**Business Decisions Triggering Bimodal IT Transformations**
Article 1	Fortmann, L., Haffke, I., Benlian, A. (2018): „Evolution des Kanalmanagements und Transformation der IT. Der Weg der Deutschen Bahn Vertrieb GmbH [The Evolution of Channel Management and the Transformation of the IT Function. The Journey of Deutsche Bahn Vertrieb GmbH]“, *HMD Praxis der Wirtschaftsinformatik*, 55, pp. 398-411. **VHB: D**
Chapter 3	**Developer Fatigue in Agile ISD Settings**
Article 2	Mueller, L., Benlian, A. (2022): “Too Drained from Being Agile? The Self-Regulatory Effects of Agile ISD Practices Use and their Consequences for Turnover Intention”, *Journal of the Association for Information Systems*, 23(6), pp. 1420-1455. **VHB: A**
Chapter 4	**IT Project Manager Identity Tensions in Agile ISD Settings**
Article 3	Mueller, L., Albrecht, G., Toutaoui, J., Benlian, A. (2021): „Role Identity Tensions of IT Project Managers in Agile ISD Team Settings”, *42nd International Conference on Information Systems (ICIS)*, December 13-15, Austin, Texas. **VHB: A**

Table 1-1: Overview of the articles in this thesis

Chapter 3 – Article 2: Developer Fatigue in Agile ISD Settings

My second article focuses on the use of agile ISD practices and investigates its influence on developers working in teams using these practices. More specifically, this study addresses the second RQ on how the use of agile ISD practices affects key roles in the context of agile ISD. Based on the concept of ego depletion, we assessed how agile ISD practices – encompassing agile SD and agile PM practices – enhance or deplete developers’ self-regulatory resources with corresponding effects on their levels of fatigue and turnover intentions. In addition, we looked

at how perceived workload influences these relationships. We used a multimethod research approach and first conducted a cross-sectional field survey with 207 developers. Our findings show that the use of agile SD practices, such as from XP, generally replenishes self-regulatory resources and reduces fatigue and turnover intentions in developers. However, the use of agile PM practices, such as from Scrum, depletes resources and enhances fatigue and turnover intentions during times of heightened workload. In a subsequent qualitative study conducting 15 semi-structured interviews, we unpack the relationships in detail and reveal underlying processes driving the effect of agile ISD practices use on fatigue. The results of the two studies consistently demonstrate that a nuanced and balanced perspective which recognizes not only different types of agile ISD practices but also positive and – contrary to common belief – negative implications is key to investigating the consequences of these practices for individuals in agile ISD settings. A more comprehensive understanding may help to retain key IT personnel and tailor agile ISD practices to organizational settings.

Chapter 4 – Article 3: IT Project Manager Identity Tensions in Agile ISD Settings

My third article continues the investigation of how individuals are affected by the use of agile ISD practices. While article two provided rich insights on the consequences for developers, article three sets out to examine the implications for IT PMs in agile ISD settings. Obtaining a role not foreseen by agile ISD methods, IT PMs are prone to conflicts and tensions regarding responsibilities, tasks, and duties within agile ISD structures. Carrying out 26 semi-structured interviews with IT PMs we found this role to be couched between the expectations of the agile ISD team and the top management. This situation results in five serious work-related role identity tensions for the individual regarding responsibilities, duties, collaboration, communication, and control patterns. Our detailed analysis sheds light on a scientifically neglected but practically prominent role in agile ISD settings expanding the focus of IS research to include not only team-internal but also team-adjacent roles in agile ISD. As such, we provide a more comprehensive understanding of challenges, drivers, and behaviors in agile ISD. Our explanations may help practitioners take the right measures to ensure the success of their agile ISD initiatives. Taken together the second and third article offer comprehensive answers to the second RQ on individual-level implications of agile ISD practices use in organizations.

Additional Articles (not included in this thesis):

In addition to the articles listed above, I contributed to the submission and publication of the following manuscripts during my time as a Ph.D. candidate. These articles, however, are not included in this thesis:

Published:

- Toutaoui, J., Müller, L., Benlian, A. (2021): Synergien zwischen nicht-digitalen und digitalen Geschäftsmodellen in Unternehmen: Möglichkeiten und Handlungsempfehlungen“, *HMD Praxis der Wirtschaftsinformatik*, 58, pp. 628-644. **VHB: D**
- Fortmann-Müller, L. (2018): “Energizing or Depleting? Understanding the Effects of Agile Methodologies on Individual Software Developers’ Resources”, *39th International Conference on Information Systems*, December 13-16, San Francisco, CA. **VHB: A**

Submitted for publication:

- Mueller, L., Albrecht, G., Toutaoui, J., Benlian, A., Cram, W. A.: „Navigating Role Identity Tensions — IT Project Managers’ Identity Work in Agile Information Systems Development”, *Information Systems Journal*, third round of review. **VHB: A**

Chapter 2: Business Decisions Triggering Bimodal IT Transformations

Title:	Evolution des Kanalmanagements und Transformation der IT. Der Weg der Deutschen Bahn Vertrieb GmbH [The Evolution of Channel Management and the Transformation of the IT Function. The Journey of Deutsche Bahn Vertrieb GmbH]
Authors:	Lea Fortmann, Technische Universität Darmstadt, Germany Ingmar Haffke, Detecon Intl. GmbH, San Francisco, CA Alexander Benlian, Technische Universität Darmstadt, Germany
Published in:	HMD Praxis der Wirtschaftsinformatik (2018), 55, pp. 398-411.

Abstract: Distribution channels are an integral part of business models as they are defining customer access. With the ongoing digitization of both customer base and companies, new distribution channels have been added. In addition, there is the necessity to integrate the various (digital) channels in order to enable a seamless customer experience. For companies, this means managing different channels and developing a holistic channel strategy. However, this evolution from single to multi- and omnichannel management in the digital age, in addition to its influence on business performance, also has an impact on the organization of the IT function in companies. Digital sales channels require different forms of IT support than traditional (offline) sales channels. Changes in the importance of the different channels and in the sales strategy therefore lead to necessary changes in the IT function. This article uses a detailed case study conducted at Deutsche Bahn Vertrieb GmbH to show how IT organization forms can be designed to meet the needs of new sales strategies as a fundamental component of digital business models. It covers how the IT unit is structured, how it works, how it is embedded in the overall organization and how the collaboration between business and IT is defined. It also analyses the extent to which the transformation of the IT function at Deutsche Bahn Vertrieb GmbH has achieved its goals and what challenges have arisen. Finally, the insights gained will be discussed and made available to decision-makers.

Keywords: bimodal IT, multichannel management, omnichannel management, digital distribution channels, digital business models

2.1 Introduction

New digital business models and the accompanying digital transformation of all areas of the existing business model pose major challenges for established companies. Processes, products, and also sales channels have to be renewed and adapted in order to fully exploit the potential of digital technologies and remain competitive (Hess et al. 2016). Due to the ubiquity of new technologies in our lives, the interaction with the customer is particularly in focus. New digital sales channels must not only be introduced, but also integrated with each other and with existing channels (Verhoef et al. 2015). The goal must be to create an end-to-end customer experience where the customer perceives every contact with a company as seamless and satisfying on a cognitive, affective, emotional, social, and physical level (Verhoef et al. 2009).

For developing the digital capabilities needed to implement the new technological requirements in the company the IT function is indispensable. It must optimally support the business in the transformation towards digital business models - concerning the provision of both IT systems and innovation (Mirsch et al. 2016). As such, the IT unit must respond to the strategic and organizational changes in the business and also transform itself (Haffke et al. 2017a).

This article focuses on digital sales channels, the associated changes in sales strategy, and the significance of these changes for the IT organization. For this purpose, interviews were conducted with decision-makers at the sales subsidiary of the Deutsche Bahn (DB) Group, Deutsche Bahn Vertrieb GmbH (DB Vertrieb). By selecting this case study, it was possible to analyze the IT transformation specifically in the context of new sales strategies. The goal is to build a bridge between two topics that are usually considered separately in the context of digital business models - sales channel strategies and bimodal IT as a means for IT transformation.

2.2 Sales Strategies in the Age of Digital Business Models

Sales channels define the access to the customer and, thus, make up an important part of the business model. In the last 20 years, the internet in particular has contributed to the fact that companies can no longer shape only one channel to the customer, but many at the same time. The decision to add new digital sales channels to the existing ones represents a multichannel (MC) strategy (Verhoef et al. 2015). There are many to some degree varying definitions of an MC approach. However, one of the most commonly cited is Neslin et al. (2006), who define MC management as *"the design, deployment, coordination, and evaluation of channels to enhance customer value through effective customer acquisition, retention, and development"* (Neslin et al. 2006, p. 96). Many firms follow a strict channel logic in terms of management

and organization when adopting an MC strategy. That is to say, different sales channels are considered individually. Targets are defined and units are established for each channel separately (Mirsch et al. 2016). A distinction is often made between online and offline sales channels in this context.

As digitalization continues, the possibilities to reach customers continues to increase. It is no longer just about online or offline, but also about mobile phones, apps, social media, etc. In addition, the boundaries between sales channels are blurring. The customer can have anything anytime, anywhere. For a long time, the biggest challenge was to manage the different sales channels individually; now it is the seamless combination of all channels. The notion of omnichannel (OC) management has become established as an evolution of the MC approach (see Table 2-1 for a comparison). An OC approach accepts the inevitability of using different channels and is concerned with the integration of all activities within a channel and in interaction with others (Ailawadi and Farris 2017). Verhoef et al. (2015, p. 176). define OC management *"as the synergetic management of the numerous available channels and customer touchpoints, in such a way that the customer experience across channels and the performance over channels is optimized."*

	MC Management	**OC Management**
Focus	Interactive channels	Interactive channels and customer touchpoints (information exchange; not necessarily linked to an interaction)
Scope	Retail channels: Online (online shop), offline (store) and direct marketing (catalogue).	Retail channels: Online (online shop), offline (store), direct marketing (catalogue), mobile (mobile phone, tablet), social media. Customer touch points (e.g., TV, radio, posters)
Channel integration	Separate channels without overlap	Integrated channels and customer touchpoints (e.g., transferring the shopping cart from the online shop to the app)
Customer interaction	Two-sided (between company and customer)	Any kind (e.g., between customers via social media or unilaterally in the case of posters).
Management and goals	Per channel	Cross-channel
Data usage	No sharing	Cross-channel use
Sources: (Mirsch et al. 2016; Verhoef et al. 2015)		

Table 2-1: Comparison of MC/OC management

The evolution from single channel to MC and OC strategies entails profound organizational changes. Because MC is mainly driven by the addition of digital channels, a management and

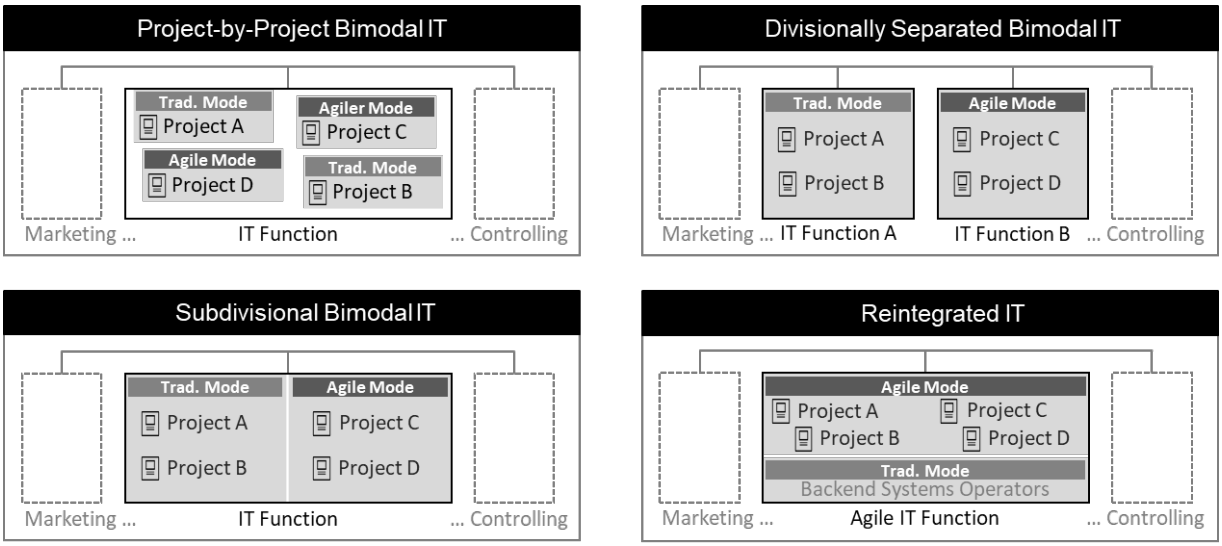
an IT function is needed to generally support all channels, but especially the newly added ones. Corresponding competencies and goals should be built up for each channel in order to optimize the interaction with the customer (Verhoef 2012). The greatest challenge for an MC strategy is the integration and coordination between the sales channels, for which appropriate ways and means must be found, e.g., an overarching portfolio management. For a successful OC approach, customer journey structures and an OC management team with representatives from all departments should be introduced to focus on the holistic customer experience and ensure alignment across the different channels. Also the IT function must reflect the overall integration. Only a common database across all channels and IT systems makes personalized services possible. At the same time, attention should be paid to ensuring that existing IT systems are integrated appropriately (Ovum 2017).

2.3 Bimodal IT as Enabler of IT Transformation

The perception of the IT function in companies has changed due to its increasing relevance for the implementation of digital business models and the development of digital capabilities. It is no longer just an internal service provider, but an enabler for improving business performance and customer satisfaction at the same time. This new and central role of the IT unit implies that it has to be able to act faster and more flexibly (Benlian and Haffke 2016). The IT needs to respond to frequently changing requirements and fix problems quickly. At the same time, it has to ensure the continuous operation of an organizations' critical IT systems. As such, the IT function has to be agile and flexible as well as reliable and secure. For this reason, a growing number of companies are adopting a two-speed or bimodal IT (Gartner 2017a). Bimodal IT is an approach with two different but coherent modes of working in organizational IT functions (Gartner 2017b). One mode is mostly focused on secure, reliable, and scalable system delivery (traditional IT), the other on experimenting with new technologies and digital products (agile IT).

However, there is not only one form of bimodal IT (see Figure 2-1). Conducting interviews with companies from different industries, both Haffke et al. (2017a) as well as Horlach et al. (2017) identified several archetypes of bimodal IT. The main difference between these is the degree of separation between the two IT modes. An IT department in which decisions are made at the project level as to whether a project is to be implemented agilely or traditionally represents the lowest degree of separation (project-by-project bimodal IT). In this structure, agile projects usually have the opportunity to bypass cumbersome processes and documentation requirements that are prescribed for traditional IT projects. A higher degree of separation

applies when two subdivisions are formed within one IT function (subdivisional bimodal IT). These work permanently agile or traditional respectively and, thus, give the IT employees the chance to concentrate on the respective methodology and to use it in an optimal way. The highest degree of separation in corporate IT occurs when there is an agile and a traditional IT function, each of which is assigned to different organizational units (divisionally separated bimodal IT). In this case, the company often introduces a digital division that contains the agile IT unit. Finally, the structure of a single agile IT department, merged from previously separate IT functions, has emerged (reintegrated IT). Here, the traditional IT function moves into the background and, in contrast to the agile IT function, no longer has direct contact with the business departments. For concrete examples of each bimodal IT archetype, we recommend reading the article by Haffke et al. (2017a).



Source: (Haffke et al. 2017a)

Figure 2-1: Archetypes of bimodal IT

The choice of a particular bimodal IT organization depends on many company-specific and situational criteria. If top management wants to highlight the digital ambitions of the company, a digital division with its own agile IT unit is very suitable. However, if the company's tolerance for internal disruption is low, the introduction of project-by-project bimodal IT may be an easier way to start introducing employees to agile structures slowly. The selection criteria change in the course of digital transformations, which in turn influences the optimal design of the IT function. A change from one archetype of bimodal IT to another may be necessary to drive innovation and continue to optimally support the business. For example, separating IT units makes less and less sense when products or services are to be more integrated and networked as part of new digital business models. A reintegrated IT has the agility needed for digital

services, reduces the risk of IT silos, and increases alignment between IT departments (Benlian and Haffke 2016). Likewise, if project teams within a project-by-project bimodal IT are inefficient, an explicit separation of the IT function, e.g., with the help of a subdivided bimodal IT, could create the necessary independence and concentration.

2.4 The Digital Transformation at DB Vertrieb

In order to examine the IT transformation in the context of the digital transformation of sales channels, semi-structured interviews were conducted with decision-makers from DB Vertrieb in 2016 and 2017. These interviews were recorded, transcribed, and coded for analysis purposes in order to filter out both the individual steps of the transformation and the positive and negative effects of specific IT organizations in the context of sales strategies. The Chief Information Officer (CIO), the Chief Digital Officer (CDO) and the head of sales processes provided valuable insights into the challenges of the digital transformation for both the sales department and the IT function as the central enabler.

DB Vertrieb is a wholly owned subsidiary of the DB Group based in Frankfurt am Main. The company's approximately 5800 employees provide advice and information on, as well as sell, passenger transport tickets via all sales channels (DBVertrieb 2017). Next to travel centers, vending machines, and agency sales, DB's central sales channels today also include the internet and mobile ticketing. With the emergence of digital sales channels, DB Vertrieb has adapted its strategy accordingly - first into an MC, then into an OC strategy. In order to optimally support these strategies from the technological side, the corporate IT function had to transform itself and chose various types of bimodal IT for this purpose.

2.4.1 Multichannel Management and Two-Speed IT

With the development of the Internet out of its niche and into an established medium shortly before the turn of the millennium, DB Vertrieb began to experiment with new sales channels in the online environment. In addition to traditional stationary and regional sales via, for example, travel centers and vending machines, a separate business unit was set up for online sales. In this unit, various possibilities of using online ticketing platforms and later also mobile solutions were examined in order to create new digital access to the end customer. DB Vertrieb, thus, followed an MC strategy with corresponding channel logic. In addition to its impact on the business organization, this development also had a particular influence on the structure of the IT function.

The traditional IT function was organized in a separate department under the direction of the CIO. As a pure systems provider, its responsibilities focused on the company's large back-end systems and their reliable and scalable delivery. The IT department's performance metrics focused primarily on meeting service level agreements and budgets. Accordingly, the management focus was on efficiency in terms of cost and performance. In particular, this led to the decision to provide only two releases per year, which severely limited the IT unit's flexibility and speed.

Because of the inherence of IT in the digital sales channels and its visibility to the customer, the cost-oriented management of the IT department was unsuitable for these channels. *"The customer doesn't understand if a bug isn't fixed for six months,"* is how the CIO describes this mismatch. Similarly, increasingly frequent technological innovations had to be implemented at an appropriate speed. The online sales department therefore defined its requirements for IT responsiveness as a minimum of six releases per year and almost weekly patches. Since the existing IT function was neither organized nor managed to achieve this speed, the management at DB Vertrieb decided to set up a second IT unit within the online sales division shortly after deciding on an MC approach, thus moving towards bimodal IT.

The idea was to design and manage the newly created online IT unit like a start-up. It was assigned to the department for digital sales channels and, thus, set up outside of traditional IT function (divisionally separated bimodal IT, see Figure 2-2). An overarching requirements management within the traditional IT function was to ensure sufficient alignment between the two IT departments.

The initially very small online IT team worked from the same location and did not have strictly separated functional roles. IT managers here saw their role not only in supporting functional departments, but rather in achieving the greatest impact for the customer. With the goal of working in a flexible and straightforward manner and being able to react quickly to necessary changes, the online IT unit applied its own rules and developed its own culture. *"The mindset [within the online IT] at that time was already very close to what is now called an agile mindset,"* says the head of sales processes.

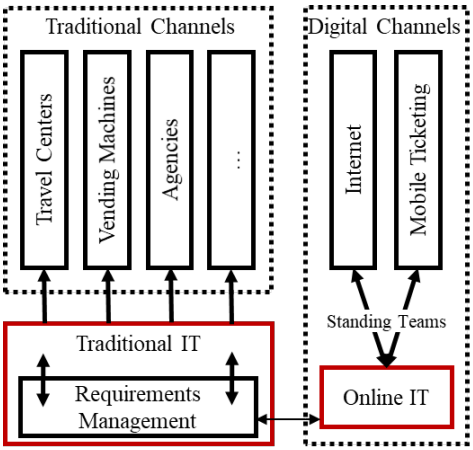


Figure 2-2: MC approach with a divisionally separated bimodal IT at DB Vertrieb

Over the last 15 years, the increasing relevance of digital sales channels for ticket sales in passenger transport has led to new challenges. The functional departments at DB Vertrieb shifted their focus away from traditional IT to online IT services. In order to meet the increased demand, changes were made within the online IT function. DB Vertrieb successively expanded and reorganized the department. From around 20 employees in the early years, the department grew to 150 employees by the end of 2015. In addition, the company introduced sub-departments within the online IT unit to manage both the larger number of employees and the increasing demand.

2.4.2 Successes and Challenges of Bimodal IT

The goal of increasing the flexibility and agility of the IT function for the new digital sales channels and, thus, optimizing the IT support for all areas of the MC strategy was achieved with the divisionally separated, hence independent online IT department. In fact, it provided almost weekly releases. Eight to ten of these releases per year contained complex functionalities. Compared to the traditional IT department, which operated with two to four releases per year, the higher speed was a huge advantage. This enabled the company to respond to the increasing number of new requirements in the online sales channels in the passenger transport market.

Similarly, close cooperation and a good alignment between business and IT staff within the online sales unit was achieved. IT demand and supply were very well aligned and the online IT function was perceived as an active partner of the business. The atmosphere was constructive and prioritization of projects and requirements was done jointly by business and IT. *"The trust that existed within the unit to achieve the budgetary optimum through good multi-project management was absolutely great,"* recalls the head of sales processes.

However, using a dedicated agile ISD method, à la Scrum (Schwaber and Beedle 2002), was difficult. Although the online IT function worked with standing teams, i.e., fixed teams of business and IT employees for each topic and a PO role, the strong interconnection of all sales channels at DB Vertrieb meant many dependencies. Many changes in the online sales channels also entailed necessary changes in traditional sales channels, which were supported by the traditional IT unit. Larger projects were, therefore, usually structured in such a way that the online IT was a sub-project. The implementation of explicit agile ISD practices was very difficult in this context.

The stronger focus on the online IT function meant that traditional IT staff increasingly felt that they were *"sitting on systems, procedures, and processes that are obsolete or that are no longer being addressed in the way they should be,"* explains the CIO. This loss of appreciation, along with a lack of understanding for release delays by online IT employees, resulted in more and more tensions and a growing cultural divide between the two IT units. The reduced willingness to cooperate and an inflexible requirements management made the alignment between the two IT areas increasingly difficult.

Further challenges arose from the increasing size of online IT function. Employees began to identify with their respective units. IT silos emerged and the agile culture disappeared. Existing collaboration models between online and traditional IT units became less feasible as digital issues were no longer just a part of overarching sales projects. Rather, they were now the core of it all. Despite this, speed and flexibility expectations on the business side concerning the online IT function remained unchanged. Therefore, it was more and more difficult to manage this fast-growing, less agile online IT unit.

