A comprehensive study of the role of cloud computing on the information technology infrastructure library (ITIL) processes

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Abstract

Purpose – Information technology infrastructure library (ITIL) is a commonly utilized IT service management execution technique that helps IT services to be planned, designed, selected, operated and continuously improved. ITIL procedures are utilized to measure the efficiency of IT service management procedures and their association with the accelerated system development of cloud systems. The challenges faced in IT deployment and maintenance management significantly restrict cloud computing services' reliability. Therefore, this article aims to review a comprehensive study of the role of cloud computing on the ITIL processes.

Design/methodology/approach – Each enterprise strives to stay competitive in the market and offers the services its consumers are looking for, all in line with cost-effectiveness and client needs. The ITIL framework provides best practice guidance for IT service management that includes a collection of ample publications supplying detailed guidelines on the management of IT functions, processes, responsibilities and roles associated with IT service management. On the other hand, the way companies employ IT services with an effect on the role of enterprise infrastructure is altered by cloud computing. Hence, the investigation makes utilization of a systematic literature review (SLR) detailing crucial success factors of cloud computing execution in ITIL. The authors have recognized 35 valuable contributions, providing a comprehensive view of study in this field, of which 22 papers were found according to some filters that have been analyzed in this article. Selected articles are presented in two groups, including cloud service and cloud service providers.

Findings – Owing to the overall expense of execution and problems with combining the ITIL approach with the existing organizational IT strategic strategy, ITIL adoption has begun to wane over the last few years. An established methodology for ITIL deployment that will assure long-term success for those wanting to use private cloud procurement will be the most important inference that can be taken from this article. ITIL offers a perfect platform to execute and support cloud applications effectively. IT will prevent cloud sprawl and instability, reduce the likelihood of service interruption and optimize customer loyalty by merging humans, procedures and technologies into hybrid environments.

Research limitations/implications – This survey is more aimed at specialists such as IT experts; so, further evaluations must also be carried out in order to understand the company's views on the risks and advantages of adopting ITIL. In addition, non-English articles are not discussed in this article.

Practical implications – The study outcomes would help suppliers of cloud computing services assess their service quality and ensure customer satisfaction with the quality of cloud computing services. The outcomes will also supply a reference for cloud infrastructure customers to assess and choose various kinds of cloud computing services.

Originality/value – An SLR with perspectives from ITIL professionals and business studies is the benefit of this report. By offering a more thorough framework that helps companies achieve efficiency, effectiveness and creativity in ITIL execution, this article would be useful for ITIL clients, decision-makers and developers.

Keywords Cloud computing, Information technology infrastructure library, Systematic literature review

Paper type Literature review

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1. Introduction

Cloud computing is increasingly evolving and is the information technology (IT) industry's most desired area (Ali *et al.*, 2020) It offers scalable computational resources for relatively smaller spending costs according to a firm's requirement (Khayer *et al.*, 2020; Shah *et al.*, 2011). Modern firms have several problems, such as scalability, affordability, mobility, shorter time to market, growing complexity and so on. Companies embrace the cloud and derive market profits by cost transformation and improved revenues to overcome these problems (Wang *et al.*, 2019). With the cloud gathering traction, companies now have to tackle on-premise and cloud applications in diverse settings (Gohil *et al.*, 2011). Security remains the greatest barrier to developments in cloud computing, because business data should be published on the cloud and therefore leave a data security question mark, as a result of which several business enterprises refuse to migrate to the cloud (Chang, 2020; Shah *et al.*, 2011). Due to the intrinsic cloud capabilities of accelerated elasticity, system automation and location-independent resource pooling, the operation of the cloud system is dynamic. Transparency and quality management of these cloud features are critical to each cloud supplier's business and client adoption (Fiegler *et al.*, 2016). Cloud computing utilization has contributed to the need for management principles and procedures expressly developed for cloud computing services (Cheng, 2020). For cloud service users, management principles and procedures are critical when implementing and using cloud technology.

An organization's decision to move IT to cloud computing and to allow a seamless and detailed transition to the cloud covers numerous decisions that should be made to reduce risks (Queiroz *et al.*, 2020). The company should also utilize the correct tools to move IT services to the cloud in an easy way, with greater control and in a more detailed manner (Cardoso *et al.*, 2018). To help organizations with the management of IT services, IT infrastructure library (ITIL) framework had been generated. ITIL is a standard procedure adopted by companies in the operation of their data centers. IT infrastructure and application services are gradually provided as Internet services, making IT Service Management (ITSM) a crucial architectural problem (Karkošková and Feuerlicht, 2014). They now require to see if ITIL can be used for cloud operations without affecting the latest on-premise setup (Gohil *et al.*, 2011). Albeit, for the most part, ITIL reports on-premise services from the viewpoint of the service supplier. ITIL systems should be reassessed to make ITSM more appropriate for users with cloud providers (Karkošková, 2018). ITIL foundation encourages applicants to look at ITSM from an end-to-end business model for the production, distribution and constant enhancement of tech-enabled goods and services (Shekhar, 2020). In the following, we will mention the motivation of the research.

Albeit, fewer investigations have addressed the systematic investigation of the role of cloud computing on the ITIL processes. To solve the problems of ITIL, we need to investigate cloud computing. The present investigation concentrates on the cloud computing effect on the ITIL procedures. The current investigation's target is to check whether and to what extend cloud computing can solve the ITIL processes problems. A systematic literature review (SLR) has been performed on cloud computing on the ITIL targeting to collect information on cloud computing's novel role on the ITIL procedures. The remaining of the article continues as follows.

Section 2 introduces the motivation and goal of this research. The background is concluded in Section 3. The research method is given in Section 4. Moreover, a review of selected papers is analyzed in Section 5. So, the discussions and the findings are given in Section 6. Ultimately, the study is concluded in Section 7.

2. Motivation and the goal of this research

In this part, we discuss and analyze several review articles related to ITIL to clarify this study's motivation.

