Literature Review on Agile IT-Service Management

Seminar paper

Stamme, Felix, FH Wedel, Wedel, Germany, imca105046@fh-wedel.de

Abstract

This literature review aims to explore the current literatures state related to agile ITSM. It covers various aspects, including a definition, guiding values and principles, frameworks, maturity assessments, and implementation practices. To achieve this, it follows a systematic approach, utilizing multiple international academic libraries and specific search terms to identify relevant literature. Conference papers, journal articles, and books are included as sources of information. The findings of the review highlight that agile ITSM combines the concepts of business agility and agile software development with traditional ITSM. Agile ITSM is found to emphasize adaptability, cooperation, and continuous improvement in delivering IT services. The values and principles of agile ITSM focus on customer value, responsiveness to change, collaboration, and efficiency. The review also discusses different frameworks and standards related to agile ITSM, such as ITIL v4, Site Reliability Engineering, VeriSM, IT4IT and FitSM. Each framework offers guidance and practices to support the implementation of agile ITSM, with varying levels of comprehensiveness and focus on agility.

Keywords: IT Service Management, Agility, Literature Review

Table of Contents

1 Introduction

1.1 Brief Definition of agile IT-Service Management

Agile IT service management (ITSM) is a methodical approach which merges the concepts of business agility and agile software development with traditional ITSM (Verlaine, 2017; Mora et al., 2021). It revolves around delivering IT services with emphasis on adaptability, cooperation, and continuous improvement (England, 2017; Rohrer and Söllner, 2017; Kaiser, 2018; Andenmatten, 2022).

1.2 Relevance to the Industry

ITSM can have a significant impact on a company's competitive advantage (Shrestha *et al.*, 2019). Several studies point out that with a higher level of maturity, benefits may increase and problems may be reduced (Hochstein, Tamm and Brenner, 2005; Marrone and Kolbe, 2010; Salman *et al.*, 2017). To achieve this, ITSM must adapt to recent cultural and methodical advancements (Kaiser, 2018; Söllner and Drescher, 2019; Faustino *et al.*, 2020). Most industries have evolved from a stable environment with midterm user demands to a dynamic one with short-term demands. As a reaction to this digital disruption wave, organizations should aim to implement IT services from an agile perspective (Skog, Wimelius and Sandberg, 2018). Benefits as a higher flexibility and customer centricity appear very promising in this context (Kaiser, 2021; Mora *et al.*, 2021).

1.3 Research Objective and Research Question

Although sophisticated progress is made concerning the development of new technologies, theoretical research is less common in the field of information technology and may improve the overall level of expertise (Webster and Watson, 2002). This literature review aims to provide an overview on recent scientific and practical findings in the field of agile ITSM. The research question to be answered with this review is: "What is the current scientific literature's state of expertise regarding Agile ITSM?".

1.4 Structure of the Paper

Following the reasoning for this paper in terms of industry relevance and scientific value (1. Introduction), the underlying concepts are briefly introduced (2. Background). In the next section, the methodical approach and input data are explained (3. Literature Review). After that, the results of the review are shown. This includes defining agile ITSM, stating the principles and values, describing established frameworks, maturity assessment approaches, and briefly guiding through the implementation practices (4. Results). Finally, the results are placed into context (5. Discussion) and there is a conclusion (6. Conclusion).

2   Background

2.1   Definition of Agility

According to the Merriam Webster dictionary (2023), being agile is characterized by the ability to move with quick ease, being resourceful and adaptive. This definition can be transferred to an organization as well. An agile manifesto was written to comprehend the values and principles (Beck et al., 2001). The nature of agility is furthermore regarded as heavily influenced by the concepts of organizational flexibility and leanness and originates in software development (Schrempf & Schwaiger, 2019).

Flexibility can be seen as a precursor to agility as it resembles a planned response to anticipated uncertainties (Sharifi & Zhang, 1999; Ganguly et al., 2009; Barton & Court, 2012). Agility on the other hand can be defined as proactive, continuous, and on a strategic level, expanding the general approach of flexibility to explicitly address change and uncertainty. This is to be achieved through internal components such as appropriate processes and the relationship to the environment (Termer, 2016; van Oosterhout, 2010; Conboy, 2009).

The aim of leanness is to increase efficiency by avoiding waste and redundancy (Womack & Jones, 2003). From a literature review by Conboy (2009), the definition "contribution to perceived customer value through economy, quality and simplicity"(p. 339) was concluded. In the case of leanness, it is assumed that learning has already taken place, and therefore, there is no need for a proactive approach to development (Conboy, 2009). In the context of agility, products are created less from the perspective of standardization and the associated efficiency, and more from a customer-oriented, individually adapted point of view (Sharp, Irani & Desai, 1999). According to Ganguly et al. (2009), lean concepts alone are only a suitable choice when the customer requirements are simple, and demand is predictable.

2.2   Definition of IT-Service Management

ITSM describes the capabilities and practices that IT service providers use to define, manage, and deliver IT services (Marrone and Kolbe, 2010; Cots, Casadesus and Marimon, 2016). The core aspects of it involve effectively managing costs and risks, understanding, and fulfilling customer needs, and ensuring that services facilitate desired outcomes. ITSM includes various elements such as processes, activities, functions, roles, knowledge management, and organizational structures within the organization (Sansbury et al., 2016; Mora et al., 2021).

Effectively managing costs and risks revolves around assets and configuration items. Assets represent the financial value of hardware or software and include information about ownership, vendors, support, and warranties. IT asset management is responsible for tracking and managing these assets throughout their lifecycle. Configuration items are elements that need to be tracked based on their attributes, relationships, dependencies, and scope, ensuring their proper functioning in the company environment. In terms of identifying user requirements and making sure they facilitate desired outcomes, sub-processes to fulfil situational user requests and services tailored to the needs of particular departments lie in focus. Situational requests require the most flexibility and are often handled as so-called incidents. Users and systems can report such incidents, and they are assigned to the correct owner group for resolution. The request fulfilment is handled by IT support, often through a service desk, which serves as a single point of contact for users. The Configuration Management Database can be used to provide information for incident diagnosis. Further instances in the ITSM organization focus on identifying and resolving problems to reduce overall downtime, among other aspects (Batty et al., 2013).

