# Agile IT Service Management Frameworks and Standards: A Review


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## 1 Introduction

In the last two decades, several IT service management (ITSM) frameworks and standards to manage the planning, design, deployment, operation, and improvement of IT services have been used by business organizations [1]. The main ITSM frameworks and standards reported in the literature are ITIL v2011 [2], CMMI-SVC v1.3 [3] (Software Engineering Institute, 2010), and the ISO/IEC 20000 [4, 5].

The utilization of these ITSM frameworks and standards have produced relevant benefits to business organizations such as IT service quality improvement, IT service management cost reduction, and IT service user satisfaction increment [6]. However, their implementation demands also significant organizational resources (economic, human, and technological ones) and efforts (large implementation periods), which limits their successful utilization to very large-sized and large-sized business organizations [7]. For the case of medium-sized and small-sized organizations, the utilization of these ITSM frameworks and standards is not technically economically affordable [8–10]. Additionally, in the last decade, the

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business environment has changed from stable and midterm user demands to dynamic and short-term ones, pushing business organizations to implement IT services from an agile perspective for supporting the digital disruption wave [11]. In the domain of software engineering [12], this agile perspective was proposed two decades ago [13], and it has strongly permeated most business organizations. Now, agile practices such as Scrum and XP are widely used [14]. In contrast, in the ITSM domain, the agile ITSM frameworks and standards have recently emerged [15, 16] and their empirical positive impacts and their implementation barriers are still unknown given the null or minimal empirical reported evidence in the literature. Consequently, ITSM practitioners and academics lack informative references on the applicability, benefits, and limitations of using agile ITSM frameworks and standards.

In this research, thus, we reviewed the main emergent ITSM frameworks and standards that are proffered as agile, from a conceptual-nonempirical-research approach. The four proffered agile ITSM frameworks and standards analyzed were ITIL v4 [17], VerisM [18], FitSM [19–21], and the ISO/IEC 20000–1:2018 [22]. The conceptual review approach was focused on the inclusion and adherence from these ITSM frameworks and standards to an agile aim, the agile values, the agile principles, and the agile practices proposed in two recent agile ITSM studies [15, 16]. Our research aim is to assess the extent of agility of these emergent proffered agile ITSM frameworks and standards regarding an agile ITSM scheme.

The remainder of this paper continues as follows. In Sect. 2, the background on ITSM, agile approach, and the agile ITSM scheme was reported. In Sect. 3, the review of the main four proffered agile ITSM frameworks and standards is presented. Finally, in Sect. 4, a discussion of the implications and conclusions of this research is reported.

## 2 Background on ITSM and Agile ITSM Tenets

This section reviews the background on ITSM and ITSM agile tenets.

### *2.1 ITSM Background*

The IT management domain has adopted the service paradigm [23–25] from the industrial engineering [26] and the marketing [27] domains. IT service management (ITSM) was focused initially on IT operation processes (i.e., IT service support and IT service delivery processes) [23], but it evolved toward the full IT management area [24, 25]. Dedicated books on modern IT management topics [24, 25] account for the adoption of a service paradigm, as well as the emergence of specific IT service management frameworks such as ITIL v2011 [2], CMMI-SVC v1.3 [3], and ISO/IEC 20000 [4, 5].