Tiong *et al.* (2009) have reviewed literature associated with financial metrics that firms can utilize to measure their investment return from their ITIL framework adoption. They have considered proper metrics that service managers can utilize to establish a business case for ITIL adoption or ongoing ITIL projects. Also, Miller *et al.* (2013) have examined an ITIL maturity strategy for private cloud sourcing models. As part of their 3–5 years of IT strategic plan, they have equipped IT, corporate leaders, with a methodical approach to execute ITIL that promotes a transformation process to a private cloud sourcing platform. Mukwasi and Seymour (2015) have concentrated on the employment of the ITSM framework and the instance of the ITIL framework as the central issue. They have reviewed the prior works to provide evidence of organizational cultural contradictions between organizations and the ITIL framework. Also, Cruz-Hinojosa and Gutiérrez-de-Mesa (2016) have reviewed the problems that small and medium enterprises (SMEs) encounter while attempting to certify their alignment with ITIL guidelines in the range 2007–2015.

Cronholm and Gobel (2016) have examined how well-known ITIL frameworks comply with a service viewpoint. As an analysis model, they have utilized service-dominant logic to figure out how ITIL relates to a service viewpoint. Also, through using SLR, Suryawan (2017) performed a synthesis of the service job performance delivered by the IT division to subscribers of information systems. The approach utilized in the investigation was a literature analysis relevant to the system of control objectives for information and related technology (COBIT) and ITIL, as well as discovering the interrelationship between SM to improve the efficiency of IT work. Ultimately, Rubio and Camazón (2018) have presented a review of different approaches for implementing ITIL practices. They found that approaches discovered vary from static sequences. The sequence is predefined and common to all organizations that are dynamically defined depending on their characteristics. So, the approaches may differ from one company to other. The key factors of each investigation are illustrated in Table 1.

Several IT leaders feel that their current ITIL systems do not serve the cloud well as enterprises migrate into cloud services, resulting in dissatisfaction and restricting the appeal of cloud commitments. It will subject the enterprise to needless uncertainties without liability for the implementation of final services and raises significant risks for any IT entity that migrates to cloud platforms (Al Mourad and Hussain, 2014). As shown in Table 1, different works developed in the past were focused on the ITIL implementation's critical success factors. ITIL provides a comprehensive collection of best practices in enterprises for ITSM, but there is only minimal academic literature on cloud acceptance of ITIL. Since the scale of this analysis is too broad, this investigation mainly emphasizes the effect of cloud computing on the procedures of the ITIL service strategy and the considerations that should be taken when applying the ITIL service procedures.

3. Background

We introduce the cloud computing and ITIL standard in this section.

Today, cost savings and improved agility are key IT priorities and triggers for cloud computing adoption (Navimipour *et al.*, 2015). Cloud computing is an increasingly common way of providing useful business resources that are allowed by IT. Via self-service portals, consumers and end users connect to the IT resources collection, utilizing and spending for only those services wherever and whenever they require (Lim *et al.*, 2020). Cloud strategies offer cost reductions, increased agility, faster time to market, greater openness and enhanced experience. Cloud computing services can be categorized into three sorts: PaaS (platform as a service), SaaS (software as a service) and IaaS (infrastructure as a service) (Oussalah *et al.*, 2014). However, good execution should also discuss entities and procedures (Habibi and Navimipour, 2016). It soon becomes obvious as a firm implements cloud computing that the

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Main factors

Papers	SMEs and ITIL	Service perspective and ITIL	Cloud sourcing and ITIL	Return on investment and ITIL	Service management and ITIL	Different approaches for implementing ITIL	Organizational cultural and ITIL
Tiong et al. (2009)							
Miller et al. (2013)				*			
Mukwasi and Seymour (2015)			*				*
Cruz-Hinojosa and Gutiérrez-de-Mesa (2016)	*						
Cronholm and Gobel (2016)		*					
Suryawan (2017)					*		
Rubio and Camazón (2018)						*	

Note(s): The Star sign "*" indicates which variables have been studied by different studies

Table 1.
Key factors analyzed in
previous literature

conventional approach to ITSM systems like ITIL requires to be reviewed (Al Mourad and Hussain, 2014). The idea that cloud computing is service-oriented is clear. So, there is an urgent requirement from vendors who can fulfill client service quality criteria quality of service (QoS) and realize service-level agreement (SLA) in the cloud computing QoS appraisal process. In addition, the appraisal mechanism will supply the context for choosing the cloud computing service and the service measurement criteria from the customer viewpoint (Garg et al., 2013). ITIL has the best ITSM architecture and guiding principles and is also the most commonly adopted and recognized ITSM framework in the world (Brewster et al., 2012; Chang et al., 2017).

To comply with established and structured requirements, several firms have already adapted their business procedures. ITIL and ISO 27001 are two standards that are sought after by enterprises. Corporations also begin to certify their business procedures with ITIL and continue following ISO 27001. The ISO 27001 certification is hard to arrange and retain for small to medium-sized companies. As part of their everyday life, the IT departments of these firms frequently do not have the patience to follow standards thoroughly. By standardizing and matching services and products between themselves and other businesses and partners, ITIL and ISO 27001 blend seamlessly with companies and help minimize risk (Bagal et al., 2018; Beckers et al., 2013). ITIL is a set of best practices for ITSM implementation. For common activities related to IT administration, the standard includes sample procedures. The standard also offers tools for considering the preparation, development, promotion and enhancement of IT services to attain market objectives. ITIL is a faulty standard for the production, formation and maintenance of essential procedures. ITIL provides standardized definitions and is autonomous of manufacturers or applications. ITIL supplies a collection of procedures that include specific procedure specifications, procedure priorities, procedure and task patterns, interfaces for multiple systems, tips for crucial success factors, recommendations for evaluating key performance metrics and knowledge of success criteria for executing the procedure (Beckers et al., 2013). In addition, ITIL helps enterprises provide adequate programs and actively ensure that they achieve strategic priorities and provide benefits. Within five key publications that incorporate five service life cycle phases, the ITIL best practices are presently detailed: service design, service strategy, service operation, service transition and continual service improvement (Figure 1)
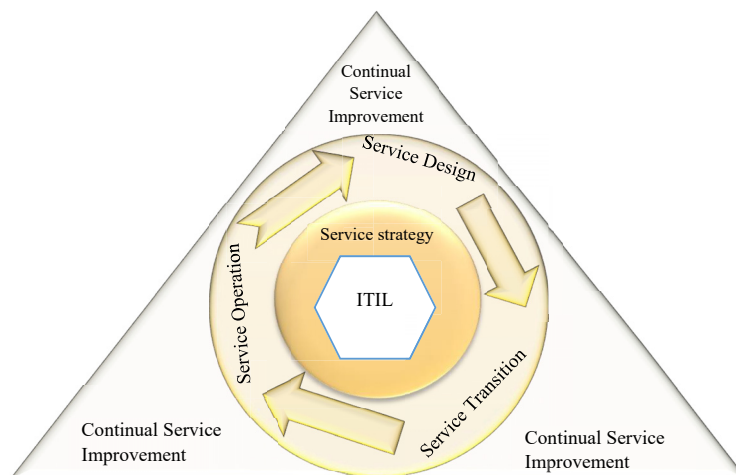