ITSM is considered a recognized profession with shared standards and disciplines. Many organizations utilize specific frameworks to manage their IT-Services of which traditionally ITIL and COBIT are common (Wan and Jones, 2011). These can yield benefits as decreased costs and increased performance (Gacenga, Cater-Steel and Toleman, 2010; Marrone and Kolbe, 2011).

3   Literature Review

3.1 Methodical Approach

The review's subject is considered a rather new field due to its small quantity of explicitly fitting literature. This applies despite the possibility that there could be sufficient practical expertise which is not incorporated into scientific documentation (Webster and Watson, 2002). On one side, this review is meant to provide an overview on the existing literature and concepts. Other than that, it strives to provide insights into the neighboring concepts which have an impact on agile ITSM. Thus, this review also considers literature which covers the key concepts of business agility and IT-Service Management in general while touching on relevant aspects for agile ITSM. Those findings form the Background section and provide content for the actual literature review if fitting. Agile IT-Service Management is the key topic of this review and will be analyzed regarding its definition, guiding values and principles, frameworks, maturity assessment and implementation practices.

The general concept of how to write a literature review follows the principles stated by Webster and Watson (2002). To identify relevant literature, multiple international academic libraries have been taken into account. Specific search terms have been used for queries in those libraries. Based on the results, literature was selected to be taken into further consideration or disregarded. Afterwards, a second round of screening was conducted considering the literature's abstracts. To go into further detail, more literature was identified based on those sources by backwards- and forwards checking citations. Because information technology is not characterized by a culture of highly academical theoretical publications (Webster and Watson, 2002), books as not peer-reviewed literature, were also considered in this review. The resulting conference papers, journal articles, and books form the basis for the review.

3.2 Search Terms

The search has been conducted using one search term in the form of a boolean phrase. It aims towards finding literature focused especially on agile ITSM and literature where it is mentioned. The phrase is "agil* AND 'it service management'" and was used on the whole text. To find relevant literature on IT-Service Management with a broader scope, backwards- and forwards checking citations was done exclusively. It is assumed that literature identified in that way could provide knowledge about IT-Service Management approaches which can be considered agile, even if not explicitly labeled as such or help further understanding the concepts behind certain approaches.

3.3 Databases in use

Source	Query	Title	Abstract	Doubles removed	Forw. & backw.	Full
AISeL	159	20	12			
EBSCO (Academic Search Elite, Business Source Premier, eBook Collection, LISTA)	396	12	9			
Elsevier ScienceDirect	956	14	5			
Finna	18	5	3	78	122	65
IEEE Explore	291	8	5			
O'Reilly E-Book Library	621	29	8			
SpringerLink	814	56	30			
Springer Professional	422	36	26			

Table 1.   Overview of academical databases and number of identified literature

4   Results

4.1   Definition of agile ITSM

As already touched on in the introduction section, agile ITSM is a methodical approach which merges the concepts of business agility and agile software development with traditional ITSM. It revolves around delivering IT services with an emphasis on adaptability, cooperation, and continuous improvement (Kaiser, 2018; Söllner and Drescher, 2019; Faustino *et al.*, 2020; Mora *et al.*, 2021; Verlaine, 2017).

In an ITSM context, the concept of agility is seen as: "the continual readiness of the management of the IT operations to rapidly or inherently create change, proactively or reactively embrace change, and learn from change while contributing to perceived customer and user value (economy, quality, and simplicity), through its collective components and relationships with its environment" (Verlaine, 2017, p. 9). To manifest this agility, several values, and principles as well as practices set agile ITSM apart from regular ITSM. The values and principles can be seen as a hybrid of the agile manifesto and regular ITSM approaches (Verlaine, 2017; Mora *et al.*, 2021). Section *4.2 Guiding Values and Principles* touches on this topic in further detail.

A literature review by Verlaine (2017) provides an overview on practices which set agile ITSM apart from regular ITSM. The practices focus on empowering self-organized teams to collectively managing tasks, make decisions, and continuously improve IT services and processes. They also emphasize a positive working environment, user feedback, collaboration between business and IT, team autonomy, knowledge sharing, and the integration of operational and project teams. Agile ITSM thereby aims to replace rigid procedures with flexible, adaptive approaches. By fostering collaboration, proactive measures, and knowledge improvement, Agile ITSM aligns with values and principles that drive effective IT service management in a dynamic and customer-centric environment. Section *4.3 Frameworks and Standards* touches on this topic in further detail.

4.2   Guiding Values and Principles

Values are defined as beliefs about what is considered right and wrong as well as what is important (Oxford Dictionary, 2023a). Principles on the other hand offer more concrete guidance to behaviour as they may suggest specific actions to be taken rather than an underlying belief (Oxford Dictionary, 2023b). In the context of establishing an organizational culture which is compatible with agility, principles are typically considered as derived from values to make the resulting guidance more tangible (Hofert & Thonet, 2019).

Traditionally, ITSM is focused on the operating process of IT-infrastructure and thereby strongly aiming to achieve resource efficiency, reliability and high performance (Sansbury and Rudd, 2013; Reinehr and Malucelli, 2019). Furthermore, a service paradigm shapes the underlying values and principles of ITSM (Keel *et al.*, 2007; Pilorget and Schell, 2018). In the context of this paradigm, the value of collaboration between developing and operating staff in the IT-organization, as well as customers, becomes especially important (Pilorget and Schell, 2022). There are common guidelines to IT-Service-Management approaches which explicitly aim is to provide value to users and customers (Mora *et al.*, 2021).

The uniqueness of agility in ITSM in terms of principles and values is characterized by the fact that it addresses the ever changing business environment of ITSM proactively (Skog, Wimelius and Sandberg, 2018). The values and principles are closely linked to those of business agility and agility in software development (Verlaine, 2017; Mora *et al.*, 2021). Still, many values and principles of traditionel ITSM should be relevant in agile ITSM since the traditional focus on quality and resource efficiency serves as a large benefits from implementing ITSM (Serrano *et al.*, 2021).