2.4.3 Omnichannel Management and the Reintegration of the IT Function

For several years now, the use of new technologies and digital products has been ubiquitous. An outstanding customer experience across all media is vital for companies to survive. However, the organization and management focus at DB Vertrieb prior to 2016 prevented the company from fully exploiting the opportunities of digitalization. Neither the importance of digital sales channels nor the relevance of an overarching integration of all sales channels was reflected by the existing structures. A company-wide OC approach was not feasible. In particular, the division of the IT department into online and traditional IT, which were assigned to different functional units, led to strong tensions and prevented a central strategy alignment. *"So far, we had a couple of different IT silos. They each supported specific channels and specific systems. That's why we didn't have omnichannel,"* confirms the CDO. The management

at DB Vertrieb, therefore, decided to restructure the company, including a merger of the two separate IT functions, with the aim of providing the best digital customer interface in the mobility sector and, thus, creating an optimal customer experience across all sales channels.

A digital division was established at the beginning of 2016, headed by a newly appointed CDO. He is a member of the executive board with the aim to improve the IT understanding within the management team. As board member, he shares responsibility for all business units and, thus, also promotes the importance of digitalization and digital transformation throughout the company. In line with the focus on a comprehensive customer experience, the digital unit is organized by customer journeys and is complemented by an overarching OC management. The IT functions have been merged into a single function within this digital division (reintegrated IT, see Figure 2-3). Only a small operational unit for the very specific requirements of regional vending machines still exists outside the reintegrated IT. This overall structure should help to break down the internal barriers - IT and channel silos - and to work together in a more integrated manner.

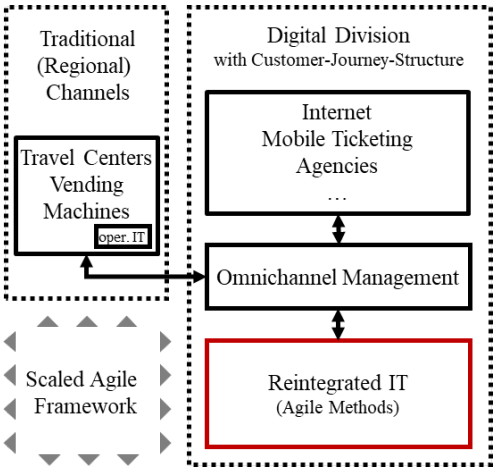


Figure 2-3: OC approach with a reintegrated IT function at DB Vertrieb

The goal for the reintegrated IT function is to resemble the former online IT unit and to be a fast and flexible partner for the business. Business and IT should also move closer together in the traditional channels and drive innovations. In addition, innovations should to be brought to market more quickly. The CIO formulates his expectations as follows: *"In time-to-market, we want to introduce a big lever, become 5 times faster – end-to-end."* In concrete terms, this means that releases must be made on a monthly basis for functionalities with many interfaces and on a weekly basis for independent features. To achieve these goals, DB Vertrieb has been investing heavily in the new organizational setup since the reorganization in 2016.

The company decided to implement the Scaled Agile Framework (SAFe) to bring the agile approach of the former online IT function to the entire company. SAFe is a best practices approach that provides DB Vertrieb with methods to solve the biggest problems in scaling agile methods (SAFe 2017). It helps the company to channel IT requirements and *"achieve strategic agreement across the different business units and ultimately come to a collaborative prioritization that we are all comfortable with and feel we have achieved an overall optimum for DB,"* emphasizes the head of sales processes. In addition to scalability, SAFe also enables a stringent derivation of group strategies. DB Vertrieb has to coordinate its business activities with other DB group units, and SAFe supports the optimization of this alignment. As part of SAFe, the company also introduced formal Scrum teams and DevOps methodologies. (Juner and Benlian 2017; Samulat 2017) . In this way, DB Vertrieb aims to improve cooperation and prevent silo thinking from the outset.

In order to close the gaps between the employees of the former IT departments and make the reintegrated IT agile, DB Vertrieb offers ongoing training on agile methods to the former employees of the traditional IT unit. In addition, cross-functional camps are organized with the aim of promoting a customer-focused, agile, and innovative mindset throughout the company. All training and courses are mandatory to ensure effectiveness and a common understanding. To facilitate spreading agile ways of working within the IT teams, DB Vertrieb also applies an employee mix strategy. This means that, wherever possible, the teams are made up of former online IT and traditional IT employees.

2.4.4 Successes and Challenges of the Reintegrated IT

The reorganization with a focus on cross-channel customer journeys, which put the customer's point of view at the center and promote the integration of all channels necessary for OC, on the basis of a single IT department that is equally focused on all journeys and sales channels made the OC approach possible. *"We have now merged the [IT departments] organizationally because we said there can only be omnichannel in the future,"* the CDO emphasized. With a single reintegrated IT, all sales channels get access to the same IT expertise, flexibility, and speed. Business requirements are now directed to a single large IT function. The OC management, in turn, prioritizes the requirements. The new clear responsibilities and increased transparency enable better business-IT alignment and easier and faster implementation of customer requirements.

By assigning the reintegrated IT to the digital unit, traditional IT topics also come to the fore and receive more attention. The digitalization strategy at DB Vertrieb encompasses the

strategies of both OC management and the reintegrated IT function, thus, creating an overarching alignment and the necessary focus. The CIO describes the impact as follows: *"The digital division has made everyone aware that IT is everything and that without IT no business is possible anymore. This awareness totally helps me push CIO issues because everyone realizes that IT is the basic component of our business of the future."*

The mandatory participation in the courses on methods and collaboration models has led to an increase in team spirit and motivation among those involved. The head of sales processes explains: *"This joint approach to a methodology by the rather mixed people from the various channels, who have not always landed in a reorganization voluntarily, has created a fantastic sense of cohesion. [...] This morning I read the employee reviews on Kununu for fun. There you can now read a lot that DB attaches a lot of importance to customer orientation and that you can feel it."* This commitment of the employees helped to quickly put together well-functioning cross-divisional teams within the customer journey structure.

However, the implementation of training also requires more time and investment than expected. The existing different working and collaboration methods are deeply entrenched and the path to a common approach is far from complete. The introduction of SAFe additionally triggered uncertainties among some employees of the reintegrated IT function. Since the restructuring in line with the OC strategy, alignment with other organizational units has been required. As a result, the employees of the former online IT unit are much less autonomous than they were used to before. At the beginning, this led to partly high fluctuation rates and difficulties in filling new positions.

DB Vertrieb is also still working on implementing SAFe within its highly integrated organization. All teams in the company are working towards a single goal, the sale of passenger transport services via various sales channels. This implies a strong interconnectedness of the departments and the enterprise architecture. It is complicated to divide new functionalities or changes regarding the service into specific release trains of a certain size - as SAFe wants to do. Ultimately, all areas are always affected by the changes and new requirements, which makes it difficult to draw a line between them.

Overall, the transformation is already taking longer than expected. All interview partners agreed that the changes have to pay off soon. To support this, DB Vertrieb has created and filled the role of a *"conductor"* within the digital unit, as the head of sales processes described the position. Her job is to oversee the progress and *"make sure that a few items get hung to 'Done' sometimes."* Further, the company recently established a Transformation Governance Board. It

is supposed to look at what is going well and what not so much. The board members also decide on appropriate measures in the context of the transformation. In this way, the board gives management the time to find appropriate ways through the reorganization of business and IT.

2.5 Discussion and Conclusion

The example of DB Vertrieb shows how developments in the sales channel strategy influence the organization of the IT function and how the IT function can transform itself to meet the new challenges.

A bimodal IT, which is located within the departments of the different sales channels, is an appropriate IT structure to support MC strategies. Viewed individually, the independence created by two divisionally separate IT units allows for the application of the respective optimal structures and work methods. The divisionally separate bimodal IT functions also enable good business-IT alignment within each channel due to their respective strong focus and orientation. In a project-by-project or subdivisional bimodal IT structure, this does not necessarily have to be the case. For digital sales channels with their IT visible to the customer, this alignment is particularly important. At the same time, however, attention must be paid to maintain the balance between IT departments. This applies to less tangible aspects, such as employee appreciation, as well as more concrete ones, such as resource allocation or project structures. A strong overarching portfolio and requirements management can play a coordinating role here and facilitate alignment.

A successful OC strategy requires a customer journey organization, intensive coordination between all departments, a common data basis, and a fast response capability in the company and especially in IT function (Ovum 2017). As the case of DB Vertrieb shows, a single IT department is important for this sales strategy. It ensures the necessary consistent IT alignment and makes the integration of IT systems possible. Hence, a common database can be achieved more easily than if the IT units are organizationally separate. A reintegrated IT structure makes particular sense in the context of OC, since agile capabilities from previous bimodal IT structures are already available and do not have to be completely rebuilt. Also, unlike project-by-project or subdivided bimodal IT, a reintegrated IT function provides the same agile, fast, and flexible IT skills across channels and projects. In order for a company to achieve this agility across the IT department, a guiding framework is necessary. SAFe is one of many possibilities here – another would be Large Scale Scrum, for example (LeSS 2017) – to support both the management and the employees.

Basically, IT has permeated the actions of companies in times of digitalization to such an extent that the effects on the corporate IT function should be examined for every strategy change and associated reorganization on the business side. Can the IT unit support the new strategy sufficiently well? Is the IT unit capable of generating innovation? No matter how promising a strategy in the context of digital business models is, it cannot be successfully implemented if the focus, structure, and working methods of the IT function are not aligned accordingly. This is where the concept of bimodal IT can add value. It should be understood less as a specific organizational form than as a tool to transform the IT function. In its various forms, bimodal IT can show a way to overcome the challenges of digital business models.

Of course, the case of DB Vertrieb is a specific context, especially since it concerns a company that specializes purely in sales. However, precisely because of this, the influence of sales strategies on the IT organization could be examined very accurately and interesting details could be worked out that are relevant for decision-makers in the sales context but also in the context of the company as a whole. The results should serve as a guideline for IT transformation in the context of new sales strategies.

Chapter 3: Developer Fatigue in Agile ISD Settings

Title:	Too Drained from Being Agile? The Self-Regulatory Effects of the Use of Agile ISD Practices and their Consequences for Turnover Intention
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Abstract: While much is known about the beneficial effects of agile ISD, scholars have largely neglected to address its potential downsides. Specifically, research on this topic has thus far overlooked the ambivalent implications of the specific demands placed on developers working in agile ISD teams, including potentially depleting effects. Drawing on ego depletion theory and the associated literature, we provide a more balanced view and introduce self-regulatory resource depletion triggered by using agile ISD practices—encompassing SD and PM practices—as a theoretical perspective on why agile developers experience different levels of work-related fatigue that lead to stronger or weaker turnover intentions. Furthermore, we propose that due to the specific way in which agile ISD methods organize ISD project work, developers' perceived workload influences the intensity by which agile ISD practices affect self-regulatory resources and developers' feelings of fatigue. We examined our research model using a multimethod approach including quantitative and qualitative data. We found that the use of agile SD practices enhances developers' self-regulatory resources and reduces fatigue and turnover intention. Our results also show that perceived workload strengthens the energizing effects of the use of agile SD practices and reveals a depleting effect of the use of agile PM practices, with countervailing implications for turnover intention. This study contributes to agile ISD literature by drawing a more nuanced and balanced picture with both resource-enhancing and resource-draining effects of the use of agile ISD practices. Finally, we give managerial advice regarding factors to consider when designing and managing agile ISD projects.

Keywords: agile information systems development, agile software development, agile project management, ego depletion, self-regulation, fatigue, perceived workload, turnover intention.

3.1 Introduction

Agile methods are omnipresent in contemporary ISD. They enable companies to respond quickly to changing conditions caused by technology-centric, turbulent, and uncertain markets (Ramasubbu et al. 2015; Rigby et al. 2016). To date, 97% of companies claim to use agile approaches and while their adoption rate has increased in many business areas, they remain most popular in ISD (VersionOne 2019). The Agile Manifesto is the common denominator for all agile ISD methods and highlights an iterative, people-centric development approach with self-organizing teams subject to continuous feedback (Fowler and Highsmith 2001). The various agile ISD methods that have emerged from these basic agile principles, such as Scrum and XP, not only fundamentally influence daily development work but also place various demands on developers, such as short cycle times and permanent responsiveness to change, exercising constant pressure to deliver software increments (Benlian 2022). The potential consequences of these demands, work exhaustion or fatigue in particular, can constitute essential antecedents to developers' intentions to stay in or leave a company (e.g., Moore 2000a). In times of IT skill shortages, in which developer churn may come with enormous costs, understanding the demands and reasons for staying or leaving can help organizations retain IT professionals (Pflügler et al. 2018).

Over more than two decades, academic literature has studied the implications of agile ISD methods and their practices (Hoda et al. 2017). Consistent with previous research, we apply the term "practices" to specific agile techniques, such as daily standups and continuous integration, and "methods" to any number of defined, interdependent sets of practices developed by practitioners, such as Scrum or XP (Tripp et al. 2016). Despite the substantive body of work, research has mainly focused on the organizational implementation of agile ISD practices examining method tailoring (e.g., Fitzgerald et al. 2003) and project-level implications, such as the benefits of agile ISD practices for product quality (e.g., Maruping et al. 2009a). Even though these insights are valuable because they explain how organizational and project demands can be addressed through the use of agile ISD practices, our understanding of how these practices and their demands influence developers in their daily work is still fragmented (Tripp et al. 2016; Venkatesh et al. 2020). The extant research has generated inconsistent findings concerning the effects of demands inherent in using agile ISD practices, indicating ambivalent implications for individual developers, including positive as well as unintended negative consequences. For example, the empowering nature of agile ISD practices was found to be motivating for developers but may also lead to ineffective decision-making, likely producing stress (Drury et

al. 2012; McAvoy and Butler 2009; McHugh et al. 2011). Similarly, increased communication and knowledge sharing within agile ISD teams facilitates work alignment yet also requires a high level of self-discipline to overcome communication barriers (Ghobadi and Mathiassen 2016; Hummel et al. 2013).

Given this ambivalence, it is surprising to find that individual-level effects of the use of agile ISD practices only recently started to attract increasing research attention (e.g., Benlian 2022; Tripp et al. 2016; Tuomivaara et al. 2017; Venkatesh et al. 2020). Tripp et al. (2016), for example, studied how agile SD practices and agile PM practices differentially shape developers' job satisfaction via specific job characteristics. The mixed results reported in this study—in the sense that agile SD and PM practices have substantially different direct and indirect effects on job satisfaction—suggest that distinguishing between distinct types of practices seems to be an essential criterion for studying job outcomes in agile ISD, that their use might not have exclusively beneficial effects on developers, and that other factors besides job characteristics seem to be important determinants of job satisfaction.

One such factor could be the effects of the demands placed by the use of agile ISD practices on developers' levels of exhaustion or fatigue as an important prerequisite for job outcomes, such as satisfaction and turnover intention (Moore 2000a; Rutner et al. 2008). Previous research on the work exhaustion of developers in agile ISD teams addresses the mitigation potential of the use of agile SD practices regarding exhaustion by reducing role ambiguity and role conflict (Venkatesh et al. 2020). Although these results provide important preliminary insights, their focus on agile SD practices leaves aside agile PM practices that are widely used and more people-centric, placing different demands on developers than IS artifact-centric agile SD practices (Baham and Hirschheim 2021). Integrating agile PM practices in the research on developer exhaustion or fatigue in agile ISD teams may thus bring forth new and potentially diverging mechanisms, which could then influence significant job outcomes.

In light of these research gaps, the objective of this study is to shed light on how the use of agile SD and PM practices—the primary and most widely used categories of agile ISD practices (Baham and Hirschheim 2021; Tripp et al. 2016)—affects developer fatigue and ultimately turnover intention. We draw on ego depletion theory and the notion of self-regulatory resources to examine how and why using agile ISD practices may invoke both individual benefits and costs for developers, and, more specifically, if developers may need to invest more or less of their personal self-regulatory resources to deal with the implications of agile ISD work structures. This self-regulation view provides a balanced perspective on the underlying

psychological mechanisms explaining the positive and energizing consequences of the use of agile ISD practices as well as its unintended negative and depleting consequences.

Given that previous research has repeatedly indicated that workload influences resource-level demands of work (e.g., Diestel and Schmidt 2012; Prem et al. 2016) and agile proponents emphasize the promotion of sustainable development through a constant and healthy work pace (Fowler and Highsmith 2001), our study also accounts for whether perceived workload may shape how intensely developers experience the self-regulation effects of the use of agile ISD practices. Tuomivaara et al. (2017) recently showed how agile ISD practices can reduce developers' work exhaustion by leveling out their workload across the entire duration of a project. However, their study does not systematically examine perceived workload as a boundary condition in agile ISD contexts. As a typically scarce resource, developers are frequently exposed to substantial amounts of workload in projects (Huarng 2001; Moore 2000a). Because organizations are rarely engaging in exclusively agile work, developers are often part of multiple projects and, even if they are working on one project only, dependencies and the extra effort created by other projects or (functional) departments may severely influence developers' daily workload (Hekkala et al. 2017; Laux and Kranz 2019), leaving developers with a workload they might not be able to balance.

Failure to fully understand the influences of the use of agile ISD practices on developer fatigue and turnover intention and ignoring the role of perceived workload in this context limits our ability to obtain a more comprehensive picture of how to manage agile ISD projects. With the aim of providing a nuanced and more balanced view of the use of agile ISD practices and its energizing, i.e., resource-enhancing, as well as fatiguing, i.e., resource-depleting, implications for developers, we propose the following overarching research questions:

1. Does the use of agile ISD practices have resource-enhancing and -depleting effects? If so, how do these effects influence developers' turnover intentions?

2. How does developers' perceived workload affect the resource-enhancing and -depleting effects of the use of agile ISD practices?

In our study, we address these research questions by drawing upon ego depletion theory (EDT) and integrating the concept of self-regulation into agile ISD research. We pursued a multimethod approach wherein quantitative and qualitative data were collected and interpreted to better understand the perceptions of developers working in agile ISD teams. In a first study, we conducted a field survey to analyze the impact of the use of agile SD and PM practices on developers' availability of self-regulatory resources, reflected in different levels of work-related

fatigue. We examined the role of work-related fatigue as a possible explanation for how agile SD and PM practices affect developers' turnover intentions. Finally, we investigated how developers' perceived workload shaped the effects of agile SD and PM practices on fatigue and turnover intention. In a second study, given the need to enrich and deepen the knowledge on the use of agile ISD practices (Maruping et al. 2009a) and in line with our goal to provide a nuanced and comprehensive understanding, we collected qualitative data to explore the antecedents of developers' feelings of fatigue triggered by the use of agile ISD practices in more detail. We conducted interviews with developers working in agile ISD teams, probing how they feel when using agile ISD methods in the context of normal and high workloads, with the aim of corroborating and expanding our findings from the survey study.

Our study results contribute to research on agile ISD, IT workforce, and work-related ego depletion. By examining resource-enhancing and resource-depleting mechanisms, we move beyond the predominant notions of the use of agile ISD practices as a largely positive phenomenon that enhances work satisfaction and mitigates exhaustion and thus provide a more balanced view on the consequences of using agile ISD practices for individual developers. In response to previous calls for research (Tripp et al. 2016; Venkatesh et al. 2020), we also extend the knowledge on developers' psychological conditions in agile ISD projects by unpacking key processes that underlie the effects of using agile ISD practices on feelings of fatigue. Moreover, complementing prior work on the project level of analysis (Tuomivaara et al. 2017), we introduce perceived workload as a still underinvestigated moderating factor that offers an important boundary condition to the individual-level implications of the use of agile ISD practices. Finally, we contribute to research on the work-based implications of ego depletion (Johnson et al. 2018) by identifying agile ISD practices as specific IT job-design features capable of reducing work-related fatigue. From a practitioner's point of view, our results provide guidance on how to enhance developers' self-regulatory resources and well-being at work and strengthen a company's position in attracting and retaining software development talents.

3.2 Theoretical Background

3.2.1 Agile Software Development and Project Management Practices

Agile ISD has been on the rise for almost two decades now. The basic principles are written down in the Agile Manifesto—setting agile boundaries reaching from "*individuals and interactions over processes and tools,*" *working product over comprehensive documentation,*"

"*customer collaboration over contract negotiation,*" to "*responding to change over following a plan*" (Fowler and Highsmith 2001). Coming from these principles, various agile ISD methods have emerged that contain a wide range of practices. In accordance with previous research (Tripp et al. 2016), we refer to agile ISD "*practices*" as specific techniques, such as continuous integration, and to agile ISD "*methods*" as a particular interdependent set of practices, such as Scrum. In our research we focus on agile ISD practices because very few agile practitioners actually adopt all of the practices in a method (Conboy and Fitzgerald 2010) and many adopt practices from multiple methods (VersionOne 2019). At a high level, these agile ISD practices can be distinguished according to their focus on SD and PM (Baham and Hirschheim 2021; Hummel et al. 2013; Tripp et al. 2016).

Agile SD practices focus on more IS artifact-centric tasks that primarily guide the execution of the software development process itself, emphasizing technical aspects and automating mechanisms (Baham and Hirschheim 2021). The most popular of these practices stem from XP (Kude et al. 2019; VersionOne 2019). When implementing unit testing, for example, developers use dedicated test code to (automatically) test the effects of changes to the system. Coding standards provide a set of established norms concerning code-naming and consistency (Beck 2000), creating a frame for efficiently designing and programming software. Appendix A provides an overview and description of the practices that are currently primarily applied (Tripp et al. 2016; VersionOne 2019). Next to unit tests and coding standards, continuous integration and refactoring are at the top of this list for agile SD practices.

Agile PM practices relate to more people-centered tasks and focus on facilitating the performance of the actual software development by managing work in teams, establishing customer relationships, and obtaining feedback (Baham and Hirschheim 2021; Tripp et al. 2016). Scrum has become particularly popular for project management as well as creative teamwork in solving complex problems (Barlow et al. 2011; Rigby et al. 2016). The most important means of agile PM practices are meetings which are preferably held face-to-face. For example, in daily standups, project progress and current tasks are discussed, while in retrospectives, the development team critically reflects on the last iteration and identifies improvement opportunities (Schwaber and Beedle 2002). Besides daily standups and retrospectives, an iterative delivery approach, including iteration planning and iteration reviews, is among the agile PM practices that are primarily applied in practice (see Appendix A).

3.2.2 Related Literature on the Effects of the Use of Agile ISD Practices

The consequences and effects of agile ISD have been studied at the organizational, project, team, and individual levels. In the years following the publication of the Agile Manifesto, the adoption of agile ISD methods in organizations, as well as combinations of agile and traditional plan-driven ISD approaches, was of major research interest (Boehm 2002; Nerur et al. 2005; Vinekar et al. 2006). Following this, scholars began to extensively examine project- and team-level effects in agile ISD. The wide range of phenomena and outcomes studied at these levels includes project and team performance, product quality, decision-making, team communication, and knowledge sharing (Coyle et al. 2015; Drury et al. 2012; Hummel et al. 2015; Kude et al. 2019; Maruping et al. 2009a; Maruping et al. 2009b). Only recently has scientific research turned significant attention toward the individual-level implications of agile ISD. The focus of these studies has mainly been on job satisfaction and work exhaustion (Fortmann-Müller 2018; Tripp et al. 2016; Tuomivaara et al. 2017; Venkatesh et al. 2020). For example, Tripp et al. (2016) conducted a study based on the job characteristics model and found support for the effect of the use of agile PM practices but not for the use of agile SD practices on developer job satisfaction.