Figure 1.
Service life cycle (Al Mourad and Hussain, 2014)

([Al Mourad and Hussain, 2014](#)). Five books compose the ITIL. These books can be categorized into three main fields: requirement analysis and initial definition (including the "service strategy" and "service design" books), migration to the production environment (including the "service transition" book) and operation and improvement in production (consisting of "service operation" and "continual service improvement") ([Cardoso *et al.*, 2018](#)).

4. Methodology
We performed the SLR under the guidelines published by [Kitchenham and Charters (2007)](#) to accomplish the purpose of the investigation. An SLR is "a method of assessing and analyzing all existing studies associated with a specific research question or subject field or interest phenomenon" ([Kitchenham, 2004b](#)). Primary articles are pointed to as the academic investigations outlined in the review, although the review itself is a secondary analysis. In providing new ideas or determining where a topic might be explained by further primary research, the collection of information by secondary studies may be quite useful. A systemic analysis includes several different operations, divided into three main stages: planning, performing the review and reporting it. The overall ten-stage review procedure is shown in [Figure 2](#) ([Brereton *et al.*, 2007](#)). In order to make a detailed assessment of the SLR, we tried to pass via the planning, performing and reporting phases of the assessment in iterations. Below is the documentation of the measures in the SLR procedure.

(1) The study concerns that this thesis answers are:

RQ1. How much activity has there been for SLR?

RQ2. What topics of study are being resolved?

RQ3. What are the restrictions of the existing study?

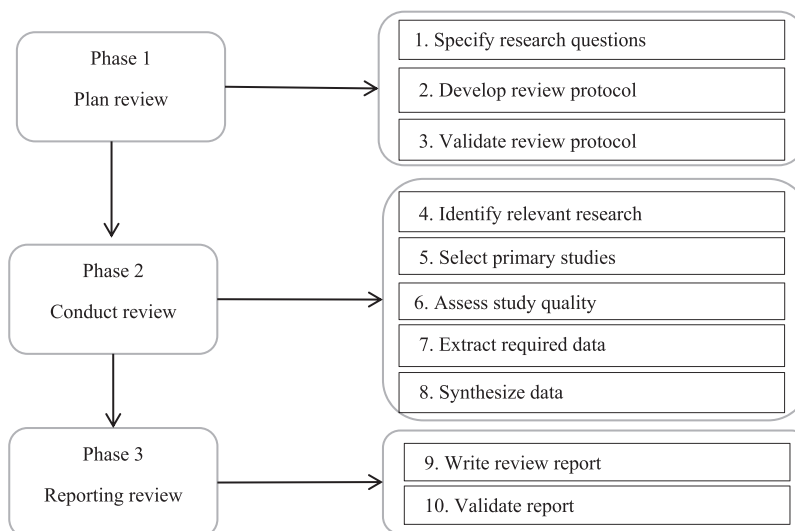*RQ4.* What are the future works of current research?

Figure 2.
Systematic literature review procedure
([Brereton *et al.*, 2007](#))

The number of SLRs released each year, the journals/conferences that published them and whether or not they cited the EBSE papers (Dyba *et al.*, 2005; Kitchenham *et al.*, 2004) or Guidelines paper (Kitchenham, 2004a; Kitchenham *et al.*, 2009) were defined to answer RQ1. Regarding RQ2, in the ITIL research topic, we considered the research and the cloud scale. With respect to RQ3, individual investigators, the institution with which investigators were associated and the country in which the organization is based were considered. We looked at a range of problems and potential studies about the drawbacks of SLRs (RQ3 and RQ4).

Experimental outcomes must be reported by investigations to be included in this SLR, which may be articles on case studies, new technologies for cloud platforms and ITIL. They should be peer-reviewed and published in English. As there is a risk for Google Scholar to return lower-grade documents, all findings from Google Scholar will be reviewed for compliance with these requirements. This SLR would contain only the latest edition of a sample. Table 2 displays the main exclusion and inclusion parameters.

Investigators profited mainly from nine publication databases (CiteSeer, Springer, ACM, IGI, Taylor Francis, Emerald Insight, IEEE, Wiley and Elsevier) and Google Academic to include relevant publications in cloud computing and ITIL in business and academic field to conduct this extensive review. In order to add on similar issues, other certain literature published on the Internet is also examined. In order to produce a shared concept well understood by both research and functional audiences, these literature surveys seek to illustrate the core facets of cloud computing. This research is carried out by first looking for the words "cloud computing and ITIL." The associated words are then looked for, as the Internet of Things (IoT) and so on. To ensure the comprehensiveness and efficiency of the analysis process, the top 100 headings, abstracts and main terms for each definition have been separately evaluated. A list that contains the keywords, as indicated in Table 3, is created after an initial review of the literature. To identify the relevant literature, these keywords are utilized.

There were 35 reviewed papers on the chosen sites from the initial keyword searches (cloud computing and ITIL). After eliminating redundant ones, it was lowered to 23. The articles left for reading were nine after reviewing the papers under the exclusion/inclusion criteria. With the inclusion/exclusion criteria being reapplied, six articles were read in whole, and 20 papers remained. Additional one and three investigations were found by backward and forward snowballing, providing a final figure for the articles to be included as 13 in this SLR.