Values	Source
Valuation of individuals and interactions / employee satisfaction	Verlaine, 2017; Mora *et al.*, 2021; Serrano et al., 2021
Responding to changes	Verlaine, 2017; Mora *et al.*, 2021
Good customer relations / customer satisfaction	Diao and Shwartz, 2017; Verlaine, 2017; Mora et al., 2021; Serrano et al., 2021; Andenmatten, 2022
High level of service quality	Diao and Shwartz, 2017; Verlaine, 2017; Mora et al., 2021; Serrano et al., 2021; Andenmatten, 2022
High resource efficiency	Diao and Shwartz, 2017; Serrano et al., 2021; Andenmatten, 2022

Table 3.   Values of agile ITSM

Principles	Source
Customer value is provided as a primary measure of success	Verlaine, 2017; Mora *et al.*, 2021; Andenmatten, 2022
Recognize and alleviate pain of customers	Diao and Shwartz, 2017
Deliver frequently useful and warranted IT services	Mora *et al.*, 2021
Generate tangible improvements	Serrano et al., 2021
Do not waste time or other resources / maximize the amount of work not necessary	Diao and Shwartz, 2017; Mora *et al.*, 2021; Serrano et al., 2021; Andenmatten, 2022
Aim towards simplicity with technical excellence	Verlaine, 2017; Mora *et al.*, 2021
Do not advocate a specific technology for the sake of it	Diao and Shwartz, 2017
Maintain a sophisticated information management	Serrano et al., 2021
Aim to understand the motivation of others and not fall victim	Diao and Shwartz, 2017
Address fear and reluctance	Diao and Shwartz, 2017
Embrace changes	Verlaine, 2017; Mora *et al.*, 2021
Business and technical people work together daily	Verlaine, 2017; Mora *et al.*, 2021
Maintain an adequate work environment	Verlaine, 2017; Mora *et al.*, 2021; Serrano et al., 2021
Have face-to-face conversations within teams	Verlaine, 2017; Mora *et al.*, 2021
Keep work pace sustainable	Verlaine, 2017; Mora *et al.*, 2021
Implement break-times for reflection	Verlaine, 2017; Mora *et al.*, 2021
Maintain self-organized team	Verlaine, 2017; Mora *et al.*, 2021

Table 4.   Principles of agile ITSM

4.3   Frameworks and Standards

All frameworks share the aim to aid the customer and users in the context of agile ITSM. However, there is a differentiation concerning how comprehensive they are. Some may provide guidance in the form of a holistic ITSM approach while others only apply to a specific section of ITSM. There are also frameworks which suggest more specific processes and actions to be taken while others provide a broader line of orientation which requires more individual processes. Furthermore, some have a stronger focus on agility then others. Those with a stronger focus on agile practices appear more feasible (Mora *et al.*, 2021). The following table displays the most common frameworks.

Frame-work	Source	Scope	Description
ITIL v4	Kaiser, 2021; Mora et al., 2021	Comprehensive ITSM framework	Service value system to ensure a flexible, coordinated, integrated, and effective approach towards IT governance and management.
SRE	Beyer et al., 2016; Beyer et al., 2018	Comprehensive ITSM framework	Integration of development and operation to ensure the reliable and efficient functioning of services.
VeriSM	England, 2017; Mora et al., 2021	Framework for the whole IT organization	Value-driven, evolving, responsive, and integrated approach, not only for the IT domain.
IT4IT	Andenmatten, 2022	IT-value chain reference architecture	Reference architecture to manage the entire IT value chain, enabling effective ITSM.
FitSM	Rohrer and Söllner, 2017; Mora et al., 2021	Broad guiding criteria for ITSM	Lightweight standard without an exhaustive incorporation of the agile approach. It can be complemented with agile ITSM processes.
Scrum	Shalaby and El-Kassas, 2011	For selected domains of ITSM	Common framework for agile software development, possible to be used in the support domain.
DevOps	Faustino et al., 2020; Kuruba, 2020	For selected domains of ITSM	Common framework for combining development and operations in specific sections of ITSM.

Table 5.   Frameworks for agile ITSM

4.3.1 ITIL v4

ITIL v4 is a flexible framework, designed to co-create value with the service consumer. It aims to leverage technology, embrace digital transformation, and drive business strategy, surpassing the capabilities of its predecessors which mainly provided guidance for traditional service management activities such as incident management (Kaiser, 2021; Mora et al., 2021; Axelos, 2023). Some of the core benefits intended to be achieved with ITIL 4 are to be able to work with complex systems and processes, promote holistic and collaborative approaches, build stakeholder relationships, and empower professionals to understand the impact of IT on strategy (Axelos, 2023).

ITIL v4 consists of 4 core components including the service value chain, practices, guiding principles, governance, and continual improvement (Kaiser, 2021; Mora et al., 2021). The service value chain and the linked service value system are new concepts which replace the traditional service lifecycle to encompass planning, acting, vetting, and corrective actions. As an addition, so called practices extend the processes, bringing together several entities and capabilities to achieve set objectives, promote collaboration and support efficient value delivery (Kaiser, 2021). The principles aim to guide organizational decision-making and behaviour. Governance refers to the top-level policy and regulation body. At last, the continual improvement model is required to keep up the performance in all organizational areas and is compatible with the version from ITIL 3. Organizations are responsible for defining their practices by themselves based on the suggestions proposed in the service management model. These constructs of practices and activities are called value streams and can be organized as disciplined, agile, or hybrid, based on organizational decision (Mora et al., 2021).