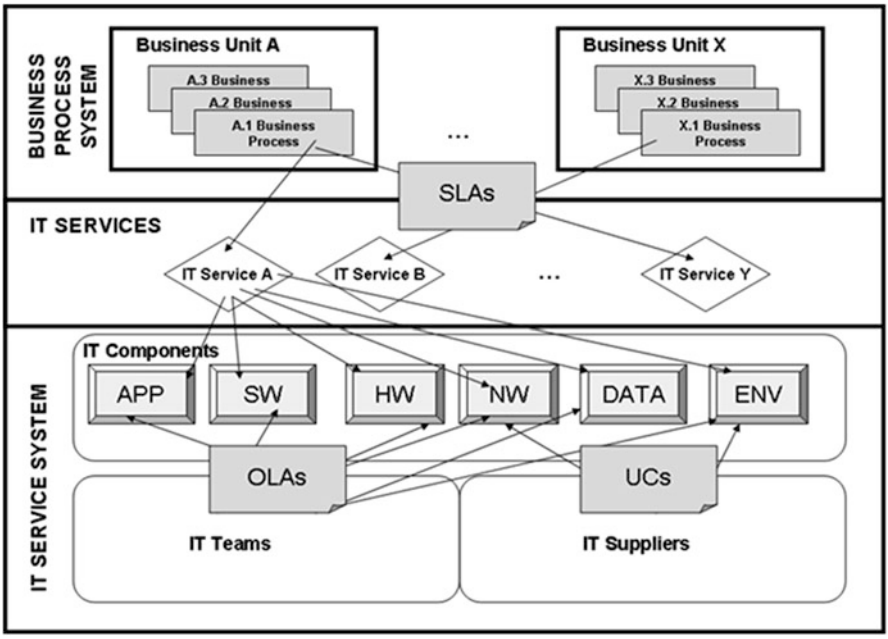


**Fig. 1** The IT service system and IT service concept

Service management, in the ITSM domain, refers to the organizational capabilities used and applied to provide value to customers through the delivery of services [2]. Services are "means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks" [2; p. 5]. ITSM is defined as "the implementation and management of quality IT services that meet the needs of the business" [2; p. 7].

An IT service is a service made up of IT, people, and processes; it is delivered by an IT service provider and consumed by an IT service customer. Both the IT service provider and customer form an IT service system. Thus, ITSM provides IT services "through an appropriate mix of people, process, and information technology" [2; p. 7]. Figure 1 portrays the concepts of IT services and the IT service system.

Value is realized in the IT service delivery when the IT service impacts on the utility (fit for purpose) and warranty (fit for use) on the customer business process supported by the IT service are achieved. The utility of an IT service corresponds to what the service does, its warranty, and how well it is delivered [2]. The utility of an IT service is achieved when occurs a performance improvement and/or a reduction of constraints on a customer's business process using the IT service. Warranty of an IT service is received when the customer obtains the expected levels of availability, capacity, continuity, and security from the contracted IT service. Hence, ITSM can essentially be summarized as an IT service-centered management approach to provide value (i.e., utility and warranty) to IT service customers.

### 2.2 Agile ITSM Background

In the last decade, the high dynamism of business demands for IT services [11], as well as the growing utilization of agile practices in other domains (i.e., lean manufacturing [28] and agile software engineering [12–14]), has pushed the ITSM professional and academic communities to propose and elaborate agile versions of ITSM frameworks and standards [15, 16]. Four main ITSM frameworks and standards that claim to be agile or that can be assumed as agile are ITILv4 [17], VeriSM [18], FitSM [19–21], and the ISO/IEC 20000–1:2018 standard [22].

According to several studies on agile foundations [29, 30], agile practices are also considered lightweight ones, but not vice versa. Lightweight practices are shortened but still useful practices regarding the original heavy-oriented ones. Agile practices are also lightweight ones, but they need to be also flexible (i.e., to embrace changes), responsive (i.e., reactive to changes), rapid (i.e., applicable in relatively short periods), lean-seeking (i.e., simple, high-quality, and waste minimizing), and improvable (i.e., continually improved).

ITSM literature on the agile approach is still scarce, and consequently, ITSM practitioners lack informative references on the applicability, benefits, and limitations of using agile ITSM frameworks. Nevertheless, an ITSM literature review identified two studies on agile ITSM frameworks [15, 16] based on the Agile Manifesto from the software engineering domain [12]. Table 1 shows a summarized adaptation from the components (aim, values, and principles) of the proposal of the agile ITSM framework from [15] as it is reported in [16]. Table 1 also includes a list of the most used agile practices based on diverse current studies in the software engineering domain [14, 31–32], as well as the seven ones proposed in [15] for agile ITSM.