An evaluation of the quality of primary investigations was carried out in compliance with the guidelines provided by Kitchenham and Charters (2007). It made it easier to determine the importance of the articles to the intent of the study, taking into account some indicators of research bias and the quality of the empirical data. The evaluation procedure relied on the procedure utilized by Hosseini *et al.* (2017). To verify their efficacy, the randomly chosen articles were subjected to the following content evaluation procedure.

The articles that had passed the content review were then removed from their data to determine the thoroughness of the data in order to verify the precise recording of the

Inclusion criteria	Exclusion criteria
Data about cloud computing and ITIL must be addressed in the report	The title, abstract and keywords are in English, but not the full-text
Information about cloud computing and ITIL should be included in the document	Gray literature, including blogs and official reports
A peer-reviewed product published in a conference proceeding journal must be the article	The full-text of the paper is not available for the assessment

Table 2.
Exclusion and inclusion criteria for the primary investigations

Key words	Publisher	Number of publication reviewed
ITIL	Elsevier	16
	Springer	110
	Emerald Insight	5
	Taylor francis	10
	ACM	8
	CiteSeer	26
	IGI	24
	IEEE	119
	Wiley	10
Cloud computing, cloud systems	Elsevier	1,190
	Springer	4,080
	Emerald Insight	119
	Taylor francis	210
	ACM	541
	CiteSeer	1,290
	IGI	758
	IEEE	8,310
	Wiley	504
ITIL and cloud computing	Elsevier	0
	Springer	5
	Emerald Insight	0
	Taylor francis	0
	ACM	1
	CiteSeer	1
	IGI	0
	Wiley	0
	IEEE	2
	Other publications	26

Table 3.
The list of key terms

information found in the articles. Before being extended to include the entire range of analyses that have passed the quality evaluation period, the data extraction technique was attempted on original studies. The data was analyzed, sorted and then processed in a spreadsheet from each sample. The classifications given for the data are shown below:

Context data: Information about the survey's objective.

Qualitative data: Conclusions and findings supplied by the writers.

Quantitative data: Data observed through experiments and study as applied to the sample.

Figure 3 indicates the papers chosen at each point of the procedure and the rate of attrition of papers obtained from each platform's initial keyword searches to the final list of primary experiments.

Finally, Figure 4 provides a rundown of the publishing of 35 articles and the publication year. The special interest group on the cloud published the high portion in ITIL studies, with fewer articles hitting the most prominent journal publications. As can be seen from Figure 4, most of the articles were published in Springer and IEEE in 2014.

5. Related work
Sequentially, the literature review discussed in this section represents the significant topics related to cloud systems and ITIL. It starts with analyzing cloud systems and ITIL and the associated principles of high effect history research. Comprehension of this history literature
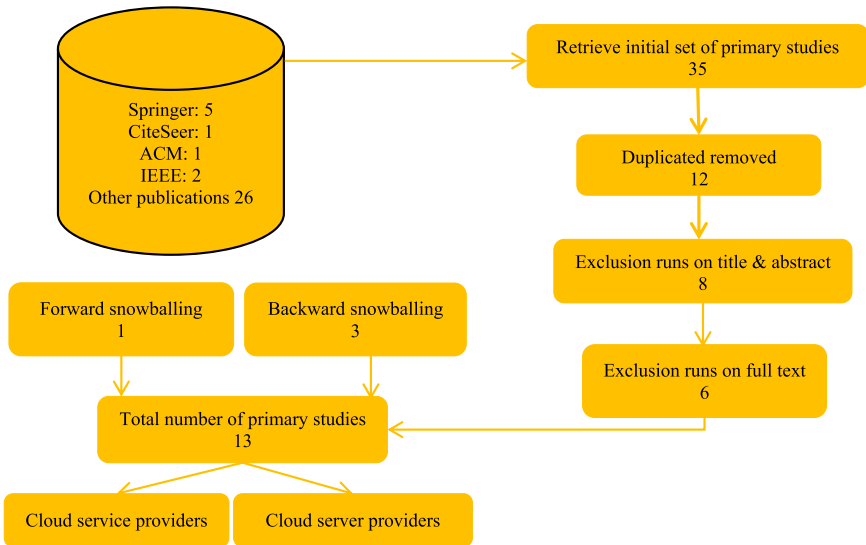
Figure 3.
Attrition of papers
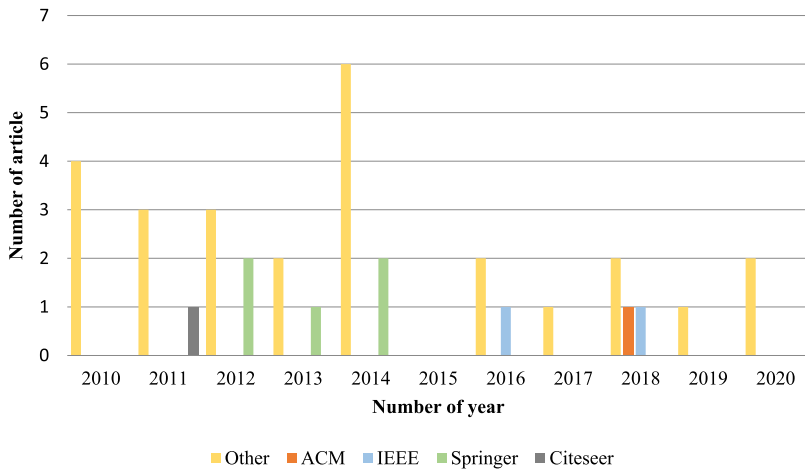through processing

Figure 4.
The articles published
by journal and year

applies to the important literature analysis of ITIL cloud systems. It is described as a possible way to address the challenges of SM. Several pieces of literature allow one to have a clearer comprehension of globally renowned IT outsourcing service provider products and relevant ITIL-based methodologies: such as the ITPM (Intelligent Thyristor Power Module) model in IBM (International Business Machine) (Kadleck, 2002), the ITSM model in HP (Hewlett Packard) (Kadleck, 2002), the MOF (Microsoft Operations Framework) model in Microsoft (Kelkar *et al.*, 2017), the BSM (Business SM) model in BMC (British Motor Corporation) (Zhan and Zhang, 2014). In this section, we review the selected articles in the previous section. We have categorized and discussed the articles into two groups (see Figure 5).