4.3.2 Site Reliability Engineering (SRE)

SRE was developed by Google as an internal approach to service management. This was done because traditional ITSM approaches used to rely on a clear separation of organizational functions from software development and IT operations. The framework can be seen as an implementation of the DevOps approach (Beyer et al., 2016; Kuruba, 2020). It aims to ensure the reliability and performance of software systems by combining software engineering and operational practices to create scalable and resilient systems. It focuses on creating robust systems that can handle high traffic and user demands by utilizing automation, monitoring, and proactive incident management. This is meant to address issues before they affect users (Beloki, 2022)

SRE operates on the foundation of seven key principles. First, it acknowledges that operations can be approached as a software issue, employing software development techniques to optimize IT operations. Second, it recommends setting realistic Service Level Objectives (SLOs) for service management rather than striving for 100% availability. Third, it emphasizes the reduction of manual toil by automating repetitive tasks within IT operations. Fourth, the objective is to automate 50% of operational work to minimize reliance on manual efforts. Fifth, SRE prioritizes the reduction of Mean Time To Repair (MTTR) to swiftly address failures. Sixth, it advocates for shared ownership between software developers and IT operations, with joint responsibility for the service's technology stack. Finally, it promotes the use of consistent tooling across software development and IT operations, regardless of specific roles or job titles involved (Beyer *et al.*, 2018).

4.3.3 VeriSM

VeriSM is a service management approach that builds on the realization that traditional IT service management frameworks are not flexible enough to meet the demands of the digital age. It provides guidance for the entire IT organization and focuses on delivering high quality products and services which deliver value to the customer (Mora et al., 2021).

To do so, it encourages the adoption of an integrated approach to service management that leverages the strengths of different practices, such as Agile, DevOps, Lean, and ITIL. The framework also defines several service management components, such as service culture, organizational governance, service portfolio management, service operations, and service design and how to approach them. It is based on a service management operating model that includes consumers, governance, service management principles, and the management mesh. Governance provides the background system for controlling and regulating organizational activities, while management provides the foreground system for managing activities within the boundaries set by governance. Service management principles define how the organization wants to operate and help determine the specific best practices to include in the management mesh. The management mesh is a flexible structure that includes organizational resources, management practices, technologies, and environmental conditions to enable a flexible and agile service management approach. It defines four functional areas/stages for developing and delivering products and services which are "Define", "Produce", "Provide", and "Respond", each with specific high-level activities (England, 2017).

4.3.4 IT4IT

The reference architecture IT4IT represents the entire value chain process of an IT organization in an integrated model (The Open Group, 2016; Akershoek et al., 2016). The model is based on Michael Porter's value chain concept (Porter, 1985). It is independent from process models and enables the integration of processes from established frameworks such as ITIL or COBIT. It allows enabling an integrated view of the value chain process, increasing efficiency, and supporting agility. By standardizing data structures and interfaces, IT organizations can accelerate the value flow and ensure higher transparency and quality (Andenmatten, 2022).

The IT4IT standard defines five primary capabilities being Strategy to Portfolio, Requirement to Deploy, Request to Fulfil, Detect to Correct, and supporting capabilities. Those consist of seven primary value streams. The value streams focus on evaluating and optimizing the digital product portfolio, exploring new features and directions, integrating product releases, releasing services, deploying product releases, fulfilling service offers, and operating product instances. Each value stream has specific objectives, such as assessing the effectiveness of digital products, driving innovation, creating new versions, offering products as services, deploying, and managing releases, fulfilling customer demand, and ensuring the continuous operation of deployed instances. The reference architecture consists of four pillars: Information Model, Function Model, Integration Model, and Service Model. The Information Model encompasses a data model with all relevant data objects, attributes, and relationships. The Function Model establishes the central tasks and tools for data management and automation. The Integration Model links processes, data, and tools, while the Service Model forms the backbone of the value chain model and is based on the Service Lifecycle (Andenmatten, 2022).

4.3.5 FitSM

FitSM is considered a lightweight ITSM framework, consisting of only four core documents with 38 pages. It aims to be clear, pragmatic, lightweight, and achievable. The core components cover an overview, requirements, objectives and activities, and a model for roles. They are complemented by templates, implementation guides, and a maturity assessment tool (Söllner and Drescher, 2019). FitSM is seen as a promising alternative to complex frameworks and can thus be especially useful for small and medium enterprises (Rohrer and Söllner, 2017). However, the concept of agility is not explicitly mentioned in the core documents and the framework is not sufficiently qualified as a stand-alone agile ITSM framework based on its features (Mora et al., 2021).

In utilizing it, the focus lies on achieving compliance with certain requirements. The 85 requirements are divided into general and process-oriented requirements. The 16 general requirements include top management commitment, planning, monitoring, improvement, documentation, and further aspects. The 69 process requirements revolve around service portfolio management, incident management, change management, release management, and others (FitSM, 2016a, 2016b). Activities to comply with the requirements include assessing the maturity level of the Service Management System, defining target maturity levels, identifying discrepancies, and creating a Service Management Plan (FitSM, 2016c). Also, there are roles for each process, being Service Management System Owner, Service Management System Manager, Service Owner, Process Owner, Process Manager, Case Manager, and Process Staff members (FitSM, 2016d). While Service Management System related roles have an overall perspective, the Case Manager is accountable for advancing the processing of cases within the relevant process, and the Process Owner and Process Manager hold overall responsibility for a specific process and its efficient implementation. The Process Staff members carry out the prescribed activities and provide updates to the Case Manager or the Process Manager (Söllner and Drescher, 2019).

4.3.6 Scrum

Scrum is a lightweight framework that helps generate value through adaptive solutions for complex problems (Schwaber and Sutherland, 2020) and is used in software development. However, it can also be applied in the IT service support domain. This domain includes disciplines such as configuration management, problem management, incident management, change management, service/help desk, and release management. Many tasks in these domains are comparable to small software projects. Using Scrum here is especially reasonable due to its ability to cope with fast-changing, highly volatile, and time-pressured environments. These challenges are also a common in the support domain of IT service management and could lead to staff demotivation, high knowledge transfer time, high mean time to repair, and underutilized staff resulting in increasing backlog if not addressed adequately (Shalaby and El-Kassas, 2011).