Research on the people-oriented implications of the use of agile ISD practices shows ambivalent individual-level consequences for developers emphasizing beneficial effects, while also pointing to negative side effects. Collective decision-making within a self-managed team of developers, for instance, is considered a central advancement of agile ISD. It places decision power where the knowledge is and empowers each team member (Fowler and Highsmith 2001; Tessem 2014). While this empowerment has been found to be motivating for developers (McHugh et al., 2011), studies have also reported inefficiencies in decentralized team decision-making that are likely to produce stress for developers (Drury et al. 2012; McAvoy and Butler 2009). Other examples include the increased communication requirements and the intensive knowledge sharing that, on the one hand, facilitate developers' alignment of work with other stakeholders due to higher transparency (Hummel et al. 2013; Schlauderer et al. 2015). However, on the other hand, developers must invest more time and effort into these communication activities (e.g., in meetings related to planning, grooming, aligning, reviewing), and may need a high-level of self-discipline to do so (Ghobadi and Mathiassen 2016; Schlauderer et al. 2015). Also, as an important practice of agile ISD, collaborative code ownership contributes to higher product quality and fewer misunderstandings about code (Maruping et al. 2009a) but may also offer a considerable scope for conflicts among developers who may disagree on code structure and quality (Balijepally et al.

2006). These examples showcase that the use of agile ISD practices may be a double-edged sword, generating both benefits and detriments for developers. Yet scholars have rarely adopted a balanced perspective and have not sufficiently discussed potentially unintended negative individual-level effects (Benlian 2022).

Notable exceptions are studies on work exhaustion and well-being. Tuomivaara et al. (2017) found that an agile PM approach can prevent exhausting phases by balancing the workload in ISD projects. Venkatesh et al. (2020) introduced individual developer skills in their discussion of why agile SD practices are more, or less, effective in reducing role conflict and ambiguity and, eventually, work exhaustion. While these studies provide important insights into the effects of the use of agile ISD practices on developers, they focus primarily on how agile ISD methods can mitigate potential individual-level downsides, emphasizing the generally positive lens through which the consequences of agile ISD method use are examined. Additionally, their results focus on a particular type of agile ISD practices. The study of Tripp et al. (2016), however, shows that different types of agile ISD practices, namely agile PM and SD practices, can potentially trigger divergent consequences for individual developers. Another recent study (Benlian 2022) showed that agile ISD practices, in general, can simultaneously impair and improve developer well-being. Hence, while this study takes a more balanced view, it also lacks a distinction between types of agile practices, which is necessary to achieve a deeper understanding and illustrate effects on a more granular level. As a consequence, the previous agile ISD literature on work exhaustion and well-being has failed to provide a holistic and nuanced view on the individual-level effects of using agile ISD practices on developers. In sum, individual-level research on agile ISD is still scarce and lacks a balanced perspective that takes both positive and negative implications for job outcomes into account; thus, it misses out on a comprehensive discussion on how the use of agile ISD practices potentially differs in its effects on individual developers. In the following, we turn to an established theory, namely EDT, to build a more thorough and exhaustive understanding of how using agile ISD practices influences developers and their self-regulatory resources.

3.2.3 Self-Regulation and Feelings of Fatigue

EDT defines self-regulation as the act of exerting control over one's feelings, thoughts, or impulses and adapting behaviors based on various demands (e.g., Baumeister et al. 2006). For example, resisting distractions or coping with stress are demands that require a great deal of control over oneself (Muraven and Baumeister 2000). According to Muraven et al. (1998), self-regulation relies on a limited pool of resources. When it is used up, one falls into a state of ego

depletion, which describes a state of diminished availability of regulatory resources or self-control. Once it is depleted, subsequent tasks in need of self-regulation are less successful than they would be without prior depletion (Baumeister et al. 2006). The literature typically compares the strength of self-control to a muscle that gets exhausted when continuously exerted (e.g., Muraven and Baumeister 2000). Indeed, fundamental studies of EDT found that performing regulatory tasks results in intensified feelings of fatigue in the sense of being mentally tired, drowsy, or exhausted (Baumeister et al. 1998; Muraven et al. 1998). However, there are circumstances in which regulatory resources can become less depleted or even replenished—in other words, the "muscle" is energized so that one experiences less fatigue. While rest or sleep obviously reduces fatigue and can replenish depleted resources (Muraven and Baumeister 2000), positive experiences and mood, as well as motivation, have been shown to also counteract the regulatory depletion effect, increase resources, and reduce fatigue (Baumeister and Vohs 2007; Bono et al. 2013; Gross et al. 2011; Tice et al. 2007). In addition, an environment that supports rather than controls autonomy can help to build regulatory resources through enhanced feelings of subjective vitality (Muraven et al. 2008).

In the organizational and IS literature, EDT has recently received increasing attention. Studies have drawn on EDT to explain the consequences of self-regulatory demands, hence fatigue, at the workplace or when using technology (e.g., Chan and Wan 2012; Soror et al. 2015). Such studies have, for example, investigated the resource-draining effects of helping others at work (e.g., Lanaj et al. 2016) and the resource-replenishing effects of specific technology designs in online gaming (e.g., Lee et al. 2016). Given the arguments above, we believe that EDT has the potential to provide a solid foundation for investigating the potentially positive and negative effects of the use of agile ISD practices on individual developers' work-related fatigue.

3.3 Hypotheses Development

Figure 3-1 depicts our research model regarding feelings of fatigue and turnover intentions of developers working in agile ISD teams. We draw on EDT to theorize that the use of agile SD and PM practices is associated with lower and higher levels of fatigue, respectively, and that fatigue is a mediator in the relationship between the use of agile SD and PM practices and developers' turnover intentions. We additionally expect perceived workload to moderate the relationships between the use of agile SD and PM practices and developers' feelings of fatigue, in both cases intensifying the main effects in the context of high levels of perceived workload. The development and testing of this (first-stage) moderated mediation model is discussed as follows.

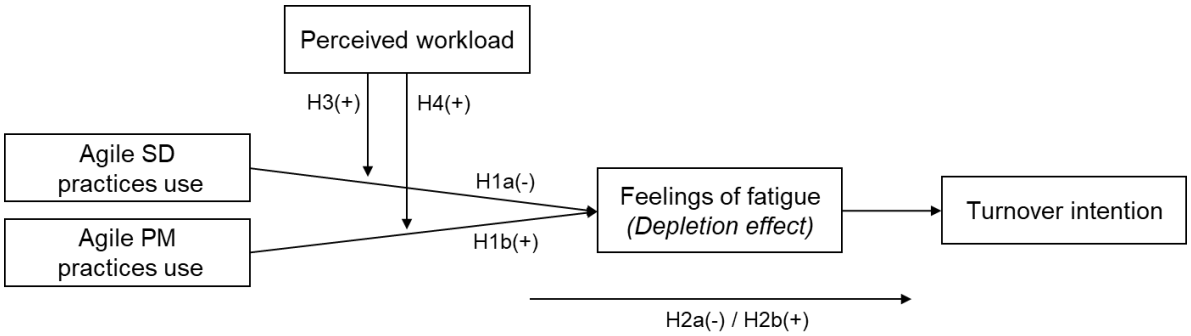


Figure 3-1: Research model

3.3.1 Agile SD Practices and Self-Regulatory Resources

Two key values of agile SD practices are feedback and simplicity in the process of programming and implementing software (Fitzgerald et al. 2006). They aim for smoothing processes, enhancing understanding, facilitating collaboration, and reducing the level of frictions, thereby lowering stress, cognitive demands, and negative feelings among developers. In line with Venkatesh et al. (2020), who found that the use of agile SD practices reduces exhaustion through lower role ambiguity and conflict, we argue that as a result of the aforementioned characteristics of agile SD practices, developers are also less likely to feel fatigued due to lower consumption of self-regulation resources. Literature from the field of agile SD as well as ego depletion supports this logic.

A considerable part of feedback in agile SD is automatically generated in terms of failed unit and acceptance tests as well as continuous integration actions on a server machine that is jointly used by all team members (Tripp et al. 2016). The immediate and automated feedback is likely to lead to a seamless and undisturbed workflow conserving developers' internal resources because answering time, that is to say workflow interruption, is minimized (Baumeister et al. 2007; Beal et al. 2005). In addition, the high frequency of testing feedback on small pieces of code—as opposed to the infrequent testing of feedback including large amounts of code—can generate more positive feelings and higher motivation regarding testing because it is perceived as a series of manageable steps (Geister et al. 2006; Hazzan and Dubinsky 2003). The result is a more comfortable atmosphere that is believed to counteract ego depletion (Baumeister and Vohs 2007; Tice et al. 2007). Lastly, Ji et al. (2005) stated that the concurrent construction and debugging enabled by frequent feedback generally leads to a higher quality of the system and future development work. Developers likely need fewer resources to cognitively process programming information when the code quality is high (Schmeichel et al. 2003). They are also less exposed to difficult and stressful team situations,

such as disagreement and friction, and need fewer regulatory resources to cope with demands (Muraven and Baumeister 2000).

Applying coding standards and refactoring during software development enhances code clarity and simplicity, enabling a common understanding of software code among developers and thereby supporting effective coordination and collaboration (Beck 2000; Maruping et al. 2009a; Pikkarainen et al. 2007). Developers' expectations of each other should become much clearer and ambiguity less likely (Venkatesh et al. 2020). Thus, cognitive processing, which is necessary for comprehending and editing code that was written by another developer, becomes easier. Facilitating cognitive processing has been found to build regulatory resources (Aspinwall 1998; Schmeichel et al. 2003). Also, the possibility of coding errors and misunderstandings is reduced through coding standards, which diminishes the level of stress because team conflicts become less likely. Less stress to cope with, again, should preserve self-regulatory resources (Muraven and Baumeister 2000). Finally, coding standards allow for a certain degree of behavioral automation in decision-making during the programming process, which is likewise consuming less regulatory resources (Webb and Sheeran 2003).

In summary, research suggests that agile SD practices facilitate the cognitive processing necessary to work on others' code, create a comfortable atmosphere through motivation and positive feelings, and reduce stress levels and conflict potential because of the high quality of code that is generated. Studies in the field of psychology show that these favorable conditions counteract the resource depletion effect (e.g., Gross et al. 2011; Schmeichel et al. 2003; Tice et al. 2007; Webb and Sheeran 2003). Thus, the use of agile SD practices holds considerable potential to alleviate resource depletion in developers, which would thus reduce their work fatigue.

H1a: The use of agile SD practices negatively influences developers' level of fatigue.

3.3.2 Agile PM Practices and Self-Regulatory Resources

The agile PM practices that are primarily used according to VersionOne (2019) (see Appendix A) focus on short iterations and a variety of meetings during these iterations—for instance, daily standups or iteration planning meetings. Accordingly, agile developers are typically subject to constant time pressure and must deal with many interruptions. Since delivering on these daily demands requires discipline and vigilance, we argue that agile PM practices are likely to trigger resource-depleting effects.

Short cycle times, as proposed by the Agile Manifesto (Beck 2000), place pressure on developers to frequently deliver software increments (Maruping et al. 2009a). (Agile) ISD in itself is a complex and cognitively demanding task, consuming a high amount of self-regulatory resources (Balijepally et al. 2015; Schmeichel et al. 2003). Feeling constantly pressured to test and deliver software increments would be expected to lead to substantial resource depletion (Muraven et al. 2008). In addition, meetings can present task-related hindrances that disrupt developers' progress on their individual work tasks related to programming software (Lanaj et al. 2016). Trying to stay focused and attentive when the number and frequency of meetings is as high as proposed by agile PM practices requires a high level of self-discipline, or self-regulation (Baumeister et al. 2007; Hagger et al. 2010; Schlauderer et al. 2015). Beyond their interruptive nature, meetings in agile ISD encompass processes that are exhausting. During retrospectives, for example, developers critically reflect on the last iteration and propose and implement possibilities for improvement (Schwaber and Beedle 2002). Identifying and solving problems regarding task outcomes and processes consume regulatory resources, as these procedures require constant vigilance and contingency planning for both real and imagined problems (Lin and Johnson 2015; Schmeichel et al. 2003). Moreover, communication can become less effective when there are no formal rules. For example, excessively brief descriptions of development problems (Coyle et al. 2015) may lead to a lack of understanding of the problems, potentially contributing to more intense and demanding problem-solving activities that require the consumption of self-regulatory resources (Schmeichel et al. 2003; Schmidt et al. 2012).

Taken together, the research indicates that when applying agile PM practices, developers need to withstand constant time pressure, muster a high level of self-discipline to stay focused, and be vigilant and careful to efficiently resolve interpersonal and process issues. These self-regulatory demands are likely to cause resource depletion (e.g., Baumeister et al. 2007; Muraven et al. 2008; Schmeichel et al. 2003). Hence, we posit that agile PM practices increase feelings of fatigue in developers.

H1b: The use of agile PM practices positively influences developers' level of fatigue.

3.3.3 The Mediating Role of Work-Related Fatigue

The effect of work-related fatigue on turnover intention has received considerable research attention across disciplines. The predominant consensus is that fatigue is positively related to turnover intention (e.g., Cropanzano et al. 2003; Mor Barak et al. 2001; Wright and Cropanzano 1998). Indeed, among the many implications of high levels of work-related fatigue, job turnover

has been suggested as the first thing that most employees consider (Jackson et al. 1986; Leatz and Stolar 1993; Moore 2000b). Investigating this relationship explicitly in the context of ISD, IS scholars have confirmed the positive effects of work-related fatigue on turnover intention for IT professionals, both directly (Ahuja et al. 2007; Moore 2000a) and indirectly, through mediators such as job satisfaction (Korunka et al. 2008; Rutner et al. 2008), organizational commitment (Ahuja et al. 2007), and psychological contracts (Moquin et al. 2019). In addition, results from studies examining IT professionals' intentions to change not only their job but also their profession portend to the positive effect of work-related fatigue (Armstrong et al. 2015; Joia and Mangia 2017). In the majority of these studies, work-related fatigue in IT professionals has been proposed and identified as a mediating mechanism between stressors or demands at work due to specific job characteristics and employee turnover intention (e.g., Armstrong et al. 2015; Moore 2000a; Rutner et al. 2008). This mediating role of fatigue has received further support from examinations of actual turnover, revealing that stressful work leads to employee turnover via work-related fatigue (De Croon et al. 2004; Taris et al. 2001). We follow these established arguments when proposing our mediation hypotheses.

As discussed above, higher levels of the use of agile SD practices can build regulatory resources by inducing positive feelings, reducing stress, and facilitating cognitive processing. Feeling less fatigued as a result of having more available resources will likely cause developers to think less about quitting their jobs. On the basis of the foregoing discussion, we posit that the use of agile SD practices reduces developers' turnover intentions because these practices help them enhance or replenish self-regulatory resources, leading to lower levels of fatigue.

H2a: Feelings of fatigue mediate the negative effect of the use of agile SD practices on developer turnover intention such that using agile SD practices reduces turnover intentions by negatively impacting feelings of fatigue.

In contrast, we have discussed how developers experience high levels of fatigue when using agile PM practices because daily development and collaboration activities drain their self-regulatory resources. Acknowledging previous empirical findings regarding the positive effect of fatigue on turnover intention, we suggest that the use of agile PM practices enhances developers' willingness to search for a new job because it consumes their regulatory resources and triggers fatigue.

H2b: Feelings of fatigue mediate the positive effect of the use of agile PM practices on developer turnover intention such that using agile PM practices increases turnover intentions by positively impacting feelings of fatigue.

3.3.4 The Role of Perceived Workload in Agile ISD

Agile ISD is usually organized into projects. Higher perceived workloads by individuals working in agile ISD teams can therefore be primarily considered in two ways: an individual takes part in various projects, which necessitates more frequent switching between tasks and topics, or projects get more intense in the sense that more tasks need to be accomplished in the same amount of time. The latter argument can certainly be challenged by agile proponents assuming that the workload in agile ISD projects ideally remains the same when agile ISD practices are used correctly and completely (Fowler and Highsmith 2001; Tuomivaara et al. 2017). However, conditions are rarely ideal for agile ISD teams because they are often part of a larger organization that does not exclusively use agile methods, which creates dependencies and extra effort even if agile practices are faithfully used (Hekkala et al. 2017; Laux and Kranz 2019; VersionOne 2019). Additionally, the perception of workload is subjective and might vary even between agile ISD team members leading to different assessments of high and acceptable levels of workload.

Higher workloads, in general, are likely to produce stress and typically require attentional focus and higher cognitive processing, thereby demanding self-regulatory resources (e.g., Beal et al. 2005; Prem et al. 2016; Schmeichel et al. 2003). However, we believe that due to their specific way of organizing project work, agile ISD practices can have varying effects on developers' level of fatigue in high-workload situations. In particular, we believe that both the resource-enhancing effect of agile SD practices and the resource-draining effect of agile PM practices are intensified in such situations.

We have already suggested that the simplicity and automation potential inherent to agile SD practices have energizing effects on software developers (Beck 2000; Fitzgerald et al. 2006; Schmeichel et al. 2003; Tripp et al. 2016; Webb and Sheeran 2003). We additionally propose that the unique characteristics of agile SD practices reveal their full potential in high workload situations when time pressure is high or switching between projects becomes prevalent, reinforcing the enhancement of developers' self-regulatory resources. We make this argument because developers would be expected to benefit more from the use of agile SD practices when they perceive their workload to be high. In fact, we believe that developers do not fully realize the benefits of using agile SD practices until their perceived workload is high. For example, automated tests and clear coding standards exhibit automation advantages under high-workload conditions through enhanced consistency and simplicity. Because of these advantages, the effort to cope with additional development tasks is likely to increase only slightly. In addition, task and

test automation can enable developers to speed up their programming work significantly when necessary and facilitate accomplishing a higher number of tasks in the same amount of time. Recognizing and appreciating the ability to increasingly exploit the efficiency provided by agile SD practices in high-workload situations may trigger positive feelings toward work in developers. Positive emotions directly counteract ego depletion and can therefore facilitate and accelerate the replenishing effect of using agile SD practices on effective self-control (Aspinwall 1998; Tice et al. 2007). In addition, positive feelings may lead to higher levels of motivation at work (Isen and Reeve 2005). Motivated developers are less likely to experience a depletion of self-regulatory resources (Baumeister and Vohs 2007; Muraven and Slessareva 2003). Hence, we propose that developers working on projects using agile SD practices can beneficially leverage the respective practices in high-workload situations and thereby substantially reduce their levels of fatigue.

H3: Perceived workload negatively moderates the relationship between the use of agile SD practices and developers' feelings of fatigue such that when the perceived workload is high (vs. low), developers experience fewer feelings of fatigue from using agile SD practices.

In contrast, for developers working on projects using agile PM practices, higher perceived workloads likely imply greater drain on regulatory resources due to more disruptions and substantial time pressure. Looking at the consequences of different workload levels in this context, we draw on findings from research on work events (e.g., Lanaj et al. 2016; Zohar et al. 2003). As mentioned earlier, agile PM practices largely focus on various meetings (e.g., daily standups, retrospectives) to provide feedback and improve work practices. These meetings place high social demands (e.g., due to intense face-to-face interactions) on developers and cannot be simply automatized or skipped in high-workload situations, thus increasing the likelihood that such meetings are experienced as disruptions to developers' daily work progress (Lanaj et al. 2016). When workloads are high, feelings of fatigue caused by disruptive events may thus intensify due to a limited capacity of regulatory resources (Beal et al. 2005; Zohar et al. 2003). In addition, when developers have to join more than one project using agile PM practices, the number of meetings they have to attend across projects increases substantially. As a result, they have less time to complete regular programming tasks, leading to severe time pressure—a situation that is likely to increase stress and deplete self-regulatory resources (Prem et al. 2016). Accordingly, we propose that in situations of high perceived workload, the resource-draining effect of using agile PM practices becomes stronger.

H4: Perceived workload positively moderates the relationship between the use of agile PM practices and developers' feelings of fatigue such that when the perceived workload is high (vs. low), developers experience more feelings of fatigue from using agile PM practices.

3.4 Research Approach

To examine the hypotheses proposed above, we employed a multimethod approach using two independent studies. The first was a cross-sectional field survey among agile ISD professionals in the United States to test our proposed relationships with a representative sample and achieve generalizable results. We then collected qualitative data in semi-structured interviews with agile ISD professionals in Germany to unpack the relationships in detail with the aim of revealing what is actually occurring and why. Figure 3-2 depicts this research approach.

We chose this research design to fulfill two purposes of multimethod research: confirmation and expansion (Jick 1979; Mingers 2001; Venkatesh et al. 2013). First, conducting two studies with different methods and samples allowed for the triangulation of our findings regarding the core theoretical associations between agile SD and PM practices and levels of fatigue as well as the influence of the moderator, perceived workload. Hence, we were able to strengthen the validity of the inferences made in each study. Second, the qualitative study expanded the survey study by empirically uncovering the mechanisms underlying the self-regulation effects of agile ISD. We were thereby able to gain additional insight into the nature and causes of the hypothesized relationships in line with our aim of providing a more nuanced view of the individual-level consequences of using agile ISD practices.

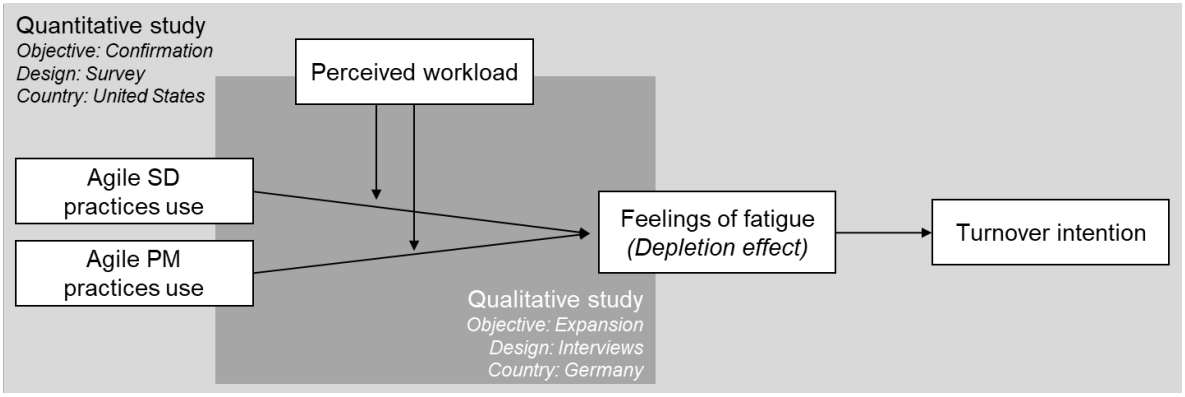


Figure 3-2: Multimethod research approach

3.5 Quantitative Field Survey Study

3.5.1 Sample and Data Collection

We recruited our survey sample using Empanel Online, a panel company that specializes in conducting internet-based surveys in a B2B context. Many studies have already shown that data can be successfully collected via panel companies (e.g., Tripp et al. 2016; Venkatesh et al. 2019; Wiener et al. 2021). Our survey was conducted among ISD professionals in the United States. Empanel Online provided 761 potential respondents. In order to ensure that the participants work with agile ISD methods, a screening question at the beginning of the survey asked whether they currently work in ISD projects using agile practices to a large degree. The screening resulted in 396 suitable respondents.