Hence, the two opposite approaches (i.e., rigor-oriented ITSM and the emergent agile-assumed ITSM) exhibit conflicts and tensions in their tenets (aim, values, principles, and practices) [16], and thus, a review of their tenets is worthy to guide practitioners and academics on their adequate utilization.

## 3 Review of the Main Four Agile ITSM Frameworks and Standards

The main four proffered agile ITSM frameworks and standards are individually described in this section, and each one is reviewed regarding their extent of adherence to the agile ITSM tenets.

**Table 1** A basic agile ITSM framework

| Tenet | Tenet description |
|---|---|
| Aim | Providing business value to its customers and users |
| Values | V1. Individuals and interactions over processes and tools<br>V2. Working IT services over comprehensive documentation<br>V3. Whole team collaboration over contracts<br>V4. Responding changes over the following plans |
| Principles | *Outcome principles*<br>P1. Customer satisfaction is the highest priority. P7. Customer value is *provided* as a primary measure of success.<br>*Project principles*<br>P2. Embrace changes. P3. Deliver frequently useful and warranted IT services.<br>*Team principles*<br>P4. Business and technical people work together daily. P5. Adequate work environment. P6. Face-to-face conversations within teams. P8. Keep sustainable work. P12. Break-times for reflection. P11. Self-organized team.<br>*Design principles*<br>P9. Simplicity with technical excellence. P10. Value simplicity—the art of maximizing the amount of work not necessary. |
| Practices | *Agile ITSM practices*<br>Pr.1A Self-Organized Teams. Pr.1B Coaching. Pr.2A Work Monitoring. Pr.2B Team Decision-Making. Pr.3A Focus on User Value. Pr.3B User concerns in SLA. Pr.4A Business Alignment. Pr.5A Work Integrated Teams. Pr.5B Work Face-to-Face Coordination. Pr.6A Simple Knowledge Management System. Pr.7A Operational and Project Dual Roles.<br>*Agile software engineering practices*<br>Pr.1 Daily Stand-Up Meetings. Pr.2 Sprint Planning. Pr.3 Sprint/Iteration. Pr.4 Short-Releases. Pr.5 Retrospectives. Pr.6 Face-to-Face Communication. Pr.7 Unit Testing. Pr.8 Tracking Monitoring. Pr.9 Continuous Integration. Pr.10 User Stories / Backlog. Pr.11 Team Working. Pr.12 Sprint Review. Pr.13 Coding Standards. Pr.14 Refactoring. Pr.15 Collective Ownership. Pr.16 40-hour per week. Pr.17 Simple Incremental Design. Pr.18 Simple Documentation. Pr.19 Burn-Down Charts. Pr.20 Release Planning Game. Pr.21 Backlog Grooming. Pr.22 Agile Dev-Test Team. Pr. 23 Acceptance Testing. Pr.24 Scrum of Scrums. Pr.25 Kanban. Pr.26 Dedicated Customer/Product Owner. Pr.27 Short Releases. Pr.28 Test-Driven Development. Pr.29 One Team Office. Pr.30 Agile UX. Pr.31 Scrum Master. Pr.32 Niko-Niko Calendar |

## *3.1 ITIL v4*

ITIL v4 [17; p. 14] has been redefined and restructured as a service value system (SVS) "to ensure a flexible, coordinated, and integrated system for the effective governance and management of IT-enabled services." ITIL v4 does not claim to be an SVS for the whole organization, but it indicates that with the new business dynamic demands for digital transformations, enhanced customer experiences based on IT, and the proliferation of new practices and technologies such as agile paradigm, DevOps, Lean, cloud computing, Internet of Things, and machine

learning, the majority of the business services are IT-based enabled services. Thus, an updated ITSM framework is required.