The Scrum framework is utilizing an iterative, incremental approach which optimizes predictability and controls risk. It also allows engaging cross-functional teams. To do so, it involves a Product Owner creating a Product Backlog, a Scrum Team building an Increment of value during a Sprint, inspecting, and adjusting the results, and repeating the process (Schwaber and Sutherland, 2020). In the context of the support domain in IT service management, it is suggested to form a Scrum team with members from different support levels to increase the team's velocity in supporting a specific system, software or domain. This formation allows for high pace knowledge sharing during daily work, eliminating the need for separate knowledge transfer sessions. The cross-functionality of team members with different knowledge backgrounds and levels is emphasized, and daily stand-up meetings facilitate coherence within the organization (Shalaby and El-Kassas, 2011).

4.3.7 DevOps

DevOps practices can be used in synergy with common IT Service Management processes. This aims to support shorter lead times and higher deployment frequencies as well as full automation. It can help solving many problems associated with the configuration and release management processes (Kim et al., 2016). DevOps analytics also provide valuable insights about operations, application and security based on data from different layers of the software stack. These insights enable faster incident resolution, better understanding of release stability and quality, identification of application vulnerabilities, and lead to cost savings (Kuruba, 2020).

However, there are multiple definitions of DevOps, leading to confusion for organizations trying to implement it. DevOps comprises ten practices, with six being specific to the software life cycle, and four being common to all practices. The six specific practices are continuous planning, build and integration, testing, deployment, monitoring, and feedback. The four common practices include automation, collaboration, infrastructure and environment provisioning, and metrics. Continuous planning involves dividing the work into smaller parts and prioritizing them. Continuous build and integration automate the building and integration of code changes. Test automation enables automatic testing by developers, and continuous deployment deploys code that has passed testing to the next stage. Continuous monitoring and feedback identify and resolve issues with the application and underlying infrastructure. Two key indicators of DevOps success are agility, measured by the frequency of changes or releases in production, and reliability and availability, measured by the number of incidents raised after these changes or releases (Kuruba, 2020).

4.4 Maturity Assessment

When evaluating the maturity of an organization, its development is often simplified and divided into a small number of maturity levels. Each level has specific criteria that the organization must fulfil to progress to the next level. The levels are organized in a sequential manner, starting from an initial level, and moving towards a final level that signifies the highest level of achievement or excellence (Klimko, 2001; Weerdmeester et al., 2003).

According to Flores, Rusu and Johannesson (2011), maturity models in the context of ITSM are often based on the Capability Maturity Model Integration (CMM, 1994; Paulk et al., 1995). These models define groups of activities known as Key Process Areas to achieve goals at each maturity level. Several models have been developed specifically for ITSM, including Capability Maturity Model Integration for Service (SEI, 2009), Control Objects for Information and related Technology (ITGI, 2005), IT Service Capability Maturity Model (Niessink & Van, 2004) and the ITIL Service Management Process Maturity Framework (Axelos, 2007). Other frameworks than ITIL also offer criteria which may be used to assess the maturity of an organization utilizing it (FitSM, 2016b, 2016e; England, 2017).

The applicability of the Process Maturity Framework of ITIL has already been demonstrated in a lean and agile context (Obwegeser, T. Nielsen and M. Spandet, 2019). Utilizing it, the maturity is assessed based on five distinct ITIL specific dimensions and corresponding maturity levels (Sansbury and Rudd, 2013; Oehrlich *et al.*, 2010). First, the vision and steering dimension considers the overall direction of the IT infrastructure and operations department within the business, along with the objectives and goals that aim to achieve that vision. Second, the process dimension focuses on the specific procedures required to accomplish the set goals and objectives, involving a standardized set of activities. Third, the people dimension emphasizes the necessary skills and abilities of individuals involved in carrying out the processes. Fourth, the technology dimension addresses the supporting IT management tools and infrastructure essential for executing the processes effectively. Fifth, the culture dimension considers the required behaviour and attitude in relation to the role of IT infrastructure and operations within the broader business context (Oehrlich *et al.*, 2010). Furthermore, the adherence to agile values and principles is considered a relevant criteria to assess (Mora *et al.*, 2021). The maturity levels could be initial, repeatable, defined, managed, and optimized (Obwegeser, T. Nielsen and M. Spandet, 2019).

4.5   Implementation Practices

The implementation of an ITSM framework heavily relies on understanding the unique characteristics of the organization. Factors such as the company's organizational culture, hierarchical structure, and overall objectives must be considered before defining the framework (Pilorget and Schell, 2022). Social and technological demands can increase the complexity of an ITSM implementation. Typical social challenges could be related to the skill, sponsor interest or ability to change within the company. Typical technological challenges evolve around processual and architectural integration. It is therefore recommended to utilize an agile approach in the process of introducing ITSM already (Pröhl and Zarnekow, 2022). Conducting the self-assessment in an agile way is especially recommended for smaller enterprises to save resources (Cronholm, 2013). Serrano et al. (2011) mention several practices which are to be considered in implementing ITSM.

Principles	Source
Commitment from all levels of management	Hochstein, Tamm and Brenner, 2005; Cater-Steel, Toleman and Tan, 2006; Keel *et al.*, 2007; Tan, Cater-Steel and Toleman, 2009
IT and business processes must be aligned	Lucio Nieto *et al.*, 2012; Melendez, Dávila and Pessoa, 2015; Winkler and Wulf, 2020;
Follow-up and assessment	Hochstein, Tamm and Brenner, 2005; Lucio Nieto *et al.*, 2012; Shrestha *et al.*, 2019
Quick wins	Hochstein, Tamm and Brenner, 2005; Cater-Steel, Toleman and Tan, 2006
Training	Hochstein, Tamm and Brenner, 2005; Melendez, Dávila and Pessoa, 2015;

Table 6.   Implementation practices for agile ITSM

5 Discussion

5.1 Results in the Frame of Reference

Based on the literature found, the field of agile ITSM appears to be rather young and lacking practical, detailed, and intuitive guidelines. Multiple values and principles are said to distinguish agile ITSM from conventional ITSM and there are some guiding frameworks (Verlaine, 2017; Mora et al., 2021). However, these provide rather broad guidance to allow being adaptable (England, 2017; Kaiser, 2021) and one framework even explicitly presents itself as a light-weight framework (FitSM, 2016b; Rohrer and Söllner, 2017). To add to this, these frameworks are theoretical constructs and documentations of their utilization are rare. Most assessments focus on conventional ITSM, such as ITIL V3 (Gacenga, Cater-Steel and Toleman, 2010; Marrone and Kolbe, 2010). This also applies to validating the benefits of agile ITSM, as highlighted by Kaiser (2018) and Andenmatten (2022).