We incorporated quality assurance questions throughout the survey to ensure participants' engagement—for example using attention checks such as "If you are paying attention, please select Daily." When these quality checks were improperly answered, respective participants were immediately disqualified and prevented from completing the survey. 228 respondents passed our quality assurance procedure. After removing incomplete data sets and cases in which participants gave the same answer to every question ignoring reverse formulations, the final sample consisted of 207 valid responses. We accounted for nonresponse bias by comparing early and late respondents (first and last 50) based on their sociodemographics (Armstrong and Overton 1977). The means of each sample showed no significant difference ($p > 0.05$) suggesting that a nonresponse bias is unlikely to have had an effect on the study results.

Of the 207 respondents, 65.7% were male. This percentage is in line with the higher rate of men in computing occupations (Ashcraft et al. 2016). Most developers in this sample were between 31 and 55 years old (71.0%). The experience with agile ISD varied but peaked at 3-5 years (32.4%). Sample statistics are summarized in Appendix B.

3.5.2 Measurement

The items used in the survey are based on established scales from previous research (see Appendix B) and measured with 7-point Likert scales. All latent constructs in our study were measured reflectively with multiple items. The use of agile ISD practices was measured based on items from Tripp et al. (2016). The authors' list was updated with respect to current statistics on the most widely used agile ISD practices (VersionOne 2019), resulting in the following eight constructs to be measured: iterative delivery, daily standups, retrospectives, short iterations,

unit testing, continuous integration, coding standards, and refactoring. We tested and validated these practices conducting a small-sized pretest with agile ISD developers. Based on the results of this pretest and recommendations from the panel company, we shortened the scale from Tripp et al. (2016). All agile ISD practices items were measured on an agreement scale with "I don't know" as an eighth option. In line with Tripp et al. (2016), we modeled the variables for the use of agile ISD practices as reflective-formative second-order constructs composed of the respective practices (Hair et al. 2017).

The depletion effect was measured with five items adapted from Van Yperen and Hagedoorn (2003) and Chan and Wan (2012) to capture the level of developers' fatigue specifically caused by conditions at work. In our survey instructions, we stressed that participants should answer questions concerning feelings of fatigue in the context of agile ISD projects. The scale was anchored at (1) never and (7) daily. Turnover intention was measured with two items adapted from Leiter et al. (2011). The correlation between the two items was very high (r = 0.86). For the moderator variable of perceived workload, we drew on two items used by Moore (2000a). These items also correlated strongly (r = 0.75). For both the dependent and the moderator variable, agreement scales were applied.

To account for alternative explanations, we included a number of control variables in the prediction of the dependent variable. In accordance with prior studies concerning IT turnover and work-related fatigue, we controlled for demographic data, such as gender and age, as well as for organizational tenure and negative affect (Ahuja et al. 2007; Chan and Wan 2012; Joseph et al. 2007; Moore 2000a). Negative affect was measured with three items adapted from the Positive and Negative Affect Schedule (PANAS) (Watson et al. 1988). We selected the three items from the PANAS that had the highest factor loadings compared to relevant prior studies (Tripp et al. 2016). Finally, we also included items concerning project characteristics, such as team size and team dispersion.

3.5.3 Data Analysis and Results

The hypotheses were tested using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 3 (Ringle et al. 2015). Because of the relatively complex model, including moderated mediation effects and aggregate second-order constructs, PLS-SEM is particularly suitable for our analysis (Hair et al. 2017; Sarstedt et al. 2020). In addition, the approach is robust to relatively lean sample sizes and makes no distributional assumptions for the data (Chin 1998). The minimum sample size for a robust calculation is ten times the maximum number of

paths that are directed toward a certain construct in the structural model (Hair et al. 2017). Our sample size (N = 207) exceeds this threshold. We applied a bootstrapping procedure with no sign changes and 5,000 subsamples, as suggested by Hair et al. (2017), to assess the paths' significance levels. When modeling the hierarchical structural model, we used the repeated indicator approach Mode B (Becker et al. 2012) for the reflective-formative second-order constructs (agile SD practices and agile PM practices).

ID	Latent Variables	Mean	StD	Loading Range	CR	AVE	Correlations and Square Roots of AVEs of Latent Variables											
							1	2	3	4	5	6	7	8	9	10	11	12
1	Coding Standards	5.73	1.19	.918-.922***	.917	.847	.920											
2	Continuous Integration	5.39	1.20	.828-.852***	.828	.706	.560	.840										
3	Daily Standups	5.68	1.32	.896-.918***	.903	.822	.417	.579	.907									
4	Feelings of Fatigue	3.06	1.23	.785-.856***	.917	.687	-.170	-.254	-.156	.829								
5	Iterative Delivery	5.59	1.18	.847-.879***	.896	.741	.571	.592	.590	-.191	.861							
6	Negative Affect	2.23	1.35	.872-.919***	.928	.810	-.301	-.324	-.201	.685	-.261	.900						
7	Perceived Workload	3.76	1.50	.808-.923***	.858	.752	-.132	-.249	-.219	.568	-.279	.463	.867					
8	Refactoring	5.58	1.21	.854-.881***	.859	.753	.632	.631	.458	-.267	.589	-.259	-.254	.868				
9	Retrospectives	5.55	1.18	.857-.889***	.865	.762	.506	.596	.579	-.146	.677	-.163	-.177	.596	.873			
10	Short Iterations	5.35	1.26	.829-.856***	.831	.710	.458	.614	.573	-.142	.591	-.214	-.137	.542	.571	.843		
11	Turnover Intention	2.14	1.36	.912-.943***	.925	.860	-.414	-.389	-.363	.485	-.348	.537	.361	-.381	-.321	-.284	.928	
12	Unit Tests	5.32	1.35	.867-.888***	.870	.770	.547	.535	.475	-.187	.526	-.233	-.146	.505	.441	.527	-.273	.878

Note. Abbreviations: StD, Standard deviation; CR, Composite reliability; AVE, Average variance extracted.
Square roots of the AVE depicted on the diagonal.
***p<.00

Table 3-1: Descriptive statistics of latent variables

Table 3-1 presents the descriptive statistics and correlations of our latent variables. We evaluated convergent validity following Gefen and Straub (2005), using three criteria proposed by Fornell and Larcker (1981). All factor loadings were greater than 0.78 and significant. Composite reliabilities (CR) and average variances extracted (AVE) exceeded 0.82 and 0.70 respectively. Discriminant validity was assessed using the Fornell-Larcker-criterion (Hair et al. 2017). In our model, the value of the square root of a construct's AVE was always larger than the correlation of the construct with any construct in the model (see Table 3-1). In addition, we performed a cross-loading analysis. All items of the model loaded higher on their intended construct than on any other construct with the difference exceeding 0.10 (Gefen and Straub 2005) (see Appendix C). Collectively, despite using shortened scales, the convergent and discriminant validity criteria indicated a satisfactory quality of the measurement models. Additionally, the correlations in Table 3-1 do not indicate any systematic relationships between the extent of the use of agile ISD practices and perceived workload supporting our argument for perceived workload as a valuable independent moderator in our model.

We addressed the potential threat of common method bias by performing Harman's single-factor test (Podsakoff et al. 2003). The highest level of covariance explained by a single factor is 21.63%, reducing the concern of common method bias. Moreover, we conducted a full collinearity test according to Kock (2015). The variance inflation factors (VIFs) calculated with our data are well below the threshold of 3.3 giving us further confidence that there is no issue with common method bias in our study (see Appendix C).

	Feelings of Fatigue			**Turnover Intention**	
	Model 1	Model 2	Model 3	Model 4	Model 5
Block 1: Controls					
Gender	-05	-.05	-.01	.01	.01
Age	-.05	-.02	.06	-.06	-.07
Team Size	-.16°	-.05	-.08		
Team Dispersion	.00	-.02	-.02		
Negative Affect				.43**	.28**
Organizational Tenure				.06	.06
Block 2: Main effects					
Agile PM Practices Use		.13	.10	-.15	-.16
Agile SD Practices Use		-.23*	-.22*	-.20	-.19
Perceived Workload		.54**	.54**		
Block 3: Interaction effects					
Agile PM Practices Use x Perceived Workload			.21**		
Agile SD Practices Use x Perceived Workload			-.18*		
Block 4: Mediator					
Feelings of Fatigue					.21**
R^2	.03	.35	.38	.38	.41
ΔR^2		.32	.03		.03

Note. °p<.1, *p<.05, **p<.01

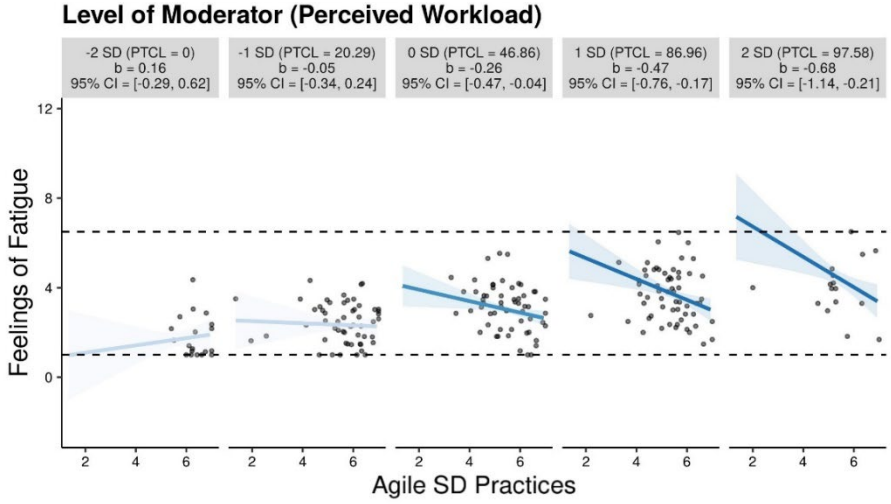
Table 3-2: Results of PLS-SEM analysis predicting feelings of fatigue and turnover intention

The results of our analysis are shown in Table 3-2. Models 1 to 3 display the results predicting feelings of fatigue. Model 1 represents the baseline model, Model 2 represents the main effects only, and model 3 represents the moderation effects. Models 4 and 5 show the results of the mediation analysis. We predicted in H1a that the use of agile SD practices would have a resource-enhancing effect on developers, and in H1b, we predicted that the use of agile PM practices would have a resource-depleting effect on developers. The results show a significant negative effect of the use of agile SD practices on fatigue (β = -0.23; p < 0.05), hence supporting H1a. However, the data does not support our hypothesis of the depletion effect of agile PM practices and we thus had to reject H1b. When analyzing the data with regard to our moderation hypotheses H3 and H4, we found significant interaction effects between the use of agile SD practices and perceived workload (β = -0.18; p < 0.05) and between the use of agile PM practices and perceived workload (β = 0.23; p < 0.01).

In order to understand the nature of these interactions, we conducted a simple slope analysis. Figure 3-3a illustrates the simple slopes of the use of agile SD practices on developers' levels of fatigue at high and low levels of perceived workload (i.e.,1 and 2 standard deviations (StD) above and below the mean). Figure 3-3b shows the marginal effect of perceived workload on the interaction effect. As can be seen, perceived workload moderates the effect of the use of agile SD practices such that the more developers perceive their workload as high, the stronger and more negative the effect on their levels of fatigue will be. Higher perceived workload seemingly amplifies the energizing effect of the use of agile SD practices. By contrast, agile SD practices has no significant effect on fatigue when developers perceive their workload as low.

The simple slope analysis depicted in Figures 3-4a and 3-4b shows the effect of using agile PM practices on developers' levels of fatigue at high and low levels of perceived workload (i.e., 1 and 2 StD above and below the mean). It indicates that the use of agile PM practices is significant and strongly positively related to developers' levels of fatigue when developers experience higher workload levels. Hence, a higher perceived workload seems to invoke a depleting effect related to the use of agile PM practices. Here again, at low levels of perceived workload, no significant effects of using agile PM practices on feelings of fatigue are observed. Overall, these results of the moderation analysis provide support for hypotheses H3 and H4. Models 2 and 3 in Table 3-2 show significant improvements in explained variance, which provides further support for H1a, H3, and H4. In total, the moderated model explains 38% of the variance.

(a)



(b)

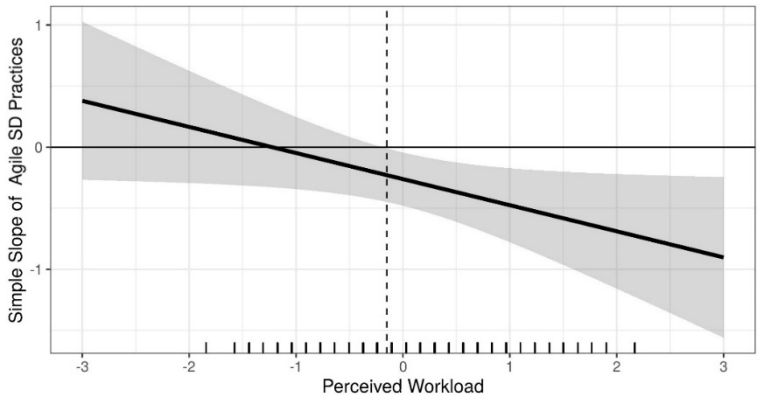
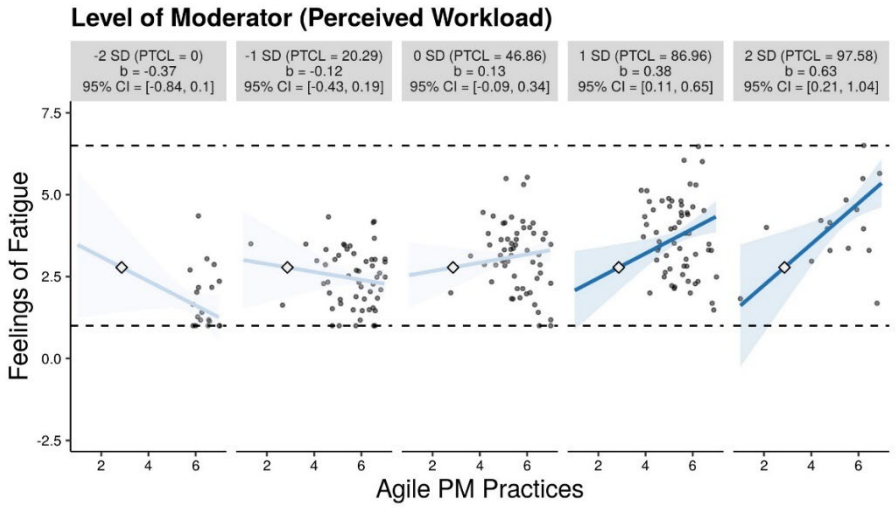


Figure 3-3 a, b: Simple slope analysis for agile SD practices

(a)



(b)

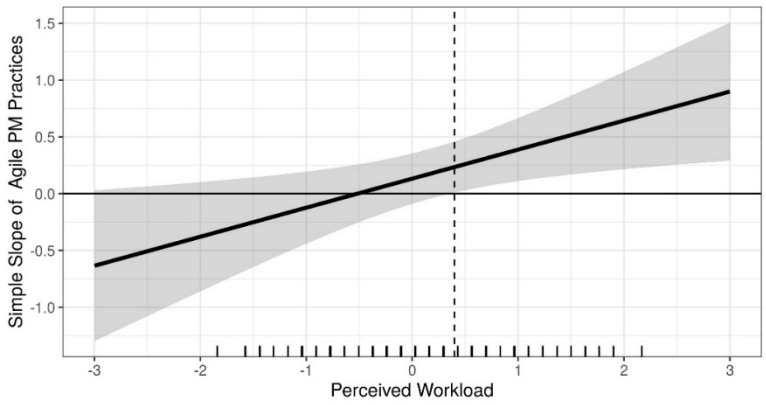


Figure 3-4 a, b: Simple slope analysis for agile PM practices

In order to test for the mediation effects posited in H2a and H2b, we followed the two-step approach by Preacher and Hayes (2008) and first analyzed the direct effects of the independent variables on the dependent variable (Model 4 in Table 3-2).

The model explained 38% of the variance in turnover intention. The path coefficients for the direct effects of using agile SD practices and using agile PM practices on turnover intention were not significant. In Step 2, we introduced the mediator, feelings of fatigue (Model 5 in Table 3-2). The explained variance in turnover intention increased to 41%. The effect of feelings of fatigue on turnover intention was positive and significant ($\beta = 0.21$; $p < 0.01$). The effect of the use of agile SD practices on feelings of fatigue was negative and significant ($\beta = -0.29$; $p < 0.05$) leading to a significant indirect effect of the use of agile SD practices on turnover intention via feelings of fatigue ($\beta = -0.06$; $p < 0.05$) (Hair et al. 2017). The direct effect of agile SD practices on turnover intention remains insignificant. Thus, feelings of fatigue fully mediate the relationship between the use of agile SD practices and turnover intention, supporting hypothesis H2a. Since the use of agile PM practices has a positive but nonsignificant effect on feelings of fatigue, H2b had to be rejected. We remark that the control variable *negative affect* had a significant effect on turnover intention. However, its path coefficient was lower when the model included feelings of fatigue. This result gives us reason to believe that the use of agile ISD practices through developers' levels of fatigue has a significant impact on their intention to change jobs beyond affective effects and mood.

We next calculated the indices of moderated mediation following Hayes (2015) and Hair et al. (2017) in order to examine the effects of the use of the agile ISD method on turnover intention in more detail. The index of moderated mediation shows the effect of the moderating variable on the indirect effect of the independent on the dependent variable via the mediator (Hayes 2015). For the relationship between agile PM practices and turnover intention the index of moderated mediation is positive and significant ($\beta = 0.05$; $p < 0.05$). Hence, when the perceived workload increases, the positive indirect effect of agile PM practices on turnover intention via feelings of fatigue becomes stronger. The index of moderated mediation for the relationship between agile SD practices and turnover intention is negative and marginally significant ($\beta = -0.04$; $p < 0.1$), indicating a stronger negative indirect effect of the use of agile SD practices on turnover intention via feelings of fatigue when the perceived workload increases. These results provide additional support for our hypothesized moderating effects of perceived workload and show that the mediated effects of the use of agile ISD practices and their interaction with perceived workload entail significant implications for developers' feelings of fatigue.

3.6 Qualitative Interview Study

3.6.1 Data Collection and Analysis

Semi-structured interviews formed the basis of our qualitative data collection. We employed purposeful sampling and selected software developers currently working in agile ISD teams and used most of the agile ISD practices analyzed in the quantitative study (Palinkas et al. 2015). We contacted the developers via social network sites (e.g., LinkedIn) and invited our personal and research networks to forward our call to appropriate candidates. 15 interviews with software developers who work in agile ISD teams in Germany were conducted face-to-face or via phone and lasted between 30 and 60 minutes each. After the fifteenth interview, we observed that the new data did not provide substantial additional insights related to our study and we had reached saturation (Keutel et al. 2014). Our interview partners came from various industries, had an average age of 34, and reported an average experience with agile practices of four years. Appendix D summarizes the information about our interviewees.

The semi-structured interviews followed established guidelines for qualitative interviews (Myers and Newman 2007). Our interview guideline was structured with regard to the agile ISD practices we focused on during our quantitative data collection. We asked the developers about their attitudes and feelings toward the different agile PM and SD practices under normal- and high-workload conditions in order to gain additional insights into the nature and causes tested in the quantitative data analysis.

In line with our aim to triangulate and expand our quantitative findings, we analyzed the qualitative data using ego depletion theory as a lens to interpret the results (Sarker et al. 2018; Walsham 1995). We formally coded each interview to gain insights into the mechanisms potentially causing self-regulation effects when using agile ISD methods. To accomplish this, three knowledgeable researchers read the transcripts and marked each sentence that referred to feelings of depletion or energy related to the use of agile ISD methods or specific practices. Two of these researchers were unfamiliar with the quantitative study, thereby controlling for a potential bias through prior empirical knowledge. We also stayed open for themes not affecting a complete agile ISD method but spanning multiple agile ISD practices (e.g., meetings). The coding was compared and discussed in case of discrepancies until a shared interpretation of the interviews was reached. During this process, we organized the resource-depleting and resource-replenishing mechanisms according to agile SD and PM practices and the level of workload

indicated by the interview partners. We also follow this structure in the presentation of the qualitative results.

3.6.2 Findings

3.6.2.1 Relationship between the Use of Agile SD Practices and Feelings of Fatigue

With regard to agile SD practices, the answers from the interview partners were overall very positive. The consequences of their use mentioned by the developers tended generally toward making everyday work easier. Based on the interviews, the automation of processes and tests that continuous integration practices and unit tests provide greatly facilitate developers' work. This automation allows for quick checks when needed and eliminates the need for developers to perform tedious tasks. Two interview partners indicate the benefits of automation on daily work routines in the following quotes:

> *"Testing is very annoying, especially manual testing is very annoying. So, [with unit tests] you can run the automated tests as often as you want, this can be done quickly in case of doubt."* (D5)

> *"And then processes are automatically started that somehow deploy this to the system. It makes life a lot easier."* (D3)

Further, some interviewees stated that the immediate feedback inherent in automated unit tests and continuous integration practices also gives the developers a feeling of certainty while coding:

> *"The great thing is that the unit tests in the API [application programming interface] will show you very quickly if you accidentally break something. It's very reassuring when you've made a lot of changes."* (D10)

> *"To some extent, it [continuous integration] gives you the certainty that you have done everything right."* (D8)

Moreover, the interviews indicated that the quality of the product benefits greatly from agile SD practices. In particular, the interviewed developers mentioned that running unit tests and performing conscientious refactoring lead to quality enhancements. Additionally, they stated that refactoring sets the stage for a higher speed of development later on because code snippets become modular and reusable. Two developers succinctly emphasized these benefits:

> *"Unit tests increase the quality of the software tremendously."* (D5)

> *"If you refactored a module, it looks like before but with a more solid base and later features can be programmed much faster."* (D11)

The interviews indicated that coding standards add to the positive attitude toward agile SD practices; besides improving code consistency, they provide clear and objective guidelines for developers. These guidelines make the code understandable for every existing or new team member. Hence, coding standards facilitate discussions on code between developers and speed up the onboarding of new colleagues. As our interview partners explained:

> *"I think it's good because you stay clean and consistent from the start, making the code easier to read."* (D5)

> *"There is no more discussion how it should look like, the linter shows you what is wrong. I find it very comfortable. ... If you don't have such a thing, it certainly leads to confusion."* (D7)

> *"Standards make it easier for people to get started, because they know how it is done. It is readable and understandable."* (D12)

In addition to being generally very positive about agile SD practices, some developers were also somewhat critical, particularly concerning the practice of refactoring. Apart from improving product quality, they reported that refactoring code is a very time-consuming task. Since developers therefore cannot code as much as they would like to, they eventually experience frustration. As one interview partner stated:

> *"Sometimes I get frustrated when I have to restructure the code before I can do my job."* (D9)

The refactoring conflict between more time spent and higher product quality, which facilitates code writing, especially later on, is illustrated in the following quote. The interviewee makes clear that developers only feel appreciated for new features, not for refactored features:

> *"A programmer is always a little bit more appreciated from the outside when he produces features. That's why you might be a bit more eager to generate new features and maybe not pay as much attention to how the code is written... It will always be a battle between Product Owners and the coders. Between 'Okay, we have to refactor this' and the Product Owner who says: 'It doesn't matter now. The important thing is that we deliver the feature.' ... Clearly, refactoring is very time-consuming at the beginning when you do the*

> *feature but, overall, you save time because the product becomes much more modular, reusable, and stable."* (D14)

Overall, however, the benefits of automation, continuous feedback, quality, and consistency provided by the various agile SD practices clearly prevailed during the interviews. One interview partner summarized characteristics that help developers to do their job successfully as follows:

> *"Coming to XP, all the technical stuff we have helps us a lot. Every test that runs automatically, every integration, every time a deployment happens automatically and not by hand if I don't have to manually move files to the server. That happens automatically after every change, saves time, prevents sources of error, and leads to a better product, to better software. Also, standards, much less own opinion, much less subjectivity … all that reduces sources of error."* (D1)

The benefits mentioned by the interviewed developers support a resource-enhancing view of applying agile SD practices. Automation and continuous feedback are mechanisms that can reduce workflow interruption and the effort to attract attention, thereby conserving self-regulatory resources (Baumeister et al. 2007; Beal et al. 2005). The high quality and consistency of the code facilitate the cognitive processing of information and reduce the number of conflicts in the team, diminishing the need to build self-regulatory resources (Muraven and Baumeister 2000; Schmeichel et al. 2003).