ITIL v4 keeps the concept of service management as "a set of specialized organizational capabilities for enabling value for customers in the form of services" [17; p. 18]. However, the focus on the five-phase IT service lifecycle model (i.e., service strategy, design, transition, operation, and continual improvement) has been restructured in the concept of the six-phase service value chain, which is one of the five core components of the new SVS. However, these five IT service lifecycle phases have been implicitly included and updated in the six-phase service value chain. The concept of service is kept as "a means of enabling value co-creation by facilitating outcomes that customers want to achieve, without the customer having to manage specific costs and risks" [17; p. 248], and the concept of IT service is simplified to "a service based on the use of information technology" [17; p. 242]. The concept of value which was indirectly defined as how well an IT service helps to achieve the expected customer's outcomes for using such an IT service now has been explicitly defined as "the perceived benefits, usefulness, and importance of something" [17; p. 20]. In particular, the concept of ITSM is not explicitly defined in ITIL v4.

The five core components of the ITIL v4 SVS are ITIL v4 service value chain (ITIL v4 SVC), ITIL v4 practices, ITIL v4 guiding principles, governance, and continual improvement. The six-phase ITIL v4 SVC defines a flexible and adaptable operational model for creating, delivering, and continually improving IT services. The ITIL v4 principles aim to guide organizational decision-making and behaviors toward an adequate service management culture to be applied from top to bottom organizational levels. There are eight principles. The ITIL v4 practices are organizational resources which guide it on what work to do. There are three categories of ITIL v4 practices (general management, service management, and technical management). ITIL v4 governance refers to the top-level policy and regulation body created to assure the alignment of the IT actions with the IT strategies, policies, and regulations. The ITIL v4 continual improvement model is reported as usable and required for all organizational areas from strategic to operational levels. The previous seven-phase model from ITIL v3-v2011 is supported.

The four ITIL v4 dimensions represent viewpoints on the ITIL v4 SVS, and these are fundamental for achieving effective and efficient service management that delivers IT services and/or IT products with the expected value. These dimensions are organizations and people, information and technology, partners and suppliers, and value streams and processes. Important is the consideration of political, economic, social, technological, legal, and environmental factors which by their external nature are out of the control of the ITIL v4 SVS but which must be considered because they constraint and influence the four ITIL v4 dimensions.

In the updated ITIL v4 ITSM framework, there are not mandatory or suggested obligatory IT practices to be performed. The new flexible and adaptable ITIL v4 SVS model, like the VeriSM framework, defines a generic six-phase SVC (plan, improve, engage, design and transition, obtain/build, and deliver and support). This six-phase SVC can accommodate flexibly the utilization of the 34 ITIL v4

practices (of which 14 is general management, 17 service management, and 3 technical management). These 34 ITIL v4 practices are not restricted to be used in a specific phase of the ITIL v4 SVC. Instead, there is a heat map reported for each practice to show where it is expected to use (but not in mandatory status) such a practice. Consequently, ITIL v4 proposes a flexible, adaptable, and highly customized service management model where each organization is responsible to define its value streams. Value streams are "specific combinations of activities and practices, and each one is designed for a particular scenario" [17; p. 83]. A value stream starts with the customer's demand and ends with the delivery of value to such a customer. Value streams can be organized as disciplined, agile, or hybrid flexible workflows, and it is an organizational decision. Furthermore, some value streams, for their criticality level, can be designed for a disciplined approach and others with more flexible approaches (i.e., Agile, Lean, DevOps).

### *3.2 VeriSM*

VeriSM [18; p. 376] is defined as a "value-driven, evolving, responsive, and integrated service management approach" for the entire organization in the digital era, and not only for the IT area. A service management approach is a management approach to deliver value to customers through quality products and services. VeriSM indicates that whereas the ITSM best practices frameworks have provided value to organizations in the last decade, the new digital business era demands a broader IT-based or digital transformation approach for the entire organization, and thus, these ITSM frameworks are insufficient to cope with the business demands in this digital era. VeriSM aims to help organizations on how they can use integrally a mesh of best management practices in a flexible way to deliver the right product or service at the right time to their customers. VeriSM is documented with a service management operating model composed of consumers, governance, service management principles, and the management mesh. The implementation of the VeriSM approach enables organizations to define governance requirements, service management principles, a management mesh of best practices, and the service or product stages from the definition, production, responding, and provision.