Looking at non-scientific literature or even videos on YouTube, a different picture is painted. One could view a video of an IBM employee explaining his view on Site Reliability Engineering with multiple comments of other users confirming the content (IBM Technology, 2021). Even though there may be fewer controlling instances for such publications, the choice of literature for this review can be questioned as it may have covered more practical experience.

5.2 Practical Implications

Due to the lack of established best practices for implementing specific agile ITSM frameworks, companies might find themselves grappling with various challenges on their own. Thus, there is a certain risk for companies to implement agile ITSM. Fortunately, some established concepts from other domains, such as software development, can be adapted. For these, much guidance is available (Shalaby and El-Kassas, 2011; Kuruba, 2020). If no scientific literature can be found, it could also be reasonable to stick to non-scientific publications from trustworthy sources as the guide for agile ITSM by Groll (2021).

Other than just suggesting new processual and organizational frameworks, agile ITSM is also said to bring a need for a special culture with it. This is seen in the importance of values and principles (Verlaine, 2017; Mora *et al.*, 2021). It is enhanced by the fact that multiple frameworks focus on broad guidance, allowing the organization to flexibly structure processes according to their own perception of their needs (Rohrer and Söllner, 2017; Kaiser, 2021). Experts in the field of organizational development should be consulted to avoid pitfalls related to an inappropriate corporate culture.

5.3 Future Research

An approach for future research focuses on assessing the gathered information in a practical manner. Furthermore, there are theoretical approaches which include deriving practical oriented concepts from the gathered information. The following list contains concrete approaches for further research.

1. Conducting a practical assessment of specific frameworks with a detailed and long-term perspective would be valuable. It may allow ranking them based on their suitability for different companies. Short-term factors as efficiency, customer-, and employee satisfaction should be considered, along with the long-term effects on digitalization and innovation capabilities.

2. Practical guidelines for the implementation of a culture that is compatible with agile ITSM would be particularly valuable. Conducting a literature review seems to be a suitable approach to gather relevant information on this topic.

3. To further assist companies in successfully adopting an ITSM framework, it would be beneficial to document the implementation process within a model organization. This documentation should include the encountered challenges, factors contributing to success, and valuable lessons learned throughout the implementation journey.

5.4 Limitations

As there is not yet a high quantity of scientific literature concerning agile ITSM, the results in this review are less differentiated. For example, some principles that are considered essential for agile ITSM were only mentioned by a small number of sources and thus carry the risk of being subject to a subjective assessment. Also, some content was taken from literature that does not focus explicitly on agile ITSM. This is mainly the case for literature on ITSM in general. For example, multiple principles for agile ITSM were taken from general literature reviews on ITSM as they are closely connected to some of the essential benefits ITSM brings to organizations.

Furthermore, this review contains a high amount of theoretical literature and a smaller number of practical assessments. This especially applies to the values, principles, frameworks, and maturity models for agile ITSM. Due to this circumstance, some problems to occur in the implementation of the described frameworks may have not been touched on.

6 Conclusion

Agile ITSM is a methodical approach that combines business agility and agile software development with traditional ITSM. It replaces rigid procedures with flexible, adaptive approaches and focuses on user satisfaction and qualitative evaluations. It promotes collaboration, proactive measures, and knowledge improvement to align with the values and principles that drive effective IT service management in a dynamic and customer-centric environment (Kaiser, 2018; Söllner and Drescher, 2019; Faustino et al., 2020; Mora et al., 2021; Verlaine, 2017).

The guiding values and principles of agile ITSM are a hybrid of the agile manifesto and traditional ITSM approaches (Verlaine, 2017; Mora *et al.*, 2021). These values include the valuation of individuals and interactions, responding to changes, good customer relations, high service quality, and high resource efficiency. The principles of agile ITSM include providing customer value as a primary measure of success, recognizing and alleviating customer pain, delivering frequent useful IT services, generating tangible benefits, and aiming towards simplicity with technical excellence (Diao and Shwartz, 2017; Verlaine, 2017; Mora *et al.*, 2021; Serrano *et al.*, 2021; Andenmatten, 2022).

Several frameworks and standards are available to support the implementation of agile ITSM. ITIL v4 is a comprehensive framework that aims to co-create value with the service consumer and leverage technology and digital transformation (Kaiser, 2021). Site Reliability Engineering focuses on ensuring the reliability and performance of software systems through a combination of software engineering and operational practices (Beyer *et al.*, 2018). VeriSM provides guidance for the entire organization and promotes an integrated approach to service management (England, 2017). IT4IT offers a reference architecture that integrates processes from established frameworks and enables an integrated view of the IT organization's value chain (Andenmatten, 2022). Other frameworks cover specific parts of ITSM or provide broad guidelines (Shalaby and El-Kassas, 2011; FitSM, 2016b; Faustino *et al.*, 2020).

Implementing an ITSM framework requires understanding the organization's characteristics, such as its culture, structure, and objectives. Social and technological challenges, as skill gaps and process integration, should be addressed (Cronholm, 2013; Pilorget and Schell, 2022; Pröhl and Zarnekow, 2022). Various models, including the ITIL Service Management Process Maturity Framework (Axelos, 2007), Control Objects for Information and related Technology (ITGI, 2005), and IT Service Capability Maturity Model (Niessink & Van, 2004), are used to assess ITSM maturity. The Process Maturity Framework of ITIL, which considers dimensions like vision and steering, process, people, technology, and culture, has already been applied in agile contexts (Obwegeser, T. Nielsen and M. Spandet, 2019).