3.6.2.2 Relationship between the Use of Agile PM Practices and Feelings of Fatigue

With regard to the use of agile PM practices, we observed less of a clear trend in the interviews. Our data mainly elucidates that the use of these practices can facilitate collaboration but, at the same time, they can cause distractions and negative feelings. In particular, our participants criticized the high number of meetings necessitated by such practices. They mentioned that agile meetings lead to less progress in their work and disrupt their workflow. This is described by two interview partners as follows:

> *"Way too many [meetings]. Just yesterday was retro[spective] day, which means we had a retro in the morning, which I think lasted two hours in the end. After that we had a refinement, and after that we had another meeting about design changes. That was a half-hour meeting, and it came out that I*

> *had to change one word. You could have told me that on the go. I don't think I opened my laptop before 4 pm. And I was in the office at 8 am."* (D1)
>
> *"If you do sprints of two weeks, you have the feeling that you only do sprint plannings, sprint reviews and retrospectives. You have just started, but you are already back to [the] retrospective. ... Because of the distraction from normal work, as I said, when I do sprints for a week or two, we used to feel like we were just starting and then we had to stop again. ... I realized then that two weeks suck."* (D2)

In addition, some developers clearly adopt a fatalistic view and experience agile meetings as futile. They do not see any added value, especially in the daily standups, and just endure them. As two developers explained:

> *"There are parties who are very communicative and talk about something for 10 hours and then the others fall asleep. Then a certain fatalism develops. Then you go to the sprint meeting and let the half hour, 15 minutes pass and then you leave again. And it didn't do you any good."* (D2)
>
> *"I'd say I've never had a cool daily. Well, it was always so-so. When you're on a [team] anyway, you know what's going on. I don't understand what kind of information flow there should be."* (D11)

Others referred to the retrospective as a type of meeting they think is overvalued. They get annoyed by continuously being forced to evaluate the team dynamics and processes. One interview partner even reported making things up just to get the meeting finished and avoid further discussion:

> *"I personally find a very frequent retrospective, namely after every sprint, very annoying. You start making up things to say something or people get annoyed when they have nothing to say."* (D5)

From the statements above we can derive a series of self-regulatory tasks and feelings. Directing attention back to the development task after being distracted and dealing with negative emotions in meetings that do not provide developers with any benefit are actions that require self-regulation and could lead to depletion and feelings of fatigue (Baumeister et al. 2007; Muraven and Baumeister 2000).

Apart from these critical views, we also observed very positive reactions and opinions regarding the use of agile PM practices. Some interviewees reported that they appreciated the constant

information flow and easy communication enabled by agile PM practices. In general, they stated that knowing what is going on gives them a feeling of direction. One developer stated:

> *"I think it is very useful for a developer to get constant feedback. You also feel more secure because you know it's going in the right direction."* (D12)

Further, some interview partners named the daily standups, in particular, as well as the iteration planning meetings as sources of information that are helpful for their daily work. They stated that the discussions in these meetings create a high level of transparency, which saves effort and prevents unnecessary work. As two developers explained:

> *"It's really good so that the others always know what's going on every day. Especially if you have bigger stories or you are working with several people on a story, the discussion is very important. ... Today in the stand-up I got the information that my colleague had gotten so far with the topics that I can start with my story. So, I had the information immediately and didn't have to approach him myself first."* (D7)

> *"We hold these [iteration planning] meetings together because we've noticed that otherwise there will be too much frictional loss. For example, that app developers program things that already exist or that they lack information about how the marketplace works."* (D6)

Additionally, some interviewees reported that retrospectives contribute to good feelings and a common understanding among developers. Whereas other meetings tend to be rather loaded with technical information important for the project's progress, they stated that the discussions in the retrospectives build a positive atmosphere and help to strengthen team cohesion. In the words of one interviewee:

> *"When we introduced it, it was really well received and it is still important. There's a lot of discussion and because it's not so technical, code heavy, but more about how the developers feel, I think it's really important and good."* (D11)

Moreover, the different project structure, namely the iterative approach with short iterations of between two and four weeks, was described by some of our interviewees as leading to a great sense of achievement and self-efficacy because developers frequently see what they have accomplished. The visibility of progress spurs individual motivation and enthusiasm, as illustrated by the following two quotes:

> *"I really think you have more of a sense of achievement, because I always have the feeling that we have completed a sprint and we have speeded up again. ... Everyone claps and congratulates each other. I actually find the flow quite nice."* (D4)
>
> *"I can tell we're getting things done, which is incredibly motivating."* (D9)

In contrast to the resource-depleting factors we mentioned earlier, the positive feelings, motivation, and shared understanding among developers invoked by the implementation of agile PM practices likely have a positive impact on developers' levels of self-regulatory resources. Research has shown that these characteristics can counteract the depletion effect and lead to the replenishment of personal resources (Baumeister and Vohs 2007; Baumeister et al. 2007; Tice et al. 2007).

Overall, the results of our qualitative study reveal no trend concerning positive or negative consequences of agile PM practices with regard to developers' levels of regulatory resources. We observed depleting as well as replenishing mechanisms triggered by the implementation of each of these practices. One general quote regarding the culture of continuous feedback inherent in agile PM practices nicely illustrates this self-regulation ambivalence:

> *"Usually I appreciate feedback, even if it is not always tasty. As long as it is respectful and has a comprehensible reason. But actually, it is also the case that I often have difficulties to keep my ego out of it. And to say, yes you might be right, yes I can also work on it."* (D13)

3.6.2.3 Relationship between the Use of Agile SD and PM Practices and Feelings of Fatigue during Periods of High Perceived Workload

When asked about their opinions concerning the use of agile ISD practices during periods of high perceived workload, the responses of the interviewed developers differed depending on whether they used agile SD or agile PM practices. Applying *agile SD practices* seems to have beneficial effects during peak times. The automation of tasks during the process of programming and the clear guidance provided by coding standards facilitate developers' everyday work. The practices ensure that developers can keep up with the higher number of tasks when the workload is high, thus ensuring that product quality is maintained. In addition, the code consistency established through following standards and refactoring code pays off in the long run because it makes higher workloads easier for developers to handle. Two

interviewees explained the importance of continuous integration and coding standards in the following quotes:

> *"Continuous integration is already there, you don't have to do anything but press a button, it always works."* (D10)

> *"Especially when you have a high workload, mistakes happen. The good standard makes sure that the errors are eliminated. This means that especially when you have a high workload, you should follow the rules. I'm aware of that."* (D4)

One developer pointed out that agile SD practices not only facilitate work but also speed up task accomplishment. This is particularly favorable when the number of tasks accumulates and the perceived workload is high:

> *"So, it speeds up the work considerably, because the overview is provided. Especially then, when you have a lot to do, you still keep the overview. ... It accelerates the next task at the same place."* (D7)

Performing refactoring has already been characterized as a time-consuming task when workloads are normal. Even though a generally well-refactored code enhances quality and consistency, developers do not engage in this task when the workload is high because, at such times, delivering working code is more important to the customer. As one interviewee stated:

> *"The problem with stressful situations is of course that people say, yes, they have to get the features out now. No one of the bosses would say, yes, just do a refactoring for a month."* (D13)

To summarize, the interviewed developers provided reasons to believe that developers can benefit significantly from applying agile SD practices when the workload is perceived to be high. The positive feelings that arise when one gets things done intensify during high-workload situations because developers appreciate the ability to exploit the efficiency provided by these practices even more than they do during periods of normal workloads. This can accelerate the replenishing effect on self-regulatory resources (Baumeister et al. 2007; Muraven and Baumeister 2000; Schmeichel et al. 2003; Tice et al. 2007).

In contrast, with regard to the use of *agile PM practices*, the interview partners stressed the disruptions that they experience due to plentiful meetings. These meetings cause feelings of displeasure to arise because developers have difficulties completing their programming tasks

even though frequent results are expected. Two developers expressed their dissatisfaction with the strict adherence to agile PM practices in high-workload situations as follows:

> *"When I have a lot to do, which is often the case, then it is annoying. Everybody wants to finish his tasks in the sprint first. And I think, okay, I don't have 15 minutes for a daily and I don't want to have a review or a retrospective because I want to get my tasks done."* (D14)

> *"Especially when it comes to the end of the sprint it would be better to skip it, because then the work accumulates, ... because often there are things that have to be done, and the daily is just a time waster."* (D15)

Other developers reported investing high levels of personal effort to maintain concentration during the meetings and when processing their tasks. They reported having to invest a lot of self-control to stick to the agile PM practices when workloads are high. One interview partner explained:

> *"In particular, if there are urgent things and you have a lot to do, then sometimes you have to ask yourself: do we have to do the one-hour retro now, because actually everybody has so much to do and there is not so much to talk about. ... Sometimes then I have to pull myself together to play by the rules."* (D4)

In addition, our interview partners reported that the time pressure inherent to higher-workload periods reduces discipline and thereby inhibits necessary process improvements. Frustration emerges because meetings are not only disruptive but also futile in such cases. One developer expressed his opinion vividly:

> *"[During high workload] we can't really change anything from any retro. So, we start from scratch every time. ... It might last for a week and then we get back to the usual mode because the workload is too high. We identify very large pain-points with the help of a retro and address them. We have really good action items to counteract them. But we don't stick to that. We only have the discipline for a week, and then we don't have the time to stick to it. I always think of a metaphor, like you get in cartoons. We have big weights on both legs hanging from a chain on the foot ... and we're so busy racing that we don't have time to saw off the weights."* (D1)

Overall, the developers' experiences with using agile PM practices in high-workload situations indicate intensified negative feelings toward them and a higher need to control both feelings and

actions. These consequences likely lead to higher consumption of self-regulatory resources and feelings of fatigue (Beal et al. 2005; Lanaj et al. 2016; Muraven and Baumeister 2000).

Comparing the interview partners' responses regarding the use of agile SD and PM practices during high-workload periods with the results from the quantitative study, we can infer a similar trend. Quantitatively, we observed that agile SD practices enhance and agile PM practices deplete developers' self-regulatory resources. Indicating similar effects of agile SD and PM practices, our qualitative findings complement the quantitative results by providing explanations for why these opposite consequences occur. One interview partner succinctly points out the difference:

> *"To sum it up, if the workload is high, then the Scrum meetings are rather inconvenient and the XP methods are mostly beneficial."* (D15)

Hypotheses	**Quantitative study result**	**Qualitative study findings**	
		Resource-enhancing factors	**Resource-depleting factors**
H1a: The use of agile SD practices negatively influences developers' level of fatigue	Supported	• Automation • Code consistency • Feeling of certainty • Immediate feedback • Fewer discussions • Product quality • Short onboarding • Speed of development	• Feels time-consuming • Frustration
H1b: The use of agile PM practices positively influences developers' level of fatigue.	Rejected	• Common understanding • Constant feedback • Easy communication • Motivation • Self-efficacy • Sense of achievement • Transparency	• Displeasure • Distraction • Fatalism • Futility • No progress • Self-control
H3: Perceived workload negatively moderates the relationship between the use of agile SD practices and developers' feelings of fatigue such that when the perceived workload is high (vs. low), developers experience fewer feelings of fatigue from the use of agile SD practices.	Supported	• Automation • Code consistency • Feels beneficial • Speed of development	• Feels time-consuming
H4: Perceived workload positively moderates the relationship between the use of agile PM practices and developers' feelings of fatigue such that when the perceived workload is high (vs. low), developers experience more feelings of fatigue from the use of agile PM practices.	Supported	[no factors identified]	• Discomfort • Displeasure • Frustration • Futility • No progress • Self-control

Table 3-3: Mapped results of qualitative and quantitative studies

3.6.2.4 Integration of Qualitative and Quantitative Study Results

Table 3-3 synthesizes our findings and incorporates the various mechanisms mentioned by the interview partners that potentially lead to the depletion or enhancement of self-regulatory resources. The qualitative study thereby enhances our understanding of the reasons for the (un-)intended consequences of the use of agile SD/PM practices for developers and adds to a more nuanced view of agile concepts in ISD. Table 3-3 also depicts how the qualitative findings map onto the results of our quantitative field study with a focus on the direct (i.e., H1a, H1b) and moderating effects (i.e., H3 and H4) formulated in our hypothesis development. Next, we discuss our overall results and their implications.

3.7 Discussion

We set out to provide a more balanced view on the individual-level effects of the use of agile ISD practices for developers. Drawing on EDT, we developed and tested a model that suggests that the use of agile SD practices reduces and the use of agile PM practices enhances developers' feelings of fatigue, thereby respectively decreasing and increasing their intention to change jobs. We additionally theorized that both effects are stronger when workload is perceived to be high. The results confirmed most of our hypotheses. They show that the use of agile SD practices has a replenishing effect on developers' regulatory resources (leading to less fatigue) and that this effect becomes stronger when developers are experiencing higher workloads.

Moreover, our mediation analysis reveals an explanatory mechanism for why the use of agile SD practices is beneficial in the context of ISD work. Developers' feelings of fatigue as a mediator carries the positive effects of the use of agile SD practices over to their attitudes toward their current work, which ultimately results in lower turnover intentions, especially when the workload is high. Conversely, the use of agile PM practices has neither an energizing nor a depleting effect on developers. An explanation for this result might be that agile PM practices, especially the meetings inherent to these practices, may trigger both resource-draining and resource-enhancing processes. As hypothesized, developers may be exposed to many interruptions from their development work and subject to constant time pressure to deliver, requiring discipline, vigilance, and self-regulatory resources (e.g., Baumeister et al. 2007). However, frequent meetings also remind team members to interact closely and regularly with various stakeholders, which offers great potential to build a shared understanding and circumvent conflicts through mutually agreed upon targets (e.g., Hummel et al. 2015; Hummel

et al. 2016; Maruping and Matook 2020). This, in turn, can facilitate cognitive processing and create a positive atmosphere among developers, reducing demands on self-regulation (Muraven and Baumeister 2000; Schmeichel et al. 2003; Tice et al. 2007). Hence, because resource-draining and resource-enhancing processes operate simultaneously, the effects may cancel each other out, making clear predictions with regard to the directions of the effect difficult (Benlian 2022; Gross et al. 2011). However, we found a significant positive interaction between the use of agile PM practices and developers' perceived workload, such that in high-workload situations, developers experience increased depletion and fatigue from the use of agile PM practices. This finding highlights the importance of recognizing that for various reasons, such as subjective perceptions or only partially applied agile ISD practices, workloads may be experienced differently even in agile work environments, where a sustainable pace of development is targeted yet often unrealistic. Additionally, following the results of our moderated mediation analysis, we revealed that higher workloads also lead to an amplified positive effect of the use of agile PM practices on developers' turnover intentions via intensified feelings of fatigue.

The results from our qualitative study confirmed and expanded the results from the quantitative model testing, providing rich additional insights into agile ISD practices as potential antecedents of fatigue. In particular, the findings substantiate that while agile SD practices are associated with a resource-enhancing effect during periods of normal and high perceived workloads, agile PM practices exhibit a leveled effect when the workload is perceived to be normal and a resource-depleting effect when the workload is perceived to be high. The interview results concerning the use of agile PM practices during normal-workload periods, indicating a relatively equal level of individual costs and benefits, support our above-mentioned explanation for why we could not find an effect between these practices and fatigue in our quantitative study. In addition to confirmation, the findings expand the understanding of the underlying self-regulatory mechanisms of these effects. They provide detailed insights into the nature and causes of the relationship between the use of agile ISD practices and developer well-being and shed light onto the intended and likely unintended effects of introducing these practices, such as a higher speed of development and facilitated communication, on one side, and frustration and displeasure on the other.

3.7.1 Theoretical Contributions

Our results provide four important theoretical contributions to research on agile ISD, IT workforce, and ego depletion in work-related contexts. First and foremost, this study advances

existing literature by providing a more balanced and comprehensive view on the implications of the use of agile ISD practices for individual developers, revealing resource-enhancing and resource-depleting mechanisms. Drawing on EDT, we theorized and empirically identified positive as well as negative consequences of using agile SD and PM practices, respectively, with several important theoretical implications. We have taken a first step toward bringing clarity to ambivalence in prior studies regarding the implications of using agile ISD practices for developers, such as the effects of increased communication intensity enhancing shared understanding yet requiring self-control (Ghobadi and Mathiassen 2016; Hummel et al. 2013). In addition, our results complement the current knowledge on the individual-level effects of using agile ISD practices by extending the scope of research to potentially depleting demands that agile ISD practices, particularly agile PM practices, place on developers. Thus, we move beyond the predominant understanding of the use of agile ISD practices as an invariably positive phenomenon that enhances satisfaction and mitigates exhaustion (Tripp et al. 2016; Venkatesh et al. 2020). Our study offers an important counterpoint to a potential positivity bias in previous research on the consequences of the use of agile ISD practices. In addition, by showing that agile SD and PM practices not only differ from each other in their influence on individual developers' job perceptions but have opposing effects under specific conditions, we highlight the importance of taking a nuanced view on the use of specific types of agile ISD practices instead of aggregating them into a monolithic concept (Benlian 2022; Tripp et al. 2016; Venkatesh et al. 2020).

Second, with the detailed insights from our qualitative study on the resource-enhancing and resource-depleting effects of using agile ISD practices, we answer the calls of Tripp et al. (2016) and Venkatesh et al. (2020) to extend research on the effects of the use of agile ISD practices on individual developers. In particular, we shed light on the psychological processes underlying the effects of using agile ISD practices on feelings of fatigue. On the one hand, our study showed that the use of agile SD practices decreases feelings of fatigue and thus enhances regulatory resources, especially in high-workload situations and that the use of agile PM practices consumes regulatory resources when the workload is high. On the other hand, our interview results added another perspective to the discussion on the psychological impact of the use of agile ISD practices and added rich explanations to the findings from the quantitative assessment. Agile SD practices lead to lower fatigue through higher automation, better product quality, and an enhanced feeling of certainty when coding. Concerning the use of agile PM practices, however, the resource-enhancing effect of constant feedback and shared

understanding, on the one hand, and the depleting effect of needless meetings and little progress on the other, seem to cancel each other out. However, it is only when the workload is perceived to be high that the resource-depleting effects prevail such that fatigue is significantly affected by the use of agile PM practices. Taken together, our findings contribute to previous research by providing more nuanced insights into the psychological mechanisms underlying the individual-level consequences of the use of agile ISD practices (Benlian 2022; Venkatesh et al. 2020).

Third, our moderation and moderated mediation analyses demonstrated that perceived workload intensifies the effect of both agile SD and agile PM practices on feelings of fatigue and, ultimately, turnover intention. Whereas agile SD practices had an increasingly energizing effect when the workload increased, agile PM practices were significantly more exhausting. Our qualitative analysis reinforces these quantitative results. To our knowledge, we are the first to systematically consider and confirm perceived workload as an important individual-level moderator in the context of agile ISD research (Fortmann-Müller 2018). Perceived workload has the power to boost both resource-replenishing and resource-depleting effects in developers. We see two implications of this result. We complement research on the role of workload in agile ISD settings in the sense that varying levels of perceived workload are not only a consequence of the use of agile ISD practices (Tuomivaara et al. 2017) but also provide an important boundary condition and differentiator between specific types of agile ISD practices, which has been previously overlooked (Benlian 2022). Moreover, by theorizing workload as a subjective perception in the form of a higher or lower intensity of engagement in one or more projects, we shift the existing conversation on workload effects in agile ISD from a project management (Tuomivaara et al. 2017; Vidgen and Wang 2009) to a developer perspective, revealing that individual perceptions of workload can make a difference in how we assess the effects of the use of agile ISD practices.

Finally, our study extends research on the work-based implications of ego depletion following the call of Johnson et al. (2018). Our findings that the use of agile SD practices helps enhance regulatory resources in software developers add to the discussion of at-work factors that minimize fatigue (Uy et al. 2017). We looked at the influence of specific IT job design features, namely agile SD practices, as a mechanism to reduce work-related fatigue and energize developers during work. Our qualitative study identifies the automation of processes and behavior, product quality, and feelings of certainty as major drivers of the resource-enhancing effect of the use of agile SD practices. While these effects on regulatory resources are in line

with prior research (e.g., Milkman 2012; Muraven and Baumeister 2000; Webb and Sheeran 2003), we have taken a first step toward showing that they also hold and even potentiate in situations of high perceived workload. In addition to the effects *on* ego depletion, our results also show that turnover intentions in agile ISD contexts are affected *by* the level of self-regulatory resource consumption. Using agile SD practices lowers the intention to change jobs by reducing fatigue in developers. Hence, we reveal that turnover intentions in agile ISD contexts can be reduced not only by higher levels of satisfaction (Setor and Joseph 2019) but also by self-regulatory effects and lower levels of fatigue.

3.7.2 Practical Contributions

Software developers are a scarce resource and their turnover is costly. Thus, retaining IT professionals is a key issue for IT organizations (Pflügler et al. 2018). Our findings suggest several opportunities to reduce the potential of fatigue and turnover intentions in software developers and make agile ISD projects more sustainable. Organizations should direct their attention toward providing training that creates awareness of potential resource-related consequences of agile ISD practices. In particular, trainers should sensitize developers and project managers to the resource-depleting implications of agile PM practices, show them what can be done about it, and encourage them to seek help and support, specifically in high workload situations. Collaboratively, project managers and developers may carefully consider whether certain agile PM practices can be suspended or reduced for some time based on the stage of the project in order to free up valuable time for coding. In line with the qualitative study results, we specifically propose to reevaluate the frequency of daily standups and retrospectives as well as the agile SD practice of refactoring because these are often perceived as particularly disruptive and annoying when workloads are high. At the same time, the training should emphasize the resource-enhancing effects of agile SD practices, which can provide compensation and reduce feelings of fatigue through automation, quality, and the speed of development even under heavy workloads. Based on our results, we also recommend that organizations adopt suitable tools and procedures that can increase automation, improve code consistency, and provide immediate feedback for developers. In addition, organizations might think about introducing interventions such as regular microbreaks or optimized project staffing processes to counteract potential deficiencies in agile ISD projects and minimize work-related fatigue.