Customers provide the product or service requirements, pay, receive, and give feedback for the products or services. Governance provides the background system to direct and regulate the activities of an organization, and management provides the foreground system which manages the activities of an organization into the boundaries and regulations fixed by governance. Governance consists of three main activities (evaluate, direct, and monitor). Evaluate refers to compare the overall current organizational status vs the future forecasted or planned ones. Direct refers to create organizational principles, policies, and strategies. Monitor refers to assure that policies comply, and strategic performance are the expected ones. Service management principles are statements that define how the organization wants to perform and what is valued. Service management principles, thus, help to define

the specific best practices to include in the management mesh. Service management principles address usually assets/resources utilization, change, continuity, financial, knowledge, measurement and reporting, performance, quality, regulations, risk, and security issues.

Management mesh refers to the integral and flexible fabric composed of organizational resources, management practices, current and emergent technologies, and environmental conditions. This management mesh enables a flexible and agile management service approach in organizations to define, produce, provide, and respond to their products and services. The definition of a particular management mesh happens after the definition of governance strategies and policies, and service management principles. In particular, the environmental conditions in the management mesh include the called service stabilizers (processes, tools, and measurements). This management mesh lately defines four functional areas/stages for developing and providing the products and services of the organization. These are define, produce, provide, and respond. There are four, three, three, and two high-level activities, respectively, in the four stages. The four ones of the Define stage are consumer need, required outcome, solution, and service blueprint. The three ones of the Produce stage build, test, and implement and validate. The three ones of Provide are protect, measure, and maintain and improve. The two ones of Respond are record and manage.

### *3.3 FitSM*

FitSM [19] is defined as "a lightweight standards family" in the ITSM domain compatible with the ISO/IEC 20000 standard and ITIL v3-v2011 ITSM framework. FitSM aims "to maintain a clear, pragmatic, lightweight, and achievable standard that allows for effective IT service management (ITSM)" [19; p. 1]. FitSM is composed of seven documents. FitSM-0 overview and vocabulary, FitSM-1 requirements, FitSM-2 objectives and activities, FitSM-3 role model, FitSM-4 selected templates and samples, FitSM-5 selected implementation guides, and FitSM-6 maturity and capability assessment scheme. FitSM claims its application in any type of organization and IT area.

In FitSM-1, reported are seven categories of general requirements for a service management system which include 16 items, as well as the 14 FitSM processes with their 69 specific requirements. The seven categories of general requirements are top management commitment and responsibility, documentation, defining the scope of service management, planning service management, implementing service management, monitoring and reviewing service management, and continually improving service management.

The 14 processes of FitSM are Service Portfolio Management (SPM), Service Level Management (SLM), Service Reporting Management (SRM), Service Availability and Continuity Management (SACM), Capacity Management (CAPM), Information Security Management (ISM), Customer Relationship Man-

agement (CRM), Supplier Relationship Management (SUPPM), Incident and Service Request Management (ISRM), Problem management (PM), Configuration Management (CONFM), Change Management (CHM), Release and Deployment Management (RDM), and Continual Service Improvement Management (CSI).

These 14 processes of FitSM are claimed to comply with the ISO/IEC 20001–1 standard [20]. Each process in FitSM is structured with an objective, setup activities, inputs, ongoing activities, and outputs. Additionally, there are seven objectives for the respective seven categories of general requirements for a service management system. FitSM defines also seven generic roles and about three one-specific-process roles for each one of the 14 FitSM processes. The seven generic roles are SMS owner, SMS manager, service owner, process owner, process manager, case owner, and member of process staff (process practitioner). FitSM reports in an ITSM documentation checklist guide over 60 artifacts.