References

Andenmatten, M. (2022). IT4ITTM – das agile Betriebskonzept der IT der digitalen Zukunft. In H.-P. Fröschle, R. Oestereich, and N. Schmidt (eds), *IT-Operations in der Transformation* (pp. 259–276). Wiesbaden: Springer.

Akershoek et al. (2016). *IT4IT™ for managing the business of IT – a management* guide. Zaltbommel: Van Haaren.

Axelos (2007*). ITIL Service Design - German Translation: Office of Government Commerce*, Eastbourne: Gardners

Axelos (2023). *What is ITIL?*. Available at: https://www.axelos.com/certifications/itil-service-management/what-is-itil/ (visited on 16/04/2023).

Batty, B. *et al.* (2013). *IT service management best practices: using IBM SmartCloud control desk*. IBM Corporation International Technical Support Organization (IBM redbooks).

Beck K, Beedle M, Bennekum AV, Cockburn A, Cunningham W, Fowler M, Grenning J, Highsmith J, Hunt A, Jeffries R, et al. (2001). *Manifesto for Agile Software Development*. Available at http://www.agilemanifesto.org/.

Beloki, U. H. (2022). The Foundation of Site Reliability Engineering. In Beloki, U.H., *The art of Site Reliability Engineering with Azure* (pp. 1-15). Berkeley: Apress.

Beyer, B. *et al.* (2018). *The Site Reliability Workbook*. Sebastopol: O'Reilly.

Cater-Steel, A., Toleman, M. and Tan, W.-G. (2006). Transforming IT service management- The ITIL impact. *ACIS 2006 Proceedings - 17th Australasian Conference on Information Systems*.

CMM (1994). *The Capability Maturity Model, Guidelines for Improving the Software Process*. Boston: Addison-Wesley.

Cronholm, S. (2013). Towards an Agile Method for Self-Assessment - a Design Science Approach. *International Conference on Management, Leadership and Governance.*

Diao, Y. and Shwartz, L. (2017). Building Automated Data Driven Systems for IT Service Management. *Journal of Network and Systems Management*, 25(4), pp. 848–883.

England, C.A., Suzanne van Hove, Randy Steinberg &. Rob (2017). *VeriSM - A service management approach for the digital age*. Zaltbommel: Van Haren.

Faustino, J. *et al.* (2020). Agile information technology service management with DevOps: an incident management case study. *International Journal of Agile Systems and Management*, 13, p. 339.

FitSM (2016a). *FitSM-0: Overview and Vocabulary, The FitSM Standard Family: Standard for lightweight IT service management 1, version 2.0*. Available at: https://www.fitsm.eu/ downloads/.

FitSM (2016b). *FitSM-1: Requirements, The FitSM Standard Family: Standard for lightweight IT service management 1, version 2.1*. Available at: https://www.fitsm.eu/ downloads/.

FitSM (2016c). *FitSM-2: Objectives and Activities, The FitSM Standard Family: Standard for lightweight IT service management 1, version 2.2*. Available at: https://www.fitsm.eu/ downloads/.

FitSM (2016d). *FitSM-3: Role Model, The FitSM Standard Family: Standard for lightweight IT service management, version 2.3*. Available at: https://www.fitsm.eu/downloads/.

FitSM (2016e). *FitSM-6: Maturity / Capability Assessment Tool, The FitSM Standard Family: Standard for lightweight IT service management, version 2.6*. Available at: https://www.fitsm.eu/downloads/.

Flores J, Rusu L, Johannesson P. (2011). A Maturity Model of IT Service Delivery A. *Int Conf Inf ResourManag (CONF-IRM 2011)*.

Fröschle, H.-P. (2019). Rezension „IT-Service Management mit FitSM". *HMD Praxis der Wirtschaftsinformatik*, 56(2), pp. 487–488.

Gacenga, F., Cater-Steel, A. and Toleman, M. (2010). An International Analysis of IT Service Management Benefits and Performance Measurement. *Journal of Global IT Management*, 13, pp. 28–63.

Groll, J. (2021). *The Agile Service Management Guide*. Avaliable at: https://www.devopsinstitute.com/wp-content/uploads/2023/03/the-agile-service-management-guide.pdf (visited on 01/06/2023).

Hochstein, A., Tamm, G. and Brenner, W. (2005). Service-Oriented IT Management: Benefit, Cost and Success Factors. *Proceedings of the 13th European Conference on Information Systems, Information Systems in a Rapidly Changing Economy, ECIS 2005*.

Hofert, S. & Thonet, C. (2019). *Der agile Kulturwandel*. Wiesbaden: Springer.

IBM Technology (2021). *What is Site Reliability Engineering (SRE)?*. Available at: https://www.youtube.com/watch?v=ztIIcXNzMN4 (visited on 31/05/2023).

ITGI (2005). *COBIT 4.1*. Available at: http://www.itgi.org/cobit (visited on 31/05/2023).

Kaiser, A.K. (2018). *Reinventing ITIL® in the Age of DevOps: Innovative Techniques to Make Processes Agile and Relevant*. Berkeley: Apress.

Kaiser, A.K. (2021). Introduction to the New ITIL. In Kaiser, A. K., *Become ITIL® 4 Foundation Certified in 7 Days* (pp. 3-19). Berkeley: Apress.

Keel, A. *et al.* (2007). From a technology-oriented to a service-oriented approach to IT management. *IBM Systems Journal*, 46, pp. 549–564.

Kim, G. *et al.* (2016). *The DevOps Handbook*. Portland: IT Revolution Press.

Klimko, G. (2001). Knowledge management and maturity models: Building common understanding. *Proc. of the 2nd European conference on Knowledge Management.*

Kuruba, M. (2020). DevOps for IT Service Reliability and Availability. In D.R. Karanki, G. Vinod, and S. Ajit (eds), *Advances in RAMS Engineering* (pp. 149–183). Cham: Springer International

Marrone, M. and Kolbe, L. (2010). ITIL and the Creation of Benefits: An Empirical Study on Benefits, Challenges and Processes. *18th European Conference on Information Systems, ECIS 2010*.