Moreover, we show that the application of agile ISD practices not only benefits productivity and software product quality (Balijepally et al. 2009; Maruping et al. 2009a) but also has diverse psychological implications—positive and negative—for developers' well-being. Practitioners

can use our results as additional arguments in order to convince skeptical executives (Rigby et al. 2016) to implement agile SD methods throughout software development functions and give agile ISD teams the autonomy to decide on the best way to do their work.

Lastly, self-regulation is an inner resource that is common across different domains, e.g., at work and at home (Baumeister et al. 1998; Courtright et al. 2016; Reina et al. 2017). The resource-enhancing and resource-depleting effects of the use of agile ISD practices may therefore not only spill over to activities at work outside of agile projects but also to family life (Benlian 2020). Implementing agile SD practices and carefully balancing agile PM practices offer a means toward improving work-life balance. Because a balanced relationship between family and work responsibilities is increasingly important to employees (Kaarst-Brown et al. 2019), our findings can support organizations in strengthening their position in competing for talent.

3.7.3 Limitations and Future Research

Despite the theoretical and practical contributions of this research, our study has four major limitations, which could open up a series of interesting research directions. First, we used feelings of fatigue as a measure for the resource-depleting effects using agile ISD practices. However, we did not include an explicit construct to survey resource-enhancing effects in our research model. Instead, we assumed that a reduction in fatigue would lead to an enhancement of developers' regulatory resources. While this approach is in accordance with prior research (e.g., Gross et al. 2011), using constructs such as engagement, dedication, or vigor could be a fruitful avenue for future research to explicitly measure resource-enhancing effects (e.g., Diestel et al. 2015).

Second, we theorized and modeled ego depletion as being expressed by enhanced levels of fatigue, which, according to groundwork in this research field, is a particularly suitable proxy because the depletion of regulatory resources resembles the process leading to muscle fatigue. Hence, ego depletion not only occurs concurrently with the triggering action but leads to a period of scarcity until the resources are built back up again—a state that is expressed by intensified feelings of fatigue (Muraven and Baumeister 2000; Muraven et al. 1998). However, other studies suggest that ego depletion is not entirely analogous to muscular fatigue but that it is a separate construct, based on the exhaustion of an inner energy (Vohs et al. 2011). Future work could embrace this distinctive, more specific view and examine the individual-level consequences related to the use of agile ISD practices with regard to other outcomes of self-regulatory resource depletion—for example, aggression or decision-making

comprehensiveness (Reina et al. 2017; Vohs et al. 2011). In addition, future studies might measure ego depletion using measures beyond those of fatigue, exhaustion, and burnout (e.g., Chan and Wan 2012; Courtright et al. 2016; Uy et al. 2017) such as Bertram et al.'s (2011) scale, which assesses the psychological state of ego depletion.

Third, we recognize the potential risk caused by considering only the four most used practices of agile SD and PM methods and the use of shortened scales for our latent variables. We did these things to ensure an acceptable survey length, as recommended by the panel company and the pretest participants, in order to obtain as many complete and valid answers as possible. However, we concede that using fewer items may distort measures and findings, even though our validity and reliability analyses indicate the satisfactory quality of our measurement model. Therefore, encourage future researchers investigating the individual-level effects of using agile ISD practices to utilize complete preexisting scales as well as a more comprehensive list of practices.

Finally, we examined the consequences of using agile ISD practices at an individual level only. While this focus provided rich insights into the psychological processes of software developers working in agile ISD teams, we invite future research to consider multiple levels when studying agile ISD practices. Team or project characteristics, such as team distribution, project complexity, and leadership practices (Windeler et al. 2017), could generate further insights into the boundaries of resource-enhancing or resource-depleting effects regarding the use of agile ISD practices. Similarly, studying team performance as a valuable team-level outcome of the use of ISD practices (Kude et al. 2019; Pee et al. 2010) could be complemented by taking individual-level ego depletion into account. In addition to multilevel examinations, researchers could engage in dyadic studies and compare the implications of using agile ISD practices from different stakeholder perspectives, e.g., developers and product managers (Benlian and Haffke 2016; Yakovleva et al. 2010).

Beyond addressing the shortcomings of our study, we recommend that further research take a more balanced perspective when examining the implications of using agile ISD practices for developers' well-being and job outcomes. We propose research on the unintended effects of the use of agile ISD practices to improve the understanding of the dark sides of agile ISD and how to mitigate them. Scholars might examine which individual and team-wide interventions are necessary and helpful to reduce resource depletion caused by using agile ISD practices. For example, they could refer to research on microbreaks or project staffing processes (e.g., Maurer

2010; Zacher et al. 2014) to see whether these things can enhance the sustainability of agile ISD projects.

Moreover, complementing research on single agile ISD practices (e.g., Kude et al. 2019), future research could examine which individual agile SD or PM practices are more, or less, depleting in order to gain a more nuanced understanding of the main drivers behind the effects that we found in our study. In particular, our nonsignificant results concerning the depleting effects of agile PM practices suggest that, overall, they may be not as demanding as hypothesized and individual practices might cancel each other out. An examination on a more granular level of analysis might be a fruitful avenue for future research seeking to identify more and less beneficial practices and usage conditions for developers working with agile PM practices.

We additionally propose that scholars acknowledge the significant impact of the interaction between the use of agile ISD practices and perceived workload on individual developers in agile ISD teams. For example, we found that higher perceived workloads intensify feelings of energy when using agile SD practices. Therefore, further research might dig deeper into the role of these practices as job design features because they could potentially serve as buffers in high-workload situations. This is especially interesting against the backdrop that work overload and time pressure have been proposed as depleting employees' regulatory resources (Diestel and Schmidt 2012; Prem et al. 2016).

Finally, the underlying mechanisms we identified in the qualitative study, such as frustration and futility, may serve as a starting point to study the unintended consequences of the use of agile ISD practices for important health-related aspects such as burnout and depression. Such endeavors would go above and beyond the focus on fatigue and turnover to better punctuate the health implications and individual-level sustainability of agile ISD work processes.

3.8 Conclusion

Our research was aimed at providing a nuanced and balanced view on the effects of using agile ISD practices on developers' feelings of fatigue and turnover intentions based on EDT. We theorized that the use of agile SD practices has an energizing (i.e., resource-enhancing) impact on individual developers' regulatory resources and hence decreases their level of fatigue and their turnover intentions, while the use of agile PM practices depletes developers' regulatory resources, enhancing their level of fatigue and intentions to change jobs. In addition, we proposed that these effects are amplified by higher levels of perceived workload. Our empirical studies largely supported the hypotheses in our model. The use of agile SD practices reduces

turnover intentions via the mediating effect of fatigue, especially in high-workload situations. The results concerning the use of agile PM practices indicate a depletion effect during high-workload periods only. We contribute to a deeper understanding of the positive and negative individual-level implications of the use of agile ISD practices and demonstrate the importance of considering individual developers' perceived workloads when evaluating their effectiveness. Practitioners can use our findings to help them take effective actions to retain key IT employees and when tailoring agile ISD practices to organizational settings.

3.9 Appendix

3.9.1 Appendix A: Definitions

Practices		**Definition**
Agile PM Practices	Iterative delivery - Iteration planning - Iteration reviews	The process of planning and delivering in an incremental manner. Specifically, the concept that delivery in small chunks provides the team with the ability to generate code and immediately receive feedback from the environment after each iteration. (Tripp et al. 2016)
	Daily standup	A (usually) daily meeting in which all project members meet while standing to encourage brevity. In Scrum, the meeting involves asking and answering: What did I accomplish yesterday? What will I do today? What obstacles are impeding my progress? (Schwaber and Beedle 2002)
	Retrospectives	Meeting held at the end of the iteration in which the team critically reflects on the last iteration and identifies/implements continuous improvement opportunities (Schwaber and Beedle 2002).
	Short iterations	In general, the iteration length is fix and should not exceed 30 days (Schwaber 2004).
Agile SD Practices	Unit testing	Using dedicated test code that one can run (usually automatically) to test the effects of changes to the system. The team performs this testing before team members are allowed to check in code, which allows developers to be sure that they have not broken anything in the system (Beck 2000).
	Continuous integration	The process of systematically and regularly building and deploying the code to a test server (Duvall et al. 2007).
	Coding standards	A set of established norms as to code-naming and consistency (Beck 2000).
	Refactoring	A commitment by the team to use practices that lead to removing redundancy, eliminating unused functionality, and refreshing obsolete designs (Fowler and Beck 1999).

Table 3-4: Primarily applied agile ISD practices

3.9.2 Appendix B: Survey

Category	%
Gender	
Female	34.3
Male	65.7
Age	
18-30	21.3
31-40	37.7
41-55	33.3
> 55	7.7
Experience with agile ISD practices	
< 1 year	25.1
1-2 years	24.6
3-5 years	32.4
> 5 years	17.9
Number of agile projects	
One single agile project	36.7
Several agile projects	63.3

Table 3-5: Descriptive statistics of survey respondents

Construct	Indicator	Items
Agile ISD practices use (Tripp et al. 2016) Seven-point Likert scale ("strongly disagree" to "strongly agree") and "I don't know" as eight option.		
Iterative delivery - Iteration planning - Iteration reviews	ID1	At the beginning of each work cycle, the team and business owners agree on what will be delivered during the work cycle.
	ID2	The team gives input as to how much work can be completed in a work cycle.
	ID3	At the end of each work cycle the project is assessed against the goals of this work cycle.
Daily standup	DS1	Our team has a short meeting every workday to discuss what is going on with the project.
	DS2	Our team discusses issues together daily.
Retrospectives	RE1	On a regular basis, the team reflects on previous work and looks for ways to improve team performance.
	RE2	At the end of each work cycle, the team asks itself "what went well" and "what could be improved".
Short iterations	SI1	The length of one work cycle is as short as possible but as long as necessary.
	SI2	The length of work cycles is fix throughout the project.
Unit testing	UT1	We have a separate set of "test" code that is written specifically to test the "real" code.
	UT2	Every programmer in our team is responsible for writing unit tests for the code he or she writes.
Continuous integration	CI1	Members of our team integrate code changes as soon as possible.
	CI2	The team has a process that automatically rebuilds the software several times a day.
Coding standards	CS1	The naming and structure of our code is consistent.

	CS2	Our team uses standards for consistent code formatting.
Refactoring	RF1	Whenever we see the need, we improve the design of the code we have written previously.
	RF2	Every member of the team attempts to improve the structure of the code when making a change.
Ego depletion effect (Chan and Wan 2012; Van Yperen and Hagedoorn 2003) Seven-point Likert scale (“never”, “almost never”, “rarely”, “sometimes”, “rather often”, “nearly all the time”, “daily”)		
Feelings of fatigue	FF1	I feel tired.
	FF2	I feel really fatigued at the end of a working day.
	FF3	I feel like my "batteries" are "dead".
	FF4	During the last stage of a working day, I feel too exhausted to perform well.
	FF5	I find it difficult to relax at the end of a working day.
Turnover intention (Leiter et al. 2011) Seven-point Likert scale (“strongly disagree” to “strongly agree”)		
Turnover intention	TI1	I plan on leaving my company within the next year.
	TI2	I want to remain in my job.
Perceived workload (Moore 2000a) Seven-point Likert scale (“strongly disagree” to “strongly agree”)		
Perceived workload	PW1	I feel that the number of requests, problems, or complaints I deal with is more than expected.
	PW2	I feel busy or rushed.
Negative affect (Watson et al. 1988) Seven-point Likert scale (“not at all”, “a little”, “to some degree”, “moderately”, “more than moderate”, “quite a lot”, “extremely”)		
Negative affect	NA1	During the last few weeks/ during the project, to what extent did you feel distressed?
	NA2	During the last few weeks/ during the project, to what extent did you feel upset?
	NA3	During the last few weeks/ during the project, to what extent did you feel nervous?

Table 3-6: Measurement items

3.9.3 Appendix C: Model Validation and Common Method Bias Testing

	Construct	Item	1	2	3	4	5	6	7	8	9	10	11	12
1	Daily standups	DS1	**0.90**	0.49	0.48	0.49	0.45	0.50	0.35	0.40	-0.11	-0.27	-0.14	-0.14
		DS2	**0.92**	0.55	0.59	0.55	0.42	0.55	0.40	0.43	-0.17	-0.38	-0.25	-0.22
2	Retrospectives	RE1	0.58	**0.89**	0.63	0.50	0.42	0.57	0.47	0.53	-0.11	-0.31	-0.11	-0.11
		RE2	0.42	**0.86**	0.55	0.50	0.35	0.47	0.41	0.51	-0.15	-0.24	-0.21	-0.18
3	Iterative delivery	ID1	0.52	0.57	**0.88**	0.51	0.47	0.53	0.54	0.45	-0.27	-0.39	-0.27	-0.33
		ID2	0.47	0.55	**0.85**	0.49	0.43	0.53	0.50	0.54	-0.08	-0.21	-0.23	-0.16
		ID3	0.53	0.63	**0.86**	0.52	0.46	0.47	0.44	0.53	-0.14	-0.30	-0.22	-0.19
4	Short iterations	SI1	0.50	0.44	0.45	**0.83**	0.41	0.49	0.34	0.38	-0.06	-0.19	-0.11	-0.15
		SI2	0.46	0.52	0.54	**0.86**	0.48	0.54	0.43	0.53	-0.18	-0.28	-0.12	-0.21
5	Unit tests	UT1	0.41	0.39	0.43	0.48	**0.87**	0.45	0.47	0.39	-0.14	-0.21	-0.13	-0.23
		UT2	0.43	0.38	0.49	0.44	**0.89**	0.49	0.49	0.49	-0.19	-0.27	-0.13	-0.18
6	Continuous integration	CI1	0.50	0.49	0.56	0.47	0.43	**0.86**	0.53	0.55	-0.25	-0.43	-0.23	-0.35
		CI2	0.47	0.52	0.44	0.57	0.47	**0.83**	0.41	0.51	-0.18	-0.22	-0.19	-0.19
7	Coding standards	CS1	0.38	0.46	0.54	0.44	0.48	0.52	**0.92**	0.56	-0.19	-0.39	-0.13	-0.32
		CS2	0.38	0.47	0.51	0.41	0.52	0.51	**0.92**	0.60	-0.12	-0.38	-0.12	-0.23
8	Refactoring	RF1	0.40	0.52	0.52	0.44	0.45	0.57	0.61	**0.88**	-0.21	-0.32	-0.19	-0.25
		RF2	0.40	0.51	0.50	0.51	0.43	0.53	0.48	**0.85**	-0.26	-0.34	-0.26	-0.20
9	Feelings of fatigue	FF1	-0.11	-0.14	-0.17	-0.15	-0.19	-0.22	-0.18	-0.31	**0.82**	0.40	0.49	0.59
		FF2	-0.09	-0.08	-0.13	-0.02	-0.12	-0.18	-0.08	-0.19	**0.79**	0.31	0.40	0.46
		FF3	-0.13	-0.15	-0.14	-0.10	-0.17	-0.20	-0.14	-0.24	**0.86**	0.40	0.47	0.58
		FF4	-0.17	-0.11	-0.20	-0.14	-0.16	-0.21	-0.18	-0.20	**0.86**	0.43	0.50	0.58
		FF5	-0.13	-0.11	-0.14	-0.15	-0.13	-0.23	-0.12	-0.16	**0.82**	0.45	0.49	0.61
10	Turnover intention	TI1	-0.32	-0.23	-0.30	-0.25	-0.22	-0.33	-0.33	-0.31	0.50	**0.93**	0.40	0.55
		TI2	-0.35	-0.37	-0.35	-0.28	-0.29	-0.39	-0.44	-0.40	0.40	**0.92**	0.27	0.45
11	Perceived workload	PW1	-0.14	-0.06	-0.17	-0.05	-0.02	-0.15	-0.05	-0.12	0.38	0.27	**0.81**	0.33
		PW2	-0.23	-0.22	-0.29	-0.17	-0.20	-0.26	-0.16	-0.29	0.58	0.35	**0.92**	0.46
12	Negative affect	NA1	-0.15	-0.13	-0.21	-0.15	-0.15	-0.23	-0.21	-0.19	0.61	0.51	0.40	**0.91**
		NA2	-0.14	-0.15	-0.26	-0.13	-0.20	-0.27	-0.31	-0.25	0.65	0.45	0.44	**0.92**
		NA3	-0.25	-0.17	-0.24	-0.30	-0.29	-0.37	-0.31	-0.26	0.60	0.48	0.41	**0.87**

Table 3-7: Cross loadings

Construct	VIF
Turnover intention	
Agile PM practices use	2.554
Agile SD practices use	2.619
Feelings of fatigue	2.234
Negative affect	2.065
Perceived workload	1.545
Feelings of fatigue	
Agile PM practices use	2.527
Agile SD practices use	2.666
Negative affect	1.629
Perceived workload	1.329
Turnover intention	1.618
Perceived workload	
Agile PM practices use	2.494
Agile SD practices use	2.654
Feelings of fatigue	1.963
Negative affect	2.139
Turnover intention	1.656
Agile PM practices use	
Agile SD practices use	1.294
Feelings of fatigue	2.307
Negative affect	2.147
Perceived workload	1.542
Turnover intention	1.625
Agile SD practices use	
Agile PM practices use	1.233
Feelings of fatigue	2.319
Negative affect	2.107
Perceived workload	1.587
Turnover intention	1.597
Negative affect	
Agile PM practices use	2.540
Agile SD practices use	2.636
Feelings of fatigue	1.722
Perceived workload	1.524
Turnover intention	1.553

Table 3-8: Variance inflation factors (VIFs)

3.9.4 Appendix D: Interviews

No.	Industry	Experience with agile ISD practices (in years)	Age	Agile PM practices				Agile SD practices			
				Daily standups	Retrospec-tives	Iterative delivery	Short iterations	Unit testing	Cont. integration	Coding standards	Refactoring
1	Banking	3	29	U	U	U	U	U	P	P	P
2	Banking	3	53	U	U	U	U	N	N	U	N
3	IT Service Provider	9	39	U	U	U	U	N	P	U	U
4	IT Service Provider	2	33	U	U	U	U	U	N	U	U
5	Agriculture/ Engineering	5	36	N	P	U	U	U	P	P	P
6	Agriculture/ Engineering	7	46	N	P	U	U	P	U	N	U
7	Agriculture/ Engineering	7	30	U	U	U	U	P	U	U	U
8	IT Consulting	1	24	U	U	P	U	N	N	P	P
9	Agriculture/ Engineering	2	31	U	P	P	U	N	N	U	U
10	IT Consulting	9	30	U	P	U	U	P	U	P	U
11	IT Service Provider	3	32	U	U	U	U	U	P	U	U
12	IT Service Provider (Catering)	4	31	U	U	U	U	U	U	U	U
13	IT Service Provider (Catering)	2	31	U	U	U	U	U	U	P	P
14	Web Engineering	5	32	U	U	U	U	U	U	U	U
15	Software Engineering	2	29	U	U	U	U	U	U	U	U
Note: U=used, N=not used, P=partly used											

Table 3-9: Descriptive statistics of interviewed software developers

Chapter 4: IT Project Manager Identity Tensions in Agile ISD Settings

Title:	Role Identity Tensions of IT Project Managers in Agile ISD Team Settings
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Abstract: The traditional role of IT PMs is challenged significantly in agile ISD projects in which teams are self-managed. Thus far, research recognizes their contradictory role but overlooks to problematize the consequent identity tensions that IT PMs have to face. This is critical because IT PMs continue to play an essential role in ISD project success. Using identity theory as a lens, we conducted a qualitative interpretive study interviewing 26 IT PMs in agile ISD team settings. Our findings reveal five fundamental role identity tensions IT PMs experience during agile transformations. We provide a nuanced understanding of IT PMs' role in agile ISD team settings to explain challenges in agile ISD. Moreover, we suggest moving from a narrow focus in IS research on agile ISD team-internal roles, such as developers, toward a broader focus that includes both team-internal and team-adjacent roles in agile ISD.

Keywords: agile, information systems development, agile transformation, role identity, IT project manager

4.1 Introduction

"I definitely see a huge conflict between Scrum and reality." (I9)

Adapting to fast-changing markets and technological advancements, an ever-increasing number of contemporary organizations rely on agile methods to provide them with the flexibility and reactivity they seek (Rigby et al. 2016). While this agile transformation commonly impacts entire organizations, the adoption is largely spearheaded by companies' ISD teams. Indeed, 95% of organizations with in-house software development claim to have adopted agile ISD by now (VersionOne 2020). Building upon fundamental agile principles introduced in the Agile Manifesto, agile ISD teams embrace short development cycles, shallow hierarchies, shared decision-making, and continuous collaboration among all team members (Fowler and Highsmith 2001). The agile principles promise companies a competitive advantage because they allow for rapid iterations on their digital products and short innovation cycles. Most notably, however, agile development methods are in stark contrast to more traditional (i.e., Waterfall) development methods that were the previously dominant mode for ISD teams.

Despite the numerous advantages of agile methods, this fundamental shift not only in mentality but also in working processes bears potential for a range of challenges (e.g., Conboy et al. 2011). The agile transformation has an extensive impact—particularly on the structure of ISD teams—and requires that companies address emerging complications adequately to avoid disruptions to the ISD process. Teams that are transitioning away from traditional methods find themselves faced with radically changed roles and responsibilities. Previously hierarchically structured, these now-agile teams are mainly characterized by self-management and cross-functionality (Beck 2000; Maruping et al. 2009a). In addition, all roles needed for the development process—for instance, a dedicated customer representative—are now contained within an agile ISD team (Maruping and Matook 2020). Consequently, it is often proclaimed that the IT PM is no longer necessary—although they played a critical part in traditional ISD settings. In fact, according to the widely-recognized Scrum Guide (Schwaber and Sutherland 2017), such a managing and authoritarian role is non-existent. However, numerous studies on agile ISD team settings reveal not only that IT PMs do still exist but also that they continue to be an integral factor for an ISD project's success (e.g., Maruping and Matook 2020; Venkatesh et al. 2018). Thus far, extant IS literature has studied the impact of agile practices on delivered products (e.g., Dhillon et al. 2011; Lee and Xia 2010), the project itself (e.g., Ramesh et al. 2012), the team of developers (Wiedemann and Weeger 2017), and on individual developers (e.g., Tripp et al. 2016; Venkatesh et al. 2020; Windeler et al. 2017). At the same time, the

consequences of agile practices and the resulting dilemmas for individual IT PMs remain largely unknown. Extant IS literature has neglected to problematize this contradictory situation appropriately.

The lack of IT PM understanding in agile ISD team settings is decisive in light of the growing number of agile ISD projects for which success is often not yet given (Lee and Xia 2010). Past research has emphasized IT PMs' importance in more traditional settings as a critical resource for project success numerous times (Mata and Fuerst 1995; Wiesche et al. 2018). Understanding IT PMs as stakeholders in agile ISD is crucial for IS research as neglecting them might lead to an incomplete and misleading theoretical explanation of agile ISD project success. Thereby, understanding the role of IT PMs in agile ISD team settings might be one missing link for researchers and practitioners to better grasp and ensure the success of agile ISD. Especially when they are thrown in at the deep end and assigned to agile ISD team settings without a clear role, IT PMs might experience notable tensions—similar to other negative effects of agile ISD that researchers have observed for developers or agile ISD teams overall (Fortmann-Müller 2018; McAvoy and Butler 2009). Such tensions related to their role (e.g., contradicting expectations of top management and agile teams, reporting to top management without access to insights) might lead to turnover or turn-away intentions and finally to organizations losing important and skilled employees. Against this background, it is critical for research and practice to understand IT PMs and their tensions in agile ISD team settings, which we want to address with this study.