FitSM claims to be a lightweight ITSM framework with a reduction to four core documents with a total of 38 pages compared with the extensive official documentation of full ITSM frameworks such as ITIL v3-v2011 and the ISO/IEC 20000. The concept of agile is not explicitly reported in the four core documents.

### *3.4 ISO/IEC 20000-1:2018*

The ISO/IEC 20000 standard [22] has been reviewed for the third time from their first 2005 and second 2011 versions. This standard establishes the requirements for any organization (any type, any size) that can devise, implement, operate, and improve a service management system (SMS).

A management system is defined by the ISO/IEC 20000 standard [22; p. 3] as a system of "interacting elements of an organization to establish policies and objectives and processes to achieve those objectives". Service management, in turn, is defined as a "set of capabilities and processes to direct and control the organization's activities and resources for the planning, design, transition, delivery, and improvement of services to deliver value" [22; p. 9]. Consequently, an SMS refers to a management system for directing and controlling the organization's service management activities. For the ISO/IEC 20000 standard [22], an SMS is focused on supporting the service lifecycle. A service is defined as a "means of delivering value for the customer by facilitating outcomes the customer wants to achieve" [22; p. 8]. Value refers directly to the extent of importance, benefit, or usefulness, assigned by the service customers/users.

The ISO/IEC 20000 standard (2018) is organized in a set of seven clauses. These are the context of the organization, leadership, planning, support of the SMS, operation of the SMS, performance evaluation, and improvement. Organizations interested in conforming to this standard are free on how to implement these seven categories of clauses but are also obligated to implement all of them. The ISO/IEC 20000 standard establishes [22; p. vii] that "an SMS as designed by an organization, cannot exclude any of the requirements specified in this document."

The context of the organization clause contains four subclauses. They refer to the understanding organization and its context, understanding of needs and expectations from stakeholders, determining the scope of the SMS, and devising, implementing, operating, and improving the SMS. The leadership clause contains three subclauses. They refer to governance issues such as leadership and commitment, policy, and organizational roles, responsibilities, and authorities. The planning clause contains three subclauses. They refer to risks and opportunities, objectives, and plan the SMS. The support of the SMS clause contains six subclauses. They refer to resources, competence, awareness, communication, documented information, and knowledge. The operation of the SMS clause contains six subclauses. They refer to operation, planning, and control, service portfolio, relationship and agreement, supply and demand, service design, build and transition, resolution, and fulfillment, and service assurance. The performance and evaluation clause contains four subclauses. They refer to monitoring, measurement, analysis, and evaluation, internal audit, management review, and service reporting. Finally, the improvement clause contains two subclauses. These are nonconformity and correction actions, and continual improvement.

According to the ISO/IEC 20000 standard [22; p. vii], it can be used in combination with most accepted ITSM frameworks (i.e., ITIL v2011, and CMMI-SVC v1.3). This standard was released in 2018, before the release of ITIL v4, and consequently is aligned more to the rigor-oriented ITSM approach than the agile one. The core category of clauses of this ISO/IEC 20000 standard corresponds to the operation of the SMS, performance evaluation, and improvement. Operation of the SMS category defines specific requirements for establishing performance criteria and controlling mechanisms for the SMS processes; enacting a service delivery process based on a service portfolio of planned, underdevelopment, active, and removed services; planning services; controlling the involved parties in the service lifecycle; managing the service catalogue; managing assets; managing configurations; managing business relationships with customers and users; managing service levels; managing external suppliers; managing internal suppliers; managing budgets and accounting services; managing service demand; managing service capacity; managing service changes; planning, designing, building, transitioning, deploying, and releasing services; managing incidents; managing service requests; managing problems; managing service availability; managing service continuity; managing information security; monitoring, measuring, analyzing, and evaluating services; internal auditing; management review; service reporting; nonconformity and corrective actions; and continual improvement.