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5.1 Cloud service providers
With quick cloud computing growth, more corporations will outsource their confidential data for cloud sharing. A natural way to maintain the shared data private against unreliable and insecure cloud service suppliers is to save only the encrypted ones in a cloud (Dehghani *et al.*, 2021; Wang *et al.*, 2011). So, for several industries, cloud computing is valuable; It decreases expenses and encourages them to concentrate on competence rather than IT and infrastructure problems (Chiregi and Navimipour, 2018). The cloud service provider can screen, maintain and collect firewall information, detect an intrusion or/and counteractive action mechanisms and stream information throughout the network (Kumar, 2019). Cloud computing, however, has proved to have some restrictions and drawbacks, notably for smaller business activities, especially concerning downtime and security (Souri *et al.*, 2020). For example, in servicing their users, technological outages are unavoidable and often occur as cloud service suppliers become overwhelmed. It may lead to the temporary suspension of business. After an interruption, subscribers cannot access their cloud servers, apps or data since the networks of this technology depend on the Internet (Sommer and Subramanian, 2013). In the continuation of this section, we will review the articles related to cloud service providers.

Adade (2012) has explored "what are the attributes of an efficient ITIL training course to help instructors prepare learners to pass the qualification test and utilize their new experience to apply ITIL in the workplace?" He discussed the survey issue with 15 graduates of the ITIL qualification course utilizing a semistructured interview process. His study provided perspectives on best practices for teaching ITIL to adult learners in the IT area from those ITIL course attendees. Effective instruction has been explored by the awareness and past perceptions of course learners. An interpretation of the effects leads to discovering four main groups and seven similar concepts consistent with adult learning theory. From the viewpoint of those consulted, each classification and its associated theme(s) gave an overview into different aspects of the program and teaching IT experts. The outcomes have demonstrated that the degree to which teachers are aware of and remain responsive to learner expectations is an overarching factor in assessing success in teaching adult learners. Maybe not individually, but definitely, as a collective with identifiable features that indicate certain shared learner characteristics, successful trainers know their learners; and they put students' expertise at the core of the design and execution of the course.

Beckers *et al.* (2013) have used a cloud service supplier as a running instance and compare ITIL procedures to ISO 27001 procedures. They also defined which elements of the two standards can be best applied. They also recommended mapping ITIL and ISO27001, which makes the qualification procedure comprehensible and assists them. They also demonstrated how to train for both assessments and recertification. So, to master this method, they have offered a mixture of technological and organizational methods. Their cloud analysis pattern is the foundation for the cloud-based high-availability video conferencing approach. It has offered these principal profits: A standardized approach for mapping ITIL action items with
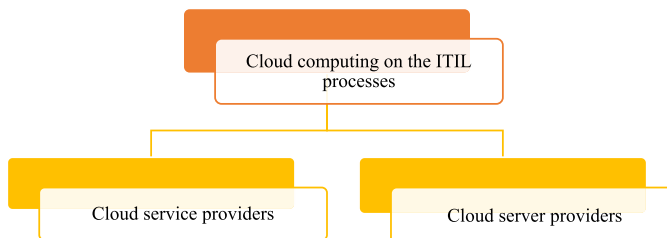
action items from ISO 27001; systematic recognition of specific items of operation and determination of their enforcement processes; enhancing the outcomes of market procedures by incorporating advantages to the mapping of standards; the reuse of ITIL and ISO 27001 standardized procedures to facilitate market operations in order to conform with applicable legislation and regulatory standards.

As part of the ITIL maturity strategy, Miller *et al.* (2013) have set up a roadmap for the first stage of ITIL deployment for enterprises entering these emerging forms of service sourcing. As part of their 3–5-year IT strategic plan, they have supplied IT and corporate leaders with a methodical strategy to ITIL delivery that promotes a transformation strategy to a private cloud procurement platform. An SLR with perspectives from ITIL professionals and market surveys was the early step of their study. A proven plan for ITIL deployment that will assure long-term achievement for those wanting to utilize private cloud sourcing was the most important conclusion.

Karkošková and Feuerlicht (2014) defined their early proposal to adapt the ITIL system for handling the cloud-based service life cycle. Taking the cloud market viewpoint, they have redefined ITIL procedures to represent cloud service users' requirements for the different life cycle stages. They also indicated that ITIL application life cycle phases can be mapped to both cloud and on-premise IT services and that ITIL can be modified to integrate cloud services. A redesign of ITIL procedures and the introduction of ITIL concepts to the execution and operation of cloud systems are the products of ITIL adaptation for cloud environments.

Al Mourad and Hussain (2014) concentrated on the ITIL service strategy approach and the influence of cloud computing on the execution of its subprocesses. In order to recommend ITIL enrichment as cloud computing is introduced, four case reports from companies that have either partially implemented or are preparing to employ cloud computing have been consulted. They observed that ITIL service strategy priorities could not be altered by cloud computing, and the ITIL service strategy procedures can be updated in the light of the debate mentioned above. Carrying out a cautious service plan would minimize the likelihood of opening the enterprise to needless uncertainties without responsibility for implementing end services and poses significant risks to any IT entity that migrates to cloud solutions.

Chang *et al.* (2017) also utilized ITIL as the basis for implementing a mechanism to determine cloud computing services' efficiency. Their research verified 44 calculation products of the cloud computing service via the literature review and Delphi expert survey. Ultimately, by utilizing the analytic hierarchy process approach to calculate the weights of various cloud computing systems in diverse modules, procedures and items, the suggested assessment method has been tested. The results presented a metric of measurement for cloud computing suppliers to measure service efficiency while maintaining consumer demand loyalty and enhancing cloud computing service. They can also be a standard in discovering and adopting cloud computing suppliers for cloud computing service customers.