Prominent theoretical underpinnings for IT PMs' role are often based on command and control-related theories (e.g., Wiener et al. 2016), which seem unsuitable as theoretical guidance in agile contexts because they conflict with fundamental agile principles (Gregory and Keil 2014; Napier et al. 2009). We, therefore, draw on role identity theory which provides a viable lens to our study (Caza et al. 2018). In the past, this theory has explained numerous effects of role changes—that is, changes in rights, duties, obligations (Markovsky and Frederick 2020), e.g., with nurses becoming managers (Croft et al. 2015), individuals becoming priests (Kreiner et al. 2006), and artificial intelligence systems affecting professionals (Strich et al. 2021). The theory posits that role changes, in the sense of different role designs or new role expectations, often engender role identity tensions (Caza et al. 2018). Accordingly, we aim to answer the following research question:

What identity tensions do IT PMs experience due to their shifting roles in agile ISD projects?

We adopt a qualitative interpretive research approach (Deng et al. 2016; Dutton et al. 2010; Walsham 1995) to answer our research question. We interviewed 26 IT PMs with experience in both traditional and agile ISD team settings, acting besides known roles such as SM and PO.

With this study, we contribute to extant literature in the domain of agile ISD in several essential ways. We add to a more complete picture of agile ISD research by highlighting the crucial role that IT PMs continue to play and broaden the research scope beyond the core team members foreseen by agile methods (Felin et al. 2015). We are also the first to go beyond descriptive observations regarding the IT PM role (e.g., Shastri et al. 2017) and establish central role identity tensions that can notably influence IT PMs' behavior in agile ISD contexts. Finally, we introduce the concept of role identity (Caza et al. 2018) to agile ISD research and, thus, open up a new research path to study and explain the subjective challenges that agile methods impose on specific team members.

4.2 Theoretical Background

4.2.1 IT Project Managers in Agile ISD Team Settings

The core of any agile ISD process is a highly self-managed team that is composed of *"individuals [that] take accountability for managing their own workload, shift work among themselves based on need and best fit, and take accountability for team effectiveness."* (Highsmith 2004, p. 52). The required foundation for this high degree of self-management lies in a common focus, mutual trust, and respect (Cockburn and Highsmith 2001). The self-management of the ISD team is a striking difference compared to traditional ISD project settings in which teams are commonly managed by multiple layers of authority and in a strictly hierarchical command and control style (Hoda et al. 2012). Compared to previous and more traditional approaches, these agile principles signified a radical paradigm shift that led to significant changes in both team roles and responsibilities.

Several frameworks exist that implement these fundamental agile principles. Among the most prominent and widely adopted agile ISD frameworks is Scrum (Schwaber and Sutherland 2017; VersionOne 2020), which focuses on project management and teamwork (Rigby et al. 2016). Each framework defines specific team-internal roles and responsibilities that can be generally categorized in the team of developers, a customer representative, and a facilitator. The development team is responsible for making decisions, delegating tasks among the team members, and managing processes (Maruping et al. 2009a; McAvoy and Butler 2009). The customer representative—in Scrum, usually the PO—is responsible for close collaboration with

the customer and the alignment of the customer requirements (Maruping and Matook 2020). The facilitator—in Scrum the SM—helps the team implement the agile ISD methodology and removes impediments to agile working (Shastri et al. 2017). These team-internal roles' duties overlap to a large extent with those of IT PMs in traditional ISD teams. IT PMs in traditional ISD settings assume a role of top-down leadership that includes centralized decision-making, the power to assign tasks to specific team members directly, and, generally, a large amount of control and authority (Benington 1987; Royce 1987). This leadership style—commonly described as command and control—comes with a critical responsibility for a project's success (i.e., in terms of delivery times, budget, and quality) that the IT PM bears toward project-external stakeholders such as top management (Highsmith 2004).

Consequently, one of the roles that were arguably most impacted by the shift from traditional to agile ISD methods is the IT PM. Coming from this authoritarian role of command and control, making decisions and managing personnel, costs, schedule, risk, and stakeholders (Nelson 2007), the IT PM becomes a facilitator who conscientiously strikes a balance between flexibility and structure (Augustine 2005; Highsmith 2002; Schuh 2004). Despite IT PMs' continued presence within agile ISD teams (e.g., Maruping and Matook 2020; Vidgen and Wang 2009), extant research has mostly focused on other team members and their roles. For instance, previous studies have examined developers (Fortmann-Müller 2018; Venkatesh et al. 2020) or customer representatives (Maruping and Matook 2020). Hitherto, literature on the specific implications that an agile transformation has on IT PMs remains scarce.

The few studies that examine the role of agile IT PMs describe a complex, provisionary, and—most importantly—highly contradictory role. For instance, in a systematic literature review, Gandomani et al. (2020), p. 119) conclude that *"[…] there is no independent role called project manager in Agile methodologies; however, there is a need for it"*. Additionally, they infer that the role of agile IT PMs appears to be structurally different from the role of IT PMs in traditional ISD teams. Similarly, Tjørnehøj (2019)) emphasizes that IT PMs must strike a balance between numerous responsibilities and handle the dualism between agile and traditional methods. Therefore, IT PMs find themselves in a team-adjacent role between agile ISD teams and organizations' top management, acting as a critical intermediary at the fringe of the project with a wide range of duties and obligations toward their respective counterparts. Hence, IT PMs face a much more complex and more difficult role, especially in organizations shifting from traditional to agile ISD team settings (Tjørnehøj 2019). Additionally, Shastri et al. (2017)) acknowledge notable conflicts between various roles in agile ISD team settings: At times, the

IT PM and the PO assume overlapping and, thus, conflicting roles and responsibilities, while in other teams, the IT PM is more involved in coaching the top management, which is traditionally not an IT PM's obligation. Lastly, McAvoy and Butler (2009) report that the IT PM's role needs to be reassessed to ensure a well-functioning and self-managed agile ISD team. Taken together, extant literature describes IT PMs as caught in the middle between the logics of the self-managed agile team and the logics of the overall organization. The individual-level consequences that IT PMs face in light of such contradictory role requirements remain largely unexamined—a void that we aim to fill by studying tensions of IT PMs in agile ISD team settings through the lens of role identity theory.

4.2.2 Work-related Role Identity and Role Identity Tensions

Role identity is an important work-related identity and one of the multiple identities each individual has (Caza et al. 2018; Cooley 1902). Identities, in general, can be defined as the meanings individuals attach to themselves based on socio-demographic characteristics, personal attributes, roles, and group memberships (Brewer and Gardner 1996; Gecas 1982; Mueller et al. 2019; Tajfel and Turner 1978). In a work context, these self-meanings are tied to participation in work-related activities or memberships in organizations and professions (Dutton et al. 2010). Role identities are built based on an individual's work role. Hence, the position one takes on in relation to others in the context of work is defined by the duties, rights, and obligations associated with this position (Markovsky and Frederick 2020; Sluss and Ashforth 2008). They create meaning and legitimacy in a particular work role (Caza et al. 2018). Research has discussed, for instance, how managers position themselves compared to the definition of their role (e.g., Epitropaki et al. 2017). As with any identity, role identities continuously develop, especially when facing and resolving tensions (Junglas et al. 2007; Phoenix and Rattansi 2005). These role identity tensions occur when central aspects of the work role change, such as a new role or role expectation, a different role design, or conflicting roles (Caza et al. 2018).

In the context of IT project management, which has to adapt from traditional to agile ISD project team realities, the characteristics of the IT PM role are changing (Gandomani et al. 2020; Shastri et al. 2017). IT PMs are often caught in the middle between various stakeholders and exposed to an array of diverging demands that need to be aligned, for example, the logic of the self-managed agile ISD teams versus the logic of the overall organization (Tjørnehøj 2019). Moreover, their top-down approach to leading is not suitable anymore due to the agile ISD team making its own project-related decisions about who is to execute tasks and how (McAvoy and

Butler 2009). As their role changes from a team-internal one that is central to the project to a team-adjacent one with a different set of duties, IT PMs working in an agile ISD team setting are likely to construe themselves differently in their work domains than IT PMs in traditional ISD project settings (Stewart et al. 2017). Hence, during the transition from a traditional to an agile ISD setting, IT PMs have to deal with complexity, inconsistencies, and tensions in the meaning they attach to themselves.

Extant research has demonstrated that work-related identity has the potential to affect important individual-level work outcomes, e.g., creativity or the capacity to deal with stress (Cheng et al. 2008; Hobfoll 1989). Hence, we believe that the concept of role identity as part of an individual's work-related identity has the potential to provide a solid basis for understanding individual-level consequences (i.e., tensions) for IT PMs in agile ISD team settings.

4.3 Research Methodology

To answer our research question, we draw on a qualitative interpretive research approach (Klein and Myers 1999; Walsham 1995) for two main reasons. First, role identities and their resulting role identity tensions are fundamentally rooted in individuals' subjective realities. Qualitative studies lend themselves perfectly to examine such subjective perceptions, especially in direct comparison to quantitative studies (Trauth 2013). This approach has also been proven effective in studying work-related role identities (e.g., Stewart et al. 2017). Second, a qualitative approach is particularly suitable for studies within nascent research areas that have not yet been met with much attention (Walsham 1995).

4.3.1 Data Collection

We conducted 26 semi-structured interviews with IT PMs who currently work in an agile ISD team setting (i.e., Scrum teams) mostly within established German financial services companies. All interviews were conducted either face-to-face or over the phone throughout 2020 and lasted between 40 and 60 minutes. Our purposeful sampling ensured that—in addition to being experienced with agile methods—all interview partners have previously worked as IT PMs in more traditional IT project settings (Palinkas et al. 2015). All interviewed individuals were recruited via posts on social network sites (e.g., LinkedIn), the authors' and their colleagues' personal networks, and the networks of research partner companies. After having interviewed 26 IT PMs, we reached saturation (i.e., we found no new and relevant codes in the IT PMs' responses) and, thus, we stopped our data collection (Keutel et al. 2014; Stake 2005). While the majority of interview partners came from financial services companies of various

sizes, their work experience varied. This variance further increases the comprehensiveness of our results (Kranz et al. 2016). We observed an average age of 42 with an average work experience of 19 years in the industry and an average tenure at the current employer of 10 years. The average experience with agile methods was 5 years. Appendix A summarizes the information on our interview partners.

To keep the interviews focused, they were conducted using an interview guideline that draws on role identity theory (see Appendix B). With this guideline, we covered various topics that directly relate to the IT PMs' role both by itself and in relation to other stakeholders within their respective ISD teams (i.e., developers, SM, PO, top management). Although role identity theory acted as the backbone of our data collection, we remained open to newly emerging topics and themes throughout all interviews and asked open questions to ensure a holistic understanding of the IT PMs' role and their situation.

4.3.2 Data Analysis

For our qualitative data analysis, we used role identity theory as a lens to interpret our data (Sarker et al. 2018; Walsham 1995). More specifically, we determined passages in the interviews that include mentions of concepts related to role identity theory (i.e., changes in duties, obligations, group memberships, or activities). Within these passages, in the first phase, we used an open coding approach in line with Hatch and Ehrlich (1993) and Andriopoulos and Lewis (2009) to identify passages in which interview partners directly referred to identity tensions or contradictions in their role. Subsequently, following the principle of abstraction and generalization (Klein and Myers 1999), we aggregated and grouped these first-order codes to form second-order codes. As depicted in Figure 4-1, we then found pairs of contradictory second-order codes that belong to the same aggregated dimensions. The entire process was based on the principles of the hermeneutic circle—highly iterative, with authors discussing their individual results, comparing similarities and differences in the codes they found, and ultimately reaching a consensus on the resulting aggregations.

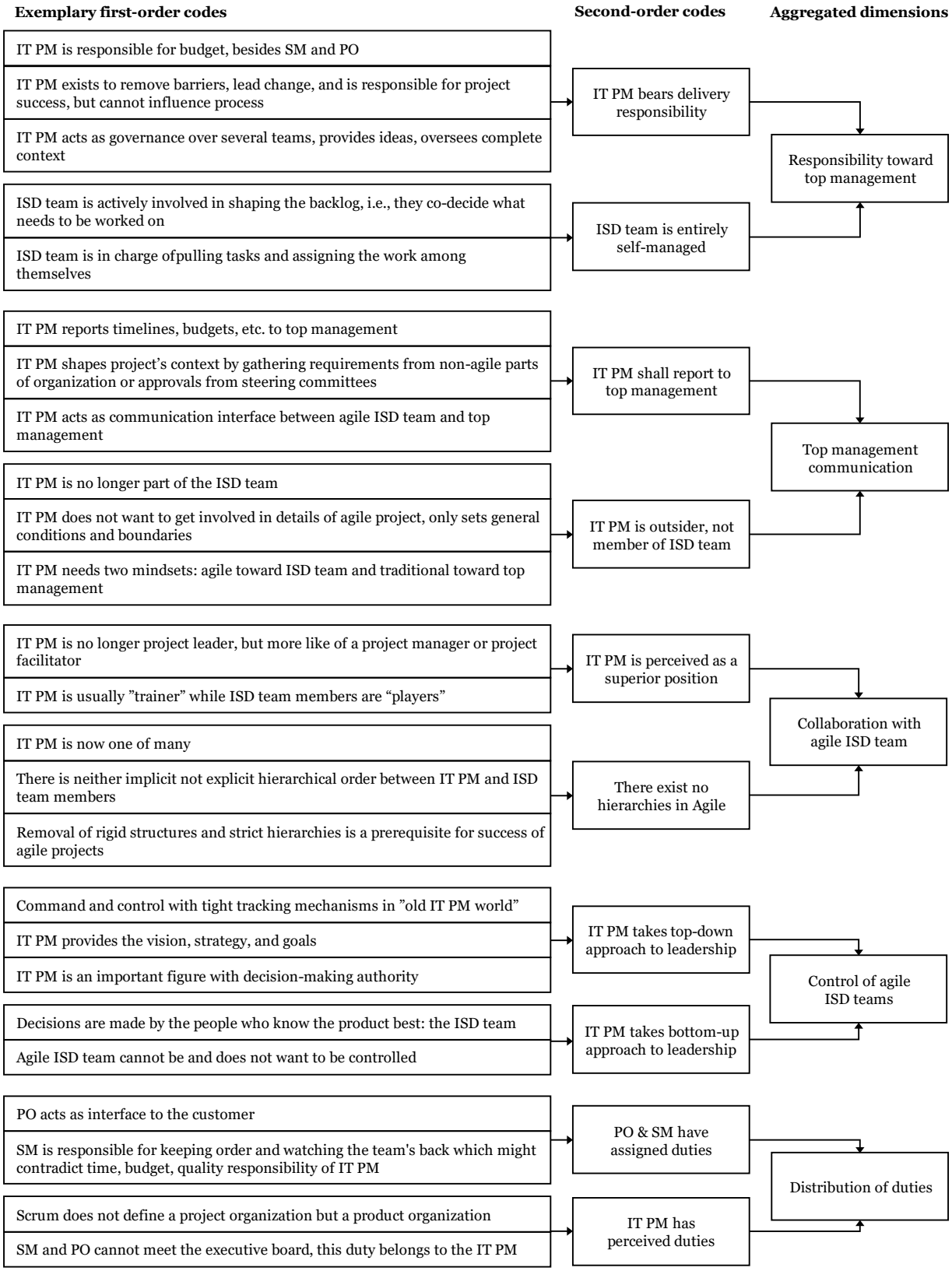

Figure 4-1: Coding structure

4.4 Identity Tensions for IT PMs

Our analysis revealed five fundamental types of role identity tensions, which are denoted as aggregated dimensions in Figure 4-1. Each of these dimensions results from two contradicting second-order codes that can be understood as two polar opposing forces impacting the IT PMs. We illustrate this relationship more clearly in Figure 4-2: Each type of tension is surrounded by one second-order code on the left and one on the right, respectively. We further distinguish between tensions that occur in the relationship between IT PMs and top management and tensions resulting from their relationship to the agile ISD team. As reported by the interview partners, these two relationships caused the highest levels of tensions.

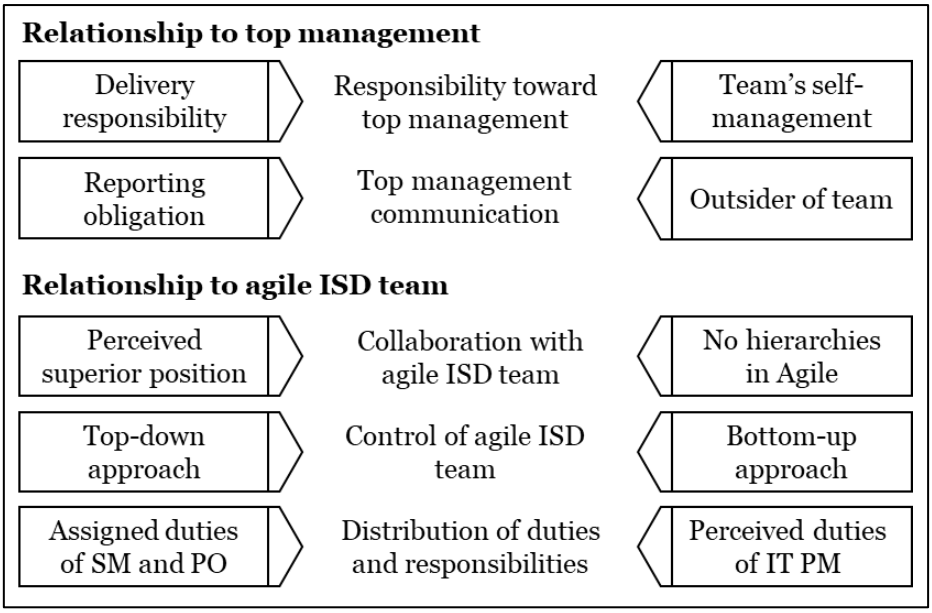

Figure 4-2: IT PM's role identity tensions in agile ISD team settings

4.4.1 Responsibility Toward Top Management

The first tension we observed is about the IT PMs' *delivery responsibility* toward their top management, despite having a highly *self-managed ISD team*. Several interview partners report that, in traditional ISD project settings, IT PMs were the central position that incorporated both responsibility (i.e., for timely delivery of a product, staying within the allocated budget, level of quality, etc.) and the means to steer the team members such that the IT PMs could influence the project's development accordingly. They also report that they continue to carry the responsibility for the whole endeavor:

> *"There is always only one culprit, and that is the project manager. That is already clear, and that remains. No matter whether agile or classic or mixed, hybrid."* (I24)

The agile ISD team, however, is self-managed. This means that IT PMs are no longer in a position to set schedules, deadlines, and quality goals. One IT PM explicitly references the connection between the ISD team's self-management and the importance of shared responsibility:

> *"But in itself, the agile concept says that leadership is distributed to the teams, they make decisions themselves. You have to look at how the people in the teams work together and how well they can take responsibility themselves."* (I7)

The top management has not internalized this shift that, according to agile principles, the newly established self-management nature of the ISD team increases shared responsibility among all team members. By still holding the IT PM accountable, they create contradicting expectations that result in tensions for the IT PM's role identity.

4.4.2 Top Management Communication

A second important tension mentioned by multiple interview partners deals with the communication with and the *reporting to the company's top management*. IT PMs are used to be the voice to top management in the projects for which they are responsible. They hold the relevant project information concerning status and performance to inform the top management about the project's progress and potential risks. Our interview partners state that in agile ISD settings, top management still requires this constant information flow from IT PMs and IT PMs have to shape the frameworks of their projects considering such requirements from the organization. In addition, the IT PM as the intermediary between agile ISD teams and the management seems necessary as communication levels and topics are different, for example, technical specifications versus key performance indicators.

However, IT PMs in agile settings are not part of the agile ISD team anymore and have little access to the status and content of team tasks. They are *outsiders of the team* by the definition of Agile. So, the obligation to report collides with the missing right of immediate access to project information. To communicate effectively, they need to incorporate an agile mindset toward their self-managed agile ISD teams respecting all limits and a traditional mindset toward

top management that expects detailed project reporting concerning time, quality, and budget. One IT PM describes this tension as a complicated balancing act:

> *"[Y]ou don't want to let this [traditional] organizational structure have an effect under any circumstances so that the team can still work in an agile mindset. Externally, however, you still have to communicate it mostly in official timelines, budgets, and so on. So it's a balancing act between not allowing anything to get through internally that would somehow make you lose your way, but then translating it upwards into organizational communication."* (I14)

4.4.3 Collaboration with Agile ISD Team

The third tension we identified originates in a perceived loss in hierarchy and authority between the IT PM and the development team. In more traditional project settings, development teams are evidently hierarchically structured in that IT PMs have a *perceived superior position* than the developers. This is reflected by the fact that they can make extensive decisions and are entrusted to delegate specific duties to specific members of the team. In contrast, there are *no hierarchies in Agile*. Instead, agile project settings aim to eliminate such rigid hierarchical structures and processes in favor of shallow or even non-existent hierarchies and more frequent interactions at eye level. This shift leads to noticeable role identity tensions for some of our interview partners because they notice that their previous collaboration approach is not in line with agile ISD methods. One interview partner explicitly notes that they still feel like the IT PM ranks hierarchically higher:

> *"In practice, the project manager ranks higher than the team. That is a fact for now."* (I11)

This lies in stark contrast to agile principles that entirely remove such authoritarian order and command and control approaches. Another interview partner recognized the IT PM's loss of hierarchy as a particularly delicate challenge:

> *"Communicating at eye level, but still having a functional responsibility, is, again, this fine line, a huge challenge."* (I14)

Hence, in their collaboration with the ISD team, IT PMs struggle with this tension between having an authoritarian and high rank within a company on one hand and working with an agile ISD team that does not recognize such hierarchies on the other hand.

4.4.4 Control of Agile ISD Team

We have identified a fourth role identity tension related to the distribution of tasks and decision-making in the agile ISD team during our analysis. In their traditional role, IT PMs have complete decision control, a great say in who does what in the ISD project team, and tight tracking mechanisms implemented. In an agile ISD setting, project teams take their own decisions and assignments and do not want the IT PM's interference. The IT PMs are expected to let go of their *top-down command and control* way of leading and come to terms with the new *bottom-up approach*, which defines their duties and responsibilities differently. This situation is new to many IT PMs, and when teams act very self-confident, the IT PMs do not know how to react and feel uncomfortable, as one interview partner indicates:

> *"At the beginning, I tried to manage it the project manager way and got a lot of resistance. [...] Some were happy that someone was there again to tell them when they could go to the bathroom again, but the ones who accept this new responsibility put you up against the wall. They say, 'Sorry, no, not like that!' And that's just the problem. I was used to it. [...] It's a lousy situation. You think you know better. You think you know how to solve it, and you think you know who can solve it. And then you go, 'Listen, guys, the problem is this. Can you take care of it?' Then they look at you and say, 'Well, first of all, no. You don't have anything to say here.' That's a huge mess. At that moment, you become very aware that your duties have changed and that your leadership responsibility is gone."* (I23)

In addition, in agile ISD settings, the number of projects one IT PM is responsible for is high. This different project organization makes it impossible for IT PMs to distribute tasks and be part of decisions in all of their projects. As one IT PM explains:

> *"I've had to scale that down because when you're primarily involved in agile projects, it's, of course, difficult to do justice to everyone when you have to be responsible for so many projects at the same time."* (I19)

Both the agile ISD team's expectations and the overall agile ISD project organization trigger tensions to the IT PMs' self-perception. Hence, the traditional idea of project leadership and the rights and duties attached to the IT PM role is challenged, forcing the IT PMs to rethink and redefine their role identity.