Hence, the ISO/IEC 20000 standard [22], being aligned to the ITIL v2011 framework, despite its claimed update, presents still a heavy-process oriented approach.

### *3.5 Analysis of the Proffered Agile ITSM Frameworks and Standards*

Table 2 reports the evaluation for four claimed agile ITSM frameworks and standards. As it was indicated, ITIL v4 and FitSM are focused on the IT area, while VeriSM and the ISO/IEC 20000–1:2018 claim to be a whole organizational service management approach, but this also applies to the IT area. The ordinal scale used for this conceptual evaluation of each attribute was as follows: (1) weak: agile statements are weakly supported; (2) moderate: agile statements are supported but not explicitly included, and (3) strong: agile statements are supported and explicitly included. An overall evaluation was also conducted based on the individual evaluations for each attribute. The scale use was as follows: (1) weak, when the majority of the individual evaluations were weak; (2) weak-moderate, when there was a mixed of weak and moderate individual evaluations; (3) moderate, when the majority of the individual evaluations were moderate; (4) moderate-strong, when there was a mixed of moderate and strong individual evaluations; and (5) strong, when the majority of the individual evaluations were strong.

## 4 Discussion of Implications and Conclusions

In this section, a discussion of theoretical and practical implications, as well as the conclusions and recommendations for further research are reported.

### *4.1 Discussion of Implications*

The results from Table 2 on the adherence to agile ITSM tenets for the four proffered ITSM frameworks and standards indicate that ITIL v4 and VeriSM can be considered with moderate-strong and strong adherence to agile tenets. FitSM was assessed with a weak-moderate level and the ISO/IEC 20000–1:2018 standard with a weak level. These results are also congruent with their reasons to be proposed.

ITIL v4 emerged with the consideration of a new business dynamic that demands the inclusion of several digital practices and technologies such as agile paradigm, DevOps, Lean, cloud computing, Internet of Things, and machine learning. ITIL v4 considers that the majority of the business services are supported by IT-based enabled services, and thus, an updated ITSM framework was required. ITIL v4 was restructured from the five-phase service lifecycle to a six-phase service value chain (SVC), and it defines a flexible and adaptable operational model for creating, delivering, and continually improving IT services. In this updated ITIL v4 ITSM framework, there are not mandatory IT practices to be performed. This six-phase SVC can accommodate flexibly the utilization of the 34 ITIL v4 practices, and they

**Table 2** A basic agile ITSM framework

| Tenet | Tenet description | ITIL v4 | FitSM | VeriSM | ISO/IEC 20000-1:2018 |
|---|---|---|---|---|---|
| Aim | Providing business value to its customers and users | Strong | Weak | Strong | Strong |
| Values | V1. Individuals and interactions over processes and tools. V2. Working IT services over comprehensive documentation. V3. Whole team collaboration over contracts. V4. Responding to changes over the following plans. | Strong | Moderate | Strong | Weak |
| Principles | *Outcome principles*<br>*Project principles*<br>*Team principles*<br>*Design principles* | Strong<br>Strong<br>Moderate<br>Strong | Weak<br>Moderate<br>Weak<br>Moderate | Strong<br>Moderate<br>Strong<br>Strong | Strong<br>Weak<br>Weak<br>Moderate |
| Practices | *Agile ITSM practices*<br>*Agile software engineering practices* | Moderate<br>Moderate | Moderate<br>Weak | Strong<br>Moderate | Weak<br>Weak |
| Overall agility Evaluation | | *Moderate-strong* | *Weak-moderate* | *Strong* | *Weak* |

are not restricted to be used in a specific phase of the ITIL v4 SVC. Their utilization is rather suggested through a visual heat map reported for each practice to show where it is expected to be used. ITIL v4 framework was assessed as moderate to strong agility level because it was identified that some agile tenets are not covered in its core structure, despite some of them are reported as complementary practices to be used jointly with ITIL v4 practices. However, this assessment moderate-strong qualifies rather as an agile than a rigorous ITSM framework.