Marrone, M. and Kolbe, L. (2011). Uncovering ITIL claims: IT executives perception on benefits and Business-IT alignment. *Information Systems and e-Business Management*, 9, pp. 363–380.

Melendez, K., Dávila, A. and Pessoa, M. (2015). Information Technology Services Management Models Applied to Medium and Small Organizations: A Systematic Literature Review. *Computer Standards & Interfaces*, 47. pp 121-126.

Mora, M. *et al.* (2021). Agile IT Service Management Frameworks and Standards: A Review. In H.R. Arabnia et al. (eds), *Advances in Software Engineering, Education, and e-Learning* (pp. 921–936). Cham: Springer International

Niessink Cl., & Van Vl., (2004). *The IT Service Capability Maturity Model*.

Obwegeser, N., T. Nielsen, D. and M. Spandet, N. (2019). Continual Process Improvement for ITIL Service Operations: A Lean Perspective. *Information Systems Management*, 36(2), pp. 141–167.

Oehrlich, E. *et al.* (2010). Introducing the forrester IT service management maturity assessment model.

Paulk M. C., Weber Ch. V., & Curtis B., (1995). The Capability Maturity Model: Guidelines for Improving the Software Process. Boston: Addison Wesley.

Pilorget, L. and Schell, T. (2018). *IT Management: The art of managing IT based on a solid framework leveraging the company ́s political ecosystem*. Wiesbaden: Springer.

Pilorget, L. and Schell, T. (2022). IT-Dienste. In Pilorget, L. and Schell, T., *IT-Management* (pp. 79–103). Wiesbaden: Springer.

Porter M (1985). *Competitive advantage: creating and sustaining superior performance*. New York: Free Press.

Pröhl, T. and Zarnekow, R. (2022). Agilität bei der Einführung von IT-Servicemanagement: Lösung klassischer Herausforderungen mit agilen Methoden. In H.-P. Fröschle, R. Oestereich, and N. Schmidt (eds), *IT-Operations in der Transformation* (pp. 245–258). Wiesbaden: Springer.

Reinehr, S. and Malucelli, A. (2019). Maturity in IT Service Management: A Longitudinal Study'. In A. Walker, R.V. O'Connor, and R. Messnarz (eds), *Systems, Software and Services Process Improvement* (pp. 99–110). Cham: Springer International.

Rohrer, A. and Söllner, D. (2017). *IT-Service-Management mit FitSM: ein praxisorientiertes und leichtgewichtiges Framework für die IT*. Heidelberg: dpunkt.verlag.

Salman, R. *et al.* (2017). Exploring capability maturity models and relevant practices as solutions addressing information technology service offshoring project issues. *International Journal of Management Science and Engineering*, 13, pp. 1–11.

Sansbury, J. *et al.* (2016). *IT Service Management, 3rd Edition*. Sebastopol: O'Reilly.

Sansbury, J. and Rudd, C. (2013). *ITIL maturity model and self-assessment service: User guide*. Sebastopol: O'Reilly.

Schwaber, K. and Sutherland, J. (2020). *The Scrum Guide*. Available at: https://www.scrum.org/re-sources/scrum-guide (visited on 16/04/2023).

SEI (2009). CMMI for Service, Version 1.2. Software Engineering Institute. *TECHNICAL REPORT CMU/SEI-2009-TR-001*.

Serrano, J. *et al.* (2021). An IT Service Management Literature Review: Challenges, Benefits, Opportunities and Implementation Practices. *Information*, 12(3), pp. 111-134.

Shalaby, M. and El-Kassas, S. (2011). Applying Scrum Framework in the IT Service Support Domain. *2011 IEEE Asia-Pacific Services Computing Conference*. *2011 IEEE Asia-Pacific Services Computing Conference*.

Sharp, J. M., Irani, Z., & Desai, S. (1999). Working towards agile manufacturing in the UK industry. *International Journal of production economics*, 62(1-2), 155-169.

Shrestha, A. *et al.* (2019). Development and Evaluation of a Software-mediated Process Assessment Method for IT Service Management. *Information & Management*, 57, p. 1-17.

Skog, D., Wimelius, H. and Sandberg, J. (2018). Digital Disruption, *Business & Information Systems Engineering*, 60. pp. 431-437.

Söllner, D. and Drescher, M. (2019). Service Management in der Ära von Agile und DevOps: Ist Service Management noch relevant, wenn die aktuelle Entwicklung in Geschäftsprozessen und -planung auf ständiger Veränderung und Anpassung basiert?. *HMD Praxis der Wirtschaftsinformatik*, 56(2), pp. 318–331.

Tan, W.-G., Cater-Steel, A. and Toleman, M. (2009). Implementing it service management: A case study focussing on critical success factors, *Journal of Computer Information Systems*, 50, pp. 1-12.

The Open Group (2016). *The IT4IT™ reference architecture*, Version 2.0. Avaliable at: https://pubs.opengroup.org/it4it/refarch20/ (visited on 16/04/2023).

Verlaine, B. (2017) Toward an Agile IT Service Management Framework, *Service Science*, 9, pp. 263–274.

Wan, J. and Jones, J. (2011). Managing IT service management implementation complexity: From the perspective of the Warfield Version of systems science. *Enterprise Information Systems - ENTERP INF SYST*, 7, pp. 1–33.

Webster, J. and Watson, R. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), pp. xiii–xxiii.

Weerdmeester R., Pocaterra C., & Mefke M., (2003).VISION Next Generation Knowledge Management. *Information Societies Technology (IST) Programme*.

Winkler, T.J. and Wulf, J. (2020). Effectiveness of IT Service Management Capability: Value Co-Creation and Value Facilitation Mechanisms. *Journal of Management Information Systems*. 37(2), pp. 639–675.

Womack, James & Jones, Daniel. (1996). *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*. New York: Simon & Schuster.