Cardoso *et al.* (2018) have proposed the utilization of ITIL to control, cover and implement the activities. On the one hand, they researched how ITIL could benefit the transfer to cloud computing of services, apps and data. On the other hand, they addressed how these procedures help individuals develop their knowledge-accessibility skills. A system to assist companies with the process of migrating IT resources to the cloud computing has been established to verify the mapping between ITIL and migration to cloud computing. The framework was verified by collecting the perspective of an expert committee with real-life execution, a case study and interviews with stakeholders – that is, consumers who had, in some way, been interested in the execution of the project. The investigation shows how each ITIL mechanism is linked to the suggested framework. The framework procedures could indeed be mapped to the ITIL groups recognized. Accordingly, in the ITIL demands analysis and initial definition category, the system procedures that define a strategy, identify and understand can be recognized. In the migration to production category, the defining,

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analyzing and mapping phase may also be identified. Ultimately, the mechanism migrates and governs the system that could be mapped in the operation and improvement in production group of ITIL. They found that it is possible to apply ITIL to facilitate the transfer of IT services to cloud computing. Albeit, it does not suggest that any company that wants to move resources to cloud computing must first execute the good practices of the entire ITIL.

Mahalle *et al.* (2018) checked out the risk resulting from change and incident management procedures leading to emergency improvements to the configuration of the cloud system. They addressed measures to reduce risks in order to offer more transparency and accountability to suppliers of cloud services. They find that it is significantly easier for cloud service suppliers to handle and repair the recorded accidents with ITIL protocols in place. Albeit, with helpdesk not able to allocate accurate priority to incidents, the absence of professional training for cloud service supplier workers, lack of knowledge to measure the probability and effect of transition, not able to converse about the transition with all relevant stakeholders, the necessity to complete the transition within a span of time, the reluctance of workers to make improvements to the information system after working hours and use of authority for wrong objectives by the cloud service manager to allow and authorize emergency changes continues to add risk to cloud architecture infrastructure. In contracts signed with cloud service providers to identify SLAs, penalties and the minimum level of knowledge needed by cloud service provider employees, the contingency measures defined to manage emergency changes can be implemented.

The most important factors are illustrated in Table 4. As it is evident, the topics covered in cloud service providers are effectiveness, availability, long-term success, cloud services management, responsiveness, complexity, the satisfaction of the user and improved service quality.

5.2 Cloud servers providers

The convergence of cloud servers and embedded devices makes cloud computing and IoT broadly available in several enterprises and government industries (Kalra and Sood, 2015). In the form of low-cost temporary servers, cloud vendors have started selling their surplus space, which can be revoked arbitrarily at any time. Although the low expense of transient servers makes them desirable for an extended app range, such as data processing and scientific computing, server revocation failures can seriously degrade application performance (Sharma *et al.*, 2017). Outsourcing data to cloud storage, while increasing the proliferation of resources and decreasing customers' data processing responsibility, eventually introduces new problems such as data protection, since the server might be truthful but curious (Chai and Gong, 2012). On the other hand, cloud server load balancing is an evolving problem to satisfy increasingly challenging criteria (e.g. latency, data rates, service quality) of 5G network implementations with the continuous heterogeneity, expansion and ever-growing request for services (Abdelltif *et al.*, 2018). For example, since data can be saved on major cloud servers from several enterprises, hackers can potentially take control of large information stores with a single attack, a method he called "hyper jacking" (Salcedo, 2014). Some profits of cloud server providers are shown in Figure 6. In the continuation of this section, we will review the articles related to cloud server providers.

By addressing the significance of following a proper system such as the ITIL security management mechanism, Shah *et al.* (2011) concentrated on finding solutions to security problems in the cloud. In order to ensure the efficiency of the security management mechanism, which involves supervision, preparation, execution, assessment and maintenance, certain activities must be carried out. They also noticed that SLA is the primary input for ITIL security management, and the service quality relies mainly on it. Some strategies for successful SLA utilization have been proposed, and information security

Papers	Effectiveness	Availability	Long term success	Management of cloud services	Responsiveness	Complexity	Satisfaction of the user	Improve service quality
Adade (2012)	Yes	No	No	No	No	No	No	No
Beckers et al. (2013)	No	Yes	No	No	No	No	No	No
Miller et al. (2013)	No	No	Yes	No	No	No	No	No
Karkošková and Feuerlicht (2014)	No	No	No	Yes	No	No	No	No
Al Mourad and Hussain (2014)	No	No	No	No	Yes	Yes	No	No
Chang et al. (2017)	No	No	No	No	No	No	Yes	No
Cardoso et al. (2018)	No	No	No	No	No	No	No	Yes
Mahalle et al. (2018)	No	No	No	Yes	No	No	No	No

Table 4.
Key factors examined in the previous literature in cloud service providers

protocols utilizing ITIL in the cloud have been established. It will reduce security risks and enhance the utilization of cloud computing, which would boost the firm's revenue in exchange for its use.

Stanley (2014) examined a case study to implement an ITIL-based SM system practically by international business machines. This service has been delivered as a SaaS-based solution, marketed to customers based on international business machines hosting the software and hardware to undertake the entire business process outsourcing for the core ITIL transactions. The customer is able to select a model whereby their staff undertakes the transactional processing. They analyzed the execution as it actually stands for the clients from the common interaction with ITIL, cloud computing and consumer specification experience at this point. The Asia Pacific international business machine SM shared hub has generally been a prosper execution regarding migrating an available client base from an incumbent obsolete system of similar base scope into a modern supported platform, that is, in technical migration terms.

Zhan and Zhang (2014) realized the integrated maintenance and operation services that are distinguished by overall, standard, detailed and automatic reporting. Their study aims to supply an integrated approach to thoroughly increase IT management level and standardize the management of the IT environment. They have illustrated the mechanism and consequences of research. By combining experiments and implementations, the device applies manual tests. This framework also checks the functions of the system by interface testing, practical checking and threshold testing, analyzes the initial system's defects and evaluates and improves it. Testing and implementation findings have demonstrated that the device will satisfy the requirements of the organization. For the "comprehensive, integrated, standard and automation control" of the bank, the system execution deploys the entire operation and maintenance services. They have obtained the following results. In order to carry out the rigorous operation and maintenance control, a management structure of asset and operation and maintenance procedure services must be developed. Diverse statistical types should be given, and the effects of the tracking and statistical material of the integrated framework should be thoroughly and explicitly displayed in graphs. Ultimately, the general operation and controlling maintenance system are built to radically enhance the IT management stage and standardize IT environmental management. In addition, it is also possible to optimize the benefit and financial gains resulting from the contribution of IT services.