4.4.5 Distribution of Duties and Responsibilities

We finally observed a fifth and last identity tension among IT PMs in agile ISD team settings concerning the ambiguity of their role compared to SMs' and POs' established roles. Duties of SM and PO are described and well-known across organizations and include, for instance, the PO being the interface to the customer and the SM watching the team's back. Duties of IT PMs in agile ISD team settings, however, are not explicitly formulated but based on their past, IT PMs have their own understanding of their duties, which includes, for example, risk management with the customer and general project management (e.g., reporting to top management):

> *"You get into a conflict with the Product Owner in that situation. Because if you say you're responsible for risk management, then you want to talk to the customers about risk management [...]. For example, it's one thing Scrum doesn't say anything about. Does the Product Owner do business risk management: yes or no? According to Scrum, yes, he is mainly responsible for the requirements. And for the prioritization together with the team. Is he the complete interface to the business, or is he only the interface to the business regarding the requirements? And doesn't every requirement also involve risk, so of course he has to do the risk management? That's where you come into conflict because this is not documented or defined anywhere. And the Product Owner says, 'Eh, no that's my job. Why did you go speak with the customer yesterday?' Then I say, 'That's not your job. That's my job. I'm responsible for the risks.'"* (I23)

Consequently, overlaps between the duties of SM, PO, and IT PM roles might happen that lead to ambiguity and tension. Two interview partners describe this tension as follows:

> *"I believe that it will take quite some time until this topic of agile projects is really anchored in such a way that everyone knows exactly what they have to do or refrain from doing in their role at that moment."* (I22)

> *"I think there were two situations at the beginning, where I consciously, maybe even unconsciously, latched myself into content topics. But it is quite legitimate that the Scrum Master or the Product Owner reflects this and says: 'No, watch out. That's not your role.'"* (I18)

SM and PO can rely on their *established roles with clearly assigned duties*, while IT PMs have *no explicitly formulated* duties. Hence, IT PMs experience a substantial identity tension because their actual duties might not correspond to what they originally expect from their role.

4.5 Discussion

Our main goal with this study is to shed light on the individual-level role identity tensions that IT PMs experience during organizations' agile transformation processes and we identified five fundamental types of role identity tensions. More specifically, we find two fundamental tensions that IT PM experience in their relation to top management: IT PMs continue to bear the responsibility for a project's success (i.e., in terms of delivery times, budget, and quality) toward the top management, although the agile ISD team is supposed to be entirely self-managed. Moreover, IT PMs' reporting obligations toward the top management have not changed, however, in a now-agile setting, the IT PMs are no longer part of the agile ISD team and, thus, have very limited access to the status and content of the team's tasks. In addition, we identified three fundamental tensions that occur between IT PMs and agile ISD teams. First, according to agile principles, hierarchies no longer exist—collaboration is supposed to happen at eye level. Hence, IT PM's experience notable tensions because their previous approaches to collaboration do not fit with agile ISD settings. Second, there is a role identity tension regarding the IT PMs' approach to leadership as agile project settings emphasize a bottom-up approach (i.e., shared decision-making and no interference by the IT PM) compared to widespread top-down approaches (i.e., centralized decision-making and control by the IT PM). Third, the lack of differentiation in agile methods of duties and responsibilities for SM, PO, and IT PM results in notable overlaps and ambiguities.

Our study contributes to research on individual-level consequences of agile ISD method use in three important ways. Since prior work has largely focused on team-internal roles, namely the developers (e.g., Tripp et al. 2016; Venkatesh et al. 2020; Windeler et al. 2017) and the customer representative (e.g., Maruping and Matook 2020), our understanding of implications for individuals affected by agile ISD has remained fragmented. With our in-depth and individual-level analysis of IT PMs that have not been envisaged by theory but exist in practice, we advance research by highlighting the team-adjacent role of IT PMs. Indeed, IT PMs are no longer the central and authoritarian conductor within their agile orchestra. Instead, they act at the fringe of the ISD team, although they continue to be responsible for the project's success toward the company's top management. Simultaneously, we broaden the research scope to stakeholders important for the implementation of agile ISD but not part of the core agile ISD

team. Past research has focused on agile teams or team-internal roles, as these are also in focus of widespread agile frameworks or guides (e.g., Scrum Guide). Our results highlight the lack of comprehensiveness of such agile frameworks. They neglect the interfaces between the agile ISD team setting and the remaining, not-yet agile, company and the coordination efforts and duties that come with such interfaces. As such, typical functional silos are avoided by cross-functional agile teams but new silos between the agile part of the company and the non-agile are created, between which the IT PMs need to mediate and, hence, experience notable tensions and are forced to navigate the blurred lines between their previously well-established role and newly adopted contradicting agile principles. Hence, we suggest that researchers include not only agile ISD teams and their members—developers in particular—in their investigations but also other team-adjacent stakeholders involved in agile ISD to fully understand the larger phenomenon of agile ISD (Felin et al. 2015). Second, we identify two role identity tensions that IT PMs experience in their relationship to top management and three role identity tensions that originate from the relationship to different agile ISD team roles (e.g., the developers). Especially the tensions toward the top management highlight that agile methods cannot be simply applied to one team but, in order to avoid tensions and protect IT PMs, must apply at a company level including the top management which needs to learn and practice the shift of responsibility and power of decision making towards agile ISD teams. To our knowledge, we are the first to go beyond descriptive observations regarding the IT PM role and to establish central role identity tensions that can notably influence IT PMs' behavior in agile ISD contexts. Understanding such tensions is of particular importance for IT management and ISD research as success of agile ISD projects is often not yet given (Lee and Xia 2010) and these tensions might be one path to explain project failure. Future research may also use the identified triggers as a foundation to study behaviors, actions, and opinions of IT PMs or other affected roles in agile ISD contexts. Third, by introducing the concept of role identity (Caza et al. 2018) in agile ISD research, we open up a new research path to study and explain challenges in agile ISD method application. Researchers can use the conceptualization to examine existing difficulties in the introduction and management of agile ISD projects (Hekkala et al. 2017; Lee and Xia 2010) and develop an understanding of how to solve them and ensure success.

Furthermore, our research provides multiple practical contributions that support organizations in their successful agile transformation. First, we alert practitioners that a shift to agile methods is accompanied not only by benefits but also by conflicts and dilemmas that need to be navigated. As an essential role that continues to be critical for an ISD team's effectiveness, the

IT PM experiences notable role identity tensions and is frequently left to cope with these by themselves. Consequently, we propose that organizations adopting agile methods should attach great importance to the design and sustainability of their agile ISD team settings and proactively define roles and responsibilities in such a way that they adequately accommodate all project members. Not accounting for such a significant key position in the ISD team setting might increase personnel turnover and a lastingly disrupted ISD process. Our findings may guide organizations to shape their ISD team and role structures in such a way that IT PMs can be productive in their new role.

4.6 Limitations and Future Research

Regardless of the aforementioned theoretical and practical contributions, our study exhibits a few noteworthy limitations that can act as guidelines for future research. First, we exclusively interviewed IT PMs who work in large and established German companies. Most of these individuals work in a rather traditional industry—the financial services sector—which means that our results should be viewed in consideration of their context (Davison 2014). Consequently, future studies could make our research more universally transferable and ensure greater generalizability by studying a wider array of industries (i.e., less traditional sectors), different work settings (e.g., start-ups), and countries. Second, since agile ISD emphasizes teams over individuals, it appears promising to expand the research's focus to include other stakeholders within the ISD team setting beyond the individual IT PMs. By examining the interplay of more diverse roles within an organization—for instance, using multi-level models (Benlian and Haffke 2016)—we could achieve a more complete understanding of the complex interdependencies within an agile ISD team. Identity theory continues to be a suitable lens for this research endeavor. Third, since our study focuses solely on the occurring role identity tensions, it appears promising for future research to examine the concrete coping mechanisms that IT PMs use to confront these tensions—for instance by studying role identity work processes (Caza et al. 2018) or to study how these tensions affect their work (e.g., their job satisfaction). Last, as is often the case with qualitative research, the generalizability and external validity of our results need to be confirmed in further studies, e.g., surveys or experiments.

4.7 Conclusion

Extant research has thus far neglected to examine the individual-level consequences for IT PMs in the transition from traditional to agile ISD team settings. Their previously well-established and central position within ISD teams vanishes in light of agile principles that emphasize a high

degree of self-management and shallow hierarchies. By interviewing IT PMs who have experience working in both traditional and agile ISD team settings, our study sheds light on the role identity tensions these IT PMs are facing within this agile transformation. We contribute to research on the emerging challenges of agile transformations in general and on the potential complications of agile ISD in particular. Ultimately, we hope that future research will build upon our findings and further investigate the critical yet contradictory role IT PMs continue to play in agile ISD teams.

4.8 Appendix

4.8.1 Appendix A: Details on the Interviewed IT PMs

ID	Age	Work experience	Organizational tenure	Experience with Agile	Industry
I1	45	10	8	7	Life Sciences
I2	50	29	20	7	Financial Services
I3	40	22	20	3	Financial Services
I4	45	15	10	7	Life Sciences
I5	50	30	25	5	Financial Services
I6	28	5	2	5	Life Sciences
I7	45	16	16	2	Financial Services
I8	33	5	1	5	Life Sciences
I9	33	10.5	7	7	Life Sciences
I10	28	13	7.5	5	Life Sciences
I11	30	5	4	5	Life Sciences
I12	50	25	25	2.5	Financial Services
I13	40	14	4	13	Financial Services
I14	30	5	4	2	Financial Services
I15	38	12	5	2	Financial Services
I16	40	20	20	4	Financial Services
I17	31	5.5	2	2	Financial Services
I18	43	17	15.5	4	Industrial Goods
I19	42	15	6	5	Building Services
I20	42	18	2	2	Financial Services
I21	47	24	4	4	Aviation
I22	49	24	4	6	Financial Services
I23	53	28	n.a./freelancer	5	Financial Services
I24	73	51	35	12	n.a.
I25	41	22	2	4–5	Financial Services
I26	51	>20	1	7	Financial Services

Table 4-1: Details on the interviewed IT PMs

4.8.2 Appendix B: Interview Guideline

- Can you please briefly introduce yourself and elaborate on your professional resume?
- Can you briefly tell me about your methods in classic as well as in agile project management and explain them briefly?
- What makes the special difference for you? What do you personally think of agile project management and why?
- How would you describe your role in agile software development?
- What is your scope in an agile context? What tasks does the team itself take on? What tasks do you take on as a team leader?
- How has the change altered the scope of duties?
- Can you compare the role of a project manager in traditional project management with that in agile project management?
- What is the relationship between you and the Scrum Master?
- What is the relationship between you and the Product Owner?
- What is the relationship between you and the Scrum development team?
- How does the agile team view you as the project manager of a "self-organizing team"?
- Were there any misunderstandings between the roles?
    - Can you describe them and how was that for you?
    - Discuss conflicts
- From your perspective, what were the key challenges that arose? When and where did these occur? How were these challenges resolved?
- How relevant do you see the position of a project manager in agile project management?
- Would you still like to mention and elaborate on important aspects that have fallen short in the interview so far?

Chapter 5: Contributions and Conclusion

My thesis was motivated by the increasing use of agile ISD practices in organizational IT functions. In practice, bimodal IT including a traditional and an agile IT mode is a common means of companies to meet the needs of digitalized customers and markets. In fact, the agile IT unit using agile ISD practices becomes more and more important due to increasingly technology-centric and fast-changing market conditions. However, our understanding of the implications of using agile ISD practices for the organization and the individual is still limited. In particular, examining the business decisions shaping certain bimodal IT structures as well as the consequences of the use of agile ISD practices for the people involved in agile ISD projects represent a promising opportunity to expand our body of knowledge on the implications of agile ISD practices. As such, this thesis seeks to provide a nuanced understanding of business-side triggers for and individual-level consequences of the introduction and use of agile ISD practices within IT functions. Against this backdrop, three studies have been conducted and published in renowned IS outlets. Each study contributes to answering the overarching research questions of this thesis – the first study by investigating the drivers, the second and third study by examining the implications of the use of agile ISD practices.

5.1 Contributions to Research

This thesis was guided by two overarching research questions addressing the organizational drivers and the individual consequences of the use of agile ISD practices within IT functions. In the following, the contributions of this thesis are structured along these research questions.

RQ1: How do business decisions drive and shape the transformation of corporate IT functions with bimodal IT settings?

The first study presented in this thesis (Chapter 2) makes unique contributions to IT transformation literature. It extends prior research statically describing bimodal IT archetypes (Haffke et al. 2017b; Horlach et al. 2017) by providing valuable insights on how business decisions shape the IT transformation journey when using bimodal IT. The findings from our in-depth case study show that while a divisionally separated bimodal IT function best serves a multichannel sales strategy with an optimal within-channel business-IT alignment, a single but more agile reintegrated bimodal IT organization is ideal for the development towards an omnichannel strategy with a focus on digital channels and a single database. As such, we contextualize existing research that outlines the evolution of bimodal IT archetypes along IT

transformation pathways (Haffke et al. 2017a). We offer unique insights into how developments in sales strategy continuously influence the organization of the IT and in which ways the IT function can transform itself to be more agile and, thus, able to master the emerging challenges. Hence, this thesis demonstrates the transferability of the general pathways to transforming the IT to the specific context of sales channel strategy advancements and deepens our understanding of organizational drivers shaping the use of agile ISD practices within the IT function.

RQ2: How does the use of agile ISD practices affect key roles in the context of agile ISD?

The second and third study (Chapter 3 and 4 respectively) in this thesis contribute to extant literature in the domain of agile ISD by highlighting important individual-level implications invoked by the use of agile ISD practices. Roles in ISD project settings are significantly affected by the demands placed on them by the use of agile ISD practices. Our focus on key roles that also exist in traditional ISD settings, i.e., developers and IT PMs, exhibits novel insights into processes explaining reactions and feelings of these individuals that have to deal with new and different responsibilities, tasks, and workplace characteristics when using agile ISD practices.

We extend prior research on consequences for developers working in agile ISD settings by presenting a nuanced and balanced perspective including positive as well as negative effects and extracting differences between types of agile practices. While existing academic literature emphasizes positive implications, such as job satisfaction and mitigating work exhaustion (Tripp et al. 2016; Venkatesh et al. 2020), our study does not contain this positivity bias and acknowledges the possibility of negative effects. Indeed, we uncover that despite an energizing effect of agile SD practices, the use of agile PM practices fatigues developers when workload is high. This result demonstrates not only that a balanced view is necessary when investigating agile ISD practices but also that fundamental differences exist between the types of practices (i.e., agile SD and PM practices). Previous research has considered agile ISD practices and methods as a monolithic concept, often assuming that effects apply for all practices in the same way (e.g., Venkatesh et al. 2020). However, as our results show, they have to be considered separately when investigating their implications for developers (Benlian 2022). Taken together, this thesis offers novel and important insights on the underlying mechanisms of the consequences of using agile ISD practices for developers providing a comprehensive and balanced understanding.

By uncovering role identity tensions experienced by IT PMs, we are the first to go beyond mere descriptions of the IT PM role in agile ISD settings (Gandomani et al. 2020; Shastri et al. 2021).

Our findings showcase the underlying complexity in the role of IT PMs, who act at the fringe of agile ISD projects and often have to navigate the competing demands of agile ISD teams and the surrounding organization. We identify five tensions that concern the communication and responsibility toward the top management as well as the collaboration with, control of, and duties toward the agile ISD team that can notably influence IT PMs' behavior in agile ISD settings. By systematizing these tensions that produce significant role identity conflicts for IT PMs in agile ISD settings, this thesis introduces team-adjacent roles to the conversation on implications of using agile ISD practices and provides insights on the adverse effects of employing agile ISD practices and teams in traditional organizations. As such, and together with our results regarding the consequences for developers, this thesis contributes to a more complete picture and a more comprehensive understanding of how the use of agile ISD practices affects individuals working in these settings.

5.2 Practical Implications

Beyond the outlined contributions to research, this thesis also offers insightful recommendations and guidelines for practitioners seeking to use agile ISD practices. Accordingly, practitioners may use the findings of this thesis to understand how they can benefit from using agile ISD practices within IT functions working partly or fully agile.

First, our case study on bimodal IT demonstrates how sales channel strategies influence the IT function introducing and expanding the use of agile ISD practices. Our findings suggest a divisionally divided bimodal IT function for a multichannel sales approach and a single more agile IT function for an omnichannel strategy. The detailed analysis and findings may serve as specific guidelines for decision-makers seeking to optimally support the introduction of digital sales channel strategies (Adam et al. 2022). We point out the benefits and advantages of particular bimodal IT structures for particular channel strategies, i.e., multichannel and omnichannel approaches. However, we also discuss the potential pitfalls of the interplay of a multichannel approach with divisionally separated bimodal IT and an omnichannel approach with reintegrated IT, and identify the signals for transitioning to a different bimodal IT organization. Managers can use our results as a blueprint when designing their IT transformation journey as well as for making conscious decisions concerning IS governance and control mechanisms to ensure the important alignment with (digital) sales strategies (Saunders et al. 2020). As sales is always customer-facing, companies may as a whole benefit from these guidelines to a well-supported and well-aligned sales-IT collaboration providing the best customer journey.

Second, this thesis provides impetus for all decision-makers responsible for the organizational IT who strive at getting the most out of the application of agile ISD practices. Developers and IT PMs are critical and scarce resources, and their turnover is costly. Hence, retaining these IT professionals is a key issue for organizations (Pflügler et al. 2018). While most practitioners broadly recommend the use of agile ISD methods and celebrate them as heralds of the new wonderful digital working world (e.g., Bain 2016; Ritter and Chim 2019), our findings call attention to potential individual-level downsides and urge leaders to implement agile ISD practices with caution. In particular, we found that agile PM practices – taken from Scrum which is by far the most widely used agile method (Digital.ai 2021) – can have a depleting effect on developers' inner resources resulting in fatigue and that they invoke role identity tensions within IT PMs. Both reactions may enhance turnover intentions within these professionals. In order to make agile ISD project more sustainable, we highly recommend that managers pay close attention to the number of meetings such as daily standups and retrospectives depending on the project stage and the workload because these are particularly disrupting for developers. Appropriate trainings could create awareness of the depleting effects of agile PM practices. At the same time, trainers should emphasize the energizing effects we found which are caused by increased automation and speed of development through the use of agile SD practices. Trainings could also be a good option for leaders to counteract identity tensions experienced by IT PMs and prepare them to their new role in agile ISD settings by making them aware of the implications that a self-managed agile ISD team has for their position. In addition, a proactive definition of the IT PM role differentiating its tasks and responsibilities precisely from those of PO and SM might guide IT PMs through their role transformation and prevent them from being occupied with managing identity tensions.

5.3 Limitations and Future Research

Despite providing valuable theoretical and practical contributions, the findings of this thesis should be interpreted in light of their limitations. Accordingly, three noteworthy limitations and corresponding avenues for future research are outlined next.

First, the studies that form the basis of the articles included in this thesis are subject to methodological limitations. The interview and the survey data were collected in one-time interactions. While the results of these studies make an important first step identifying and characterizing the beneficial and detrimental implications of agile ISD practices for individuals, longitudinal evidence is needed to allow for causal conclusions. Hence, future research could use diary or experience-sampling studies to account for potential and likely temporal

differences in developers' resource depletion and IT PMs' role identity development (Benlian 2022; Caza et al. 2018; Muraven and Baumeister 2000). Moreover, the participants recruited for all three studies in this thesis come from Germany and the United States, i.e., Western countries and societies, to ensure comparability of results. The specific economic conditions, environmental circumstances, attitudes, and behaviors might have caused a bias which limits the generalizability and transferability of the results. Future research could verify these by studying different cultural backgrounds.

Second, this thesis narrowed its focus on investigating the consequences of using agile ISD practices on an individual level only and with regard to different stakeholders separately. As such, the results of the studies provide rich insights into the psychological implications for developers and IT PMs working in agile ISD settings. To broaden our understanding of the implications of using agile ISD practices, we invite researchers to take these findings as a basis to conduct further research on agile ISD practices considering multiple levels of analysis or multiple stakeholders. For example, team performance when using agile ISD practices is an important and valuable team-level outcome (e.g., Kude et al. 2019) which is likely to be influenced by individual levels of fatigue and role identity tensions of the team members. Distractions and coping actions, for instance, might prevent developers and IT PMs from doing their actual work, reducing their performance. Also, comparing the consequences of the use of agile ISD practices from different stakeholder perspectives, e.g., IT PMs and customer representatives or developers and product managers, applying dyadic studies (Benlian and Haffke 2016) could by a fruitful avenue for future research. By employing multilevel models and including more agile ISD team members, we could gain a more holistic view of what promotes and what restrains well-functioning agile ISD teams.

Lastly, while our in-depth case study at DB Vertrieb provides valuable insights on the IT transformation journey using a divisionally separated bimodal IT, we take a deep dive into only one of the many pathways for IT transformation (Haffke et al. 2017a). Future research could engage in shedding light on the other ways to transform the IT function and introduce agile ISD. Thoroughly analyzing different IT transformation pathways as an important organizational-level driver for the implementation of agile ISD practices might uncover conditional factors influencing project- and individual-level outcomes. For example, deciding on the agile or traditional mode for each project individually (project-by-project bimodal IT) is likely to increase identity tensions of IT PMs because they probably need to change between modes often and the differences in their role between traditional and agile projects is easily

overseen by the top management. As such, future research could significantly deepen our understanding around the use of agile ISD practices by connecting the organizational-level drivers with the individual-level outcomes.

5.4 Conclusion

This thesis was aimed at providing a deep and nuanced understanding of the factors influencing both the organizational IT structure and the individuals working in the IT function when using agile ISD practices. The first strand of this thesis reveals that a multichannel sales strategy can benefit from a bimodal IT structure with divisionally separated traditional and agile IT functions because each channel receives the most appropriate and seamless IT support. An omnichannel sales strategy, however, is in need of a single IT function using primarily agile ISD practices to ensure flexible operations and optimal alignment within an integrated customer journey organization. These findings are important as they may well assist practitioners with overcoming the challenges of IT transformation in the context of new sales strategies. The second strand of this thesis uncovers that, first, developers in agile ISD teams can be energized but also fatigued by the demands of agile ISD practices depending on the type of practices used and the level of workload perceived. Second, we reveal that IT PMs in agile ISD settings experience role identity tensions because agile ISD practices do not explicitly envisage IT PMs so that these have to find their way between varying and, at times, contradictory expectations from top management and agile ISD team. These individual-level findings showcase the ambivalent impacts of the use of agile ISD practices and question their predominant invariably positive understanding in theory and practice. In conclusion, it is my hope that this thesis and its insightful results inspire future research to derive a clearer picture of how to implement and what to expect from the use of agile ISD practices.

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