VeriSM has also emerged to cope with the dynamic demands caused by the digital transformation era, as well as by the varied availability of management approaches, frameworks, practices, and methodologies, so its concept of management mesh, to elaborate an ITSM fabric customized. VeriSM, thus, does not impose mandatory low-level activities to be followed (but recommended), but its four high-level phase model on how services or products are developed is expected to be followed. VeriSM's official documentation includes emergent ITSM management practices such as Lean, DevOps, and customer/user experience, as well as emergent technologies such as cloud computing, machine learning, and the Internet of Things. Thus, VeriSM can be called an "open-mind alike" service management approach which can glue all the management approaches and emergent technologies.

The assessment for FitSM was from weak to moderate. Some agile tenets (aim, outcome principles, team principles, and agile SwE practices) are weak and the remaining ones are moderate. The four official FitSM documents do not report the concept of agility. FitSM emerged in the context of scientific data centers (cloud, grid, and federation types), providing scientific computing services to a wide global community. Consequently, while an ITSM process framework was required, the available ones (ITIL v2011 and ISO/IEC 20000) were considered quite bureaucratic with excessive required documentation, most likely useful for business organizations. FitSM, thus, emerged with the need to lighten this heavy-process approach rather than provide an agile one.

The ISO/IEC 20000–1:2018 standard was included in this review because it was recently updated as a third version. Considering that it was released under the new highly dynamic business environment with strong demands for agile delivery of IT business digital services, it was expected that this standard would present an agile view. However, it was identified that this standard kept its heavy-process oriented approach, and thus, its agility assessment was weak. Individually, the aim and outcome principles of tenets were evaluated as strong, but the remainder agile were evaluated as weak.

## 5 Conclusions

This research reviewed the main four agile proffered ITSM frameworks (ITIL v4, VeriSM, and FitSM) and standards (ISO/IEC 20000-1:2018) reported in the current ITSM literature, to assess their coverage to agile tenets. This assessment is worthy given the current growing interest and needs to implement successful agile ITSM

approaches due to the new business environment driven by digital transformation pressures.

It was identified that two of the four ITSM frameworks (VeriSM and ITIL v4) can be considered as agile ITSM ones. VeriSM was assessed as strong agile and ITIL v4 as a moderate-strong agile one. In contrast, the ITSM framework FitSM and the ISO/IEC 20000-1:2018 standard were expected to be also evaluated as moderate or strong agile, but they qualified as weak-moderate and weak agile, respectively.

These two ITSM, framework and standard, can be considered rather lightweight but not agile ones. VeriSM, as a generic service management approach that can be used also for the IT area, presented an adequate flexible approach that can accommodate effortlessly an agile approach, and thus, it was assessed as strong in its adherence to agile tenets. ITIL v4 was restructured also for fitting agile practices, and except for some missed agile tenets, this ITSM framework provides also a flexible and customizable ITSM framework of practices.

This review of the agile proffered ITSM frameworks and standards suggests the following statements: (1) clear agile ITSM frameworks will be demanded by the business organizations; (2) an adequate agile version of FitSM can be elaborated; (3) detailed implementation guides on how VeriSM and ITIL v4 can be applied are required; (4) VeriSM will expand their application in multiple global organizations; (5) specific agile version of the ISO/IEC 20000 standard can be generated; and (6) a globally accepted agile ITSM manifesto and framework with specific agile tenets alike the existing one in the software engineering field since two decades can be elaborated.

This review was conducted using the official documents from the four ITSM frameworks and standards by the first two authors and reviewed by the third one. The fourth author reviewed the logical consistency of this study from an ITSM practitioner perspective. Consequently, there is a methodological limitation on the qualitative interpretations assessed.

Finally, it can be concluded that ITSM practitioners and academics can count on two agile ITSM frameworks at present (VersiSM and ITIL v4), but their adequate utilization and impacts must be further researched.

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