Zhang (2016) deployed an updated ITIL model based on real experiences in scientific study institutions and role-based access management theory. The model has attained good outcomes as utilized in science study institutions, cloud data center service and maintenance management and offers innovative concepts to increase the quality of knowledge creation in scientific study institutions. Some units have been designed to develop data centers focused
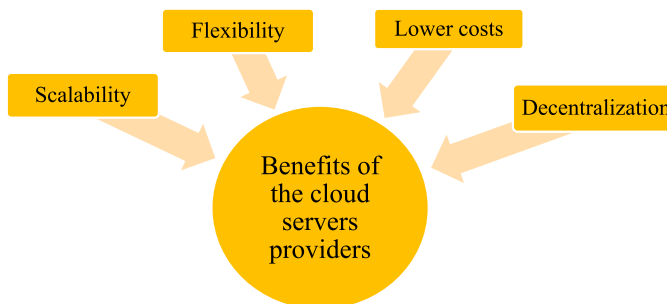

Figure 6.
The benefits of the cloud server providers

on big data and cloud computing technologies to address the actual requirements of scientific research organizations for structured data. Scientific and efficient operation and maintenance management are required to make good utilization of its economic advantages. The suggested enhanced ITIL model, the architecture and application of scientific research institutions in the operation of cloud data centers and the maintenance management system and mechanism are important ways of supporting the scientific research capability of scientific research institutions, contributing to ITIL's active experience in the area of ITSM.

Karkošková (2018) defined the model of cloud computing management that was suggested as an evolution of ITIL procedures with particular modifications from the viewpoint of cloud service users to address cloud SM. He described a cloud consumer-side application life cycle framework named a model of cloud computing management. The management paradigm for cloud computing has been formed as an extension and improvement to the ITIL paradigm. Any steps of the suggested life cycle of cloud providers and their operations relate to ITIL procedures. Still, their scope has been redefined to be more relevant for the cloud computing setting. Concerning scientific literature and practical knowledge obtained throughout the case study, a new collection of cloud computing management procedures was suggested. The suggested management of cloud computing also acts as an expansion of the system for business informatics management (MBI), which has been designed to aid companies in the Czech Republic in handling their business informatics. They also demonstrated that there is no commonly agreed management framework designed for users of cloud providers to handle IT settings where third-party cloud services are used to facilitate business procedures. None of the commonly recognized mechanisms for IT management thoroughly represents the aspects of cloud services.

The most important factors are illustrated in Table 5. As it is evident, the topics covered in cloud server providers are system functions, access control, services management, security management and improvement of service quality. As it turns out, this area is more focused on SM and quality improvement.

6. Results and discussion

The implementation of ITIL principles gives firms a methodology for handling IT programs, but ITIL focuses mainly on on-premise strategies where resources are exchanged within a single institution (Karkošková and Feuerlicht, 2014). Applying ITIL to cloud operations is similar to an expression problem where the core key areas remain the same. A few additional items need to be configured in the Configuration Management Database (CMDB) with the cloud coming in. The overall life cycle for managing these items remains the same, and hence is no major change in the ITILSM. The approach used to manage a hybrid environment can be applied across any new environment, which comes in the future (Gohil et al., 2011). ITIL provides a standardized framework supported by best practices to offer any IT service, including information security. If appropriately followed, the ITIL security management

Papers	System functions	Access control	Services management	Security management	Improve service quality
Shah et al. (2011)	No	No	No	Yes	Yes
Stanley (2014)	No	No	Yes	No	Yes
Zhan and Zhang (2014)	Yes	No	Yes	No	No
Zhang (2016)	No	Yes	Yes	No	No
Karkošková (2018)	No	No	Yes	No	Yes

Table 5.
Key factors examined in the previous literature in cloud server providers

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procedure may have a clearer justification for information security as it can handle both the shift and expense factors of cloud security risks. According to ITIL guidelines, the IaaS cloud layer is the basis for the cloud system and security operations, so it is important to improve the IaaS model. SLA is the key input for ITIL security management, and the service quality relies primarily on it (Shah *et al.*, 2011; Yuan *et al.*, 2020).

Companies that use ITIL provide an appreciation of services. However, traditional (noncloud) ITIL is usually not designed for the higher speed, the number of adjustments and approach to supplier management demanded by the cloud. ITIL is also optimized to maximize the availability of modules and systems, but instead of product availability, ITIL for the cloud needs service reliability (Nejad *et al.*, 2019). For ITIL systems and the companies that control them, it is a big change.

When enterprises migrate to cloud services, several IT leaders learn that their current ITIL systems do not serve the cloud well, leading to confusion and restricting the promises of value cloud. However, ITIL can well support cloud activities. The same ITIL procedures are going to work, and you need to tune them. ITIL procedures must adapt to the use of ITIL with the cloud. In doing so, corporations would be able to benefit from the improved resilience of the business, creativity and sales growth that the cloud will bring.

ITIL plays an important role in cloud performance since cloud computing is service delivery. In terms of mass acceptance, ITIL is a dynamic system. While achievements are widely publicized, certain shortcomings hinder and blur their promise. More complexity is introduced by cloud computing. ITIL practices must respond to the decreased times and improvements needed to concentrate cloud efforts. ITIL is a tool for ITSM that offers advice on IT services and examples of best practices (Chang *et al.*, 2017). External vendors do much of the job with the cloud, so teams of cloud managers must move to handle services and service suppliers. To decide whether your teams are at the appropriate level of capacity, evaluate the current ITIL execution. When evaluating skills, consider the following:

(1) The level of service and provider management is moving from "nice to have" to "absolutely must have."

(2) Capacity management takes a completely different sense, moving from part (long lead time) to service (near real time). It is also a vital success driver for the cloud to eliminate unnecessary resources and not a task that conventional IT teams are specialized in executing.

(3) Since the cloud provider hides the underlying IT architecture, case management and investigating are important. The source of monitoring would be consumer purchases (synthetic or live).

(4) Incident and issue management changes from heading inquiries and troubleshooting to knowledge processing and status contact.

(5) Strategy moves from "build or buy" to "rent," and particular consideration is required to optimize profits for the service portfolio.

It should be recalled that the proliferation of cloud-based applications would not alter the basics of systems such as ITIL or ITSM. They need to obtain consistent goods and services that are fit for function, fit for use and compatible with the company's strategic priorities and requirements.

Some studies that we systematically reviewed in this study had suggestions for future research that are as follows:

(1) The monitoring of security and privacy problems within the framework of ITIL will be involved in future work.

(2) The legislative framework should be discussed in more depth regarding both the cloud vendor and the client side (Beckers *et al.*, 2013).

(3) In order to ensure the thorough operation and maintenance control, the management structure of asset and operation and maintenance process resources should be created (Zhan and Zhang, 2014).

(4) Future work will concentrate on a more precise description of service interfaces for cloud users and cloud providers and create comprehensive process requirements for the different life cycle stages (Karkošková and Feuerlicht, 2014).

(5) To minimize the risk and keep the information infrastructure safe and open, the potential aim of this work could be to proactively categorize high-intensity events depending on the banking market area affected, handle workers at the end of cloud service suppliers and identify key stakeholders to talk about the transition (Mahalle *et al.*, 2018; Liu *et al.*, 2020).

6.1 Implication
Regularly evaluate your corporate maturity and personnel capacity. To understand ITIL advantages, standardized and reliable process implementation is key, so it is important to control personnel resources to ensure learning and transfer of information. In minutes and several times a day, development quality assurance teams choose to provide and customize platforms themselves. For new channels, the popular "sixteen to eighteen weeks" clearly is not an option. Provisioning, execution of orders and conventional ops must shift. Traditional functions will go away in certain situations or shift to dev.

Now launch the cloud ITIL project by creating a committee chartered in the business sense and recording resources. Next, analyze business demands or industry strategies to learn how optimizing IT services can maximize desirable cloud business results. Create plans for ITIL process optimization justified by anticipated market benefit from cloud computing.

Having ITIL to cover the whole procedure adds profits such as the following:

Providing a common language between the user and the supplier of cloud services (in the process of enhancing data usability, through a transparent and direct relationship);

(1) Enhancing assistance and IT discipline in the decision-making procedure. Due to greater usability and data accessibility, consumers indirectly develop their knowledge skills;

(2) Ultimately, decreasing the learning procedure is a direct consequence of enhancing the system's data access and the development of user expertise (Cardoso *et al.*, 2018).

Finally, we summarize the benefits of cloud computing in general in Figure 7.

7. Conclusion and limitation
We thoroughly reviewed academic articles on the application of cloud computing to ITIL in this literature review. In many aspects, this paper leads to research. First, scholars should make sure that a systematic analysis is required before conducting an SLR. In particular, any current systematic analysis of the phenomena of concern against relevant assessment criteria should be established and reviewed by investigators. For this purpose, the analysis must be straightforward and replicable to be reported in adequate depth so that readers can check the quest's completeness. We have recognized 35 important contributions, providing a comprehensive view of the studies in this field: 16 papers in JCR-recognized journals, 34 conference proceedings and 1 chapter of a book. Among these articles, 20 articles were
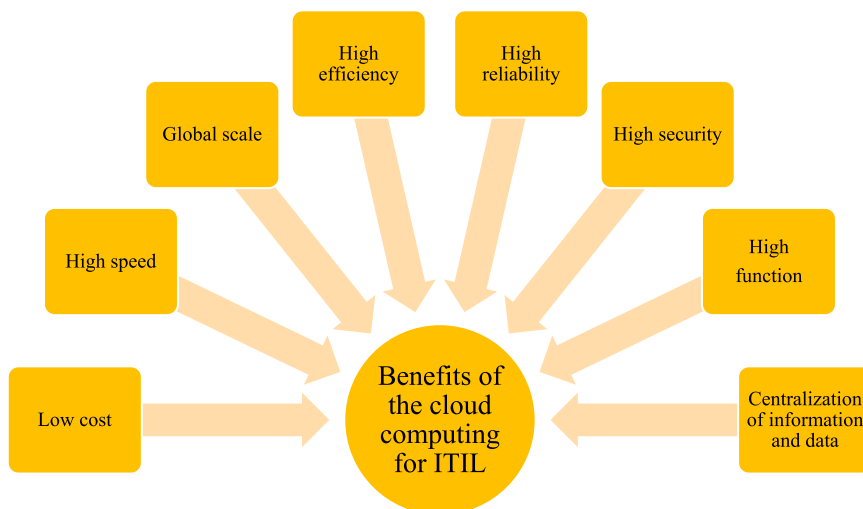
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systematically selected, of which 7 review articles were analyzed in the introduction section and 13 research articles were analyzed in Section 3. The contributions have been formally classified, which gives the status of this new area of study and will ease the search for related studies by researchers.

Second, our systematic review findings are a tremendous support for SM but do not include any assistance or implementation guidance on any procedures or best practices. It was also evident that most of the publications illustrate evidence via case studies that support their suggested mechanisms relevant to ITIL that gives the validity of the procedures within the study scope.

In our investigation, the analysis and the study procedure is depended on methodological suggestions prescribed in the literature. However, the choice of keywords, inclusion and exclusion criteria, sources and period are depended on our own judgment; we are sure that we have been able to identify the relevant contributions. The validation of the results also shows that the rigor of the articles is not relevant, concluding that researchers should be more meticulous about the reporting of their methods and the context. Also, they are not providing justification for the research design.

The result showed that cloud computing is changing how organizations utilize IT resources and affects the role of enterprise architecture, emphasizing ITSM. Service can realize the value of the enterprise. Through cloud computing service, enterprises can reduce information service construction costs, thus focusing on their core business to improve efficiency and competitiveness. Adopting cloud computing is a serious business decision. ITSM frameworks such as ITIL are essential and play a critical role in managing cloud computing. Although ITIL has been around for almost 20 years, it must be reframed and consider the context of cloud computing. On the other hand, the results revealed that there is little research on the application of cloud systems with ITIL, being the subject that most interests us; despite the fact that ITIL provides businesses with a high-level guide for the management of their IT services, regardless of their size, firms cannot introduce cloud systems in ITIL easily due to its complexity, cost and risk. However, it can also be due to the shortage of technical talent and insufficient financial resources. In this sense, we suggest the need for further research on this topic, focusing on limitations, by adopting a broader approach to the investigation design.

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