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Combining Agile, DevOps and ITSM: A Systematic Literature Review

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ABSTRACT: The usage of IT Service Management (ITSM) frameworks to manage Information Systems (IS) and Information Technology (IT) has been developed and used over the last three decades. The evolution of IS and IT with new languages, development methods, technologies and services has forced organizations to improve the way they manage these new advances in technology and services. Software development methodologies like Agile and operation practices like DevOps have also been used in organizations to help manage this challenging and complex environment along with enhancements of ITSM frameworks. Although there is an extensive list of frameworks, methodologies, and practices there is very few research in how Agile and DevOps are being used together to improve ITSM. This paper aims to present a systematic literature review on the application of Agile and DevOps in ITSM.

KEYWORDS: Agile, DevOps. IT system management, ITSM, Systematic Literature Review.

I. INTRODUCTION

Information Technology Service Management (ITSM) is a subset of Service Science that focuses on IT operations such as service delivery and service support with the objective to manage IT services through people, processes, and technology. It is a discipline for managing IT operations as a service that is process-oriented (Gallup et all).

There are several IT frameworks available to help and support ITSM (Varga et all). The usage of these frameworks can produce many benefits to organizations, such as reduction in operational costs, operational efficiencies (Gacenga et all), and competitiveness (Koch and Gierschner).

The evolution of technologies, applications, and methods to manage and operate IT systems has emerged over the last decade with new practices such as Agile and DevOps. The Agile methodology is used in software development and proposes frequent and small development iterations allowing a rapid software development process and minimizing the impact for the business (Gotel and Leip, 2007). DevOps is a set of practices that aims to emphasize the collaboration between the software development and operations teams transforming the software lifecycle development process and increasing efficiency and operation (Jabbari et all).

The origin of Agile and DevOps were associated with software development and operation, however deployment and operation of software and applications must also be tied connected with ITSM. In this sense the research questions approached by this research are: How the literature regarding the application of Agile and DevOps in the IT service management has been performing in recent years? And what are the potential challenges and future research directions regarding the application of Agile and DevOps in IT service management?

The objective of this research is to perform a systematic literature review to unravel the state-of-the-art usage of Agile and DevOps on the ITSM. The main objectives of this research are to show the bibliometric evolution of publications and indicate the potential challenges and future research directions.

The remainder of this article is organized as follows. In Section II, the background on ITSM, Agile and DevOps. In Section III, the research methodology is presented. In Section IV, research results are presented and discussed. Section V concludes this work and proposes future work.

II. BACKGROUND

This section introduces the basic concepts and background on the main subjects approached by our work.

ITSM

ITSM is a set of practices, processes, and frameworks that help organizations design, deliver, manage, and improve the delivery of IT services to meet the needs of their customers and achieve their business objectives. ITSM encompasses various methodologies and approaches, with the primary goal of ensuring that IT services are delivered efficiently, reliably, and in alignment with business goals. Here are key aspects of ITSM:

Service Orientation: ITSM is fundamentally service-oriented. It focuses on providing IT services that meet the needs and expectations of internal and external customers. These services can range from software and hardware support to network infrastructure and cloud services.

Service Lifecycle: ITSM frameworks, such as ITIL (Information Technology Infrastructure Library), typically define a service lifecycle that includes stages like service

strategy, service design, service transition, service operation, and continual service improvement (CSI). Each stage has its set of processes and activities.

Processes and Procedures: ITSM relies on well-defined processes and procedures to manage and deliver IT services effectively. These processes cover areas like incident management, change management, problem management, service request fulfillment, and more. They provide a structured approach to managing IT operations.

Service Catalog: Organizations often maintain a service catalog that lists all the IT services they offer. This catalog provides a clear and standardized way for users to request and access IT services.

Incident and Problem Resolution: ITSM processes include incident management, which focuses on resolving incidents (unplanned disruptions in service), and problem management, which seeks to identify and address the root causes of recurring incidents to prevent future occurrences.

Change Management: Change management processes help organizations plan, assess, authorize, and implement changes to IT services and infrastructure. The goal is to minimize disruptions and risks associated with changes.

Service Level Agreements (SLAs): ITSM often involves defining SLAs that specify the level of service that customers can expect. SLAs outline performance expectations, response times, and other key service metrics.

Continuous Improvement: ITSM emphasizes the concept of continual service improvement (CSI). Teams regularly assess their processes and services to identify areas for enhancement and optimization. This iterative approach ensures that IT services evolve to meet changing business needs.

IT Governance: ITSM practices contribute to effective IT governance by providing a framework for managing and controlling IT operations, resources, and risks. This helps organizations align IT activities with business objectives and regulatory requirements.

Tools and Technology: ITSM often utilizes specialized software tools and IT service management platforms to automate and streamline processes, track service performance, and manage incidents and changes.

Customer-Centricity: ITSM encourages a customer-centric approach, where the focus is on delivering services that directly support the needs and goals of the organization's customers, whether they are internal or external.

Compliance and Security: ITSM frameworks incorporate considerations for compliance with regulations and security best practices. This ensures that IT services are delivered in a secure and compliant manner.

The adoption of ITSM principles helps organizations improve service quality, reduce downtime, enhance customer satisfaction, and optimize IT operations.

ITIL V4

ITIL is the most used framework for ITSM (Cater-Steel et al. 2009, 2016; Marrone & Kolbe 2011a, 2011b, Machado et all) that proposes a set of best practices to help IT organizations to deploy and use IT services aligned with their business. It is structured around the life cycle of an IT service within an organization, and it is structured around five services (Cartlidge at al. 2007): Service Strategy, Service Design, Service Transition, Service Operation and Continuous Service Improvement.

In 2019, a new version of ITIL 4, also known as ITIL 4 Foundation, was introduced to address the evolving landscape of IT and align ITSM practices with modern approaches such as DevOps and Agile. It comprises the following key features:

Service Value System (SVS): ITIL 4 introduces the Service Value System, which provides a holistic approach to creating, delivering, and sustaining value through services. It emphasizes the importance of stakeholders, governance, processes, and practices.

Four Dimensions of Service Management: ITIL 4 incorporates four dimensions—organizations and people, information and technology, partners and suppliers, and value streams and processes—to consider when designing and delivering services.

Service Value Chain: The Service Value Chain is a key concept in ITIL 4, representing a series of interconnected activities that an organization performs to create and deliver value through its services.

Guiding Principles: ITIL 4 introduces seven guiding principles that guide organizations in adopting and adapting ITIL practices. These principles include focusing on value, starting where you are, progressing iteratively with feedback, and collaborating and promoting visibility.

Practices: ITIL 4 includes a set of practices that are organized into three categories: general management practices, service management practices, and technical management practices. These practices provide detailed guidance on how to perform specific activities.

AGILE

The Agile methodology was not created at a specific point in time by a single individual. Instead, it emerged gradually through the collaborative efforts of many software development practitioners and thought leaders during the 1990s. The main usage of Agile methodologies is in project management and software development, although Agile principles and practices have also been applied to various other fields and industries.

The term "Agile" was first coined in the "Manifesto for Agile Software Development," which was written in February 2001 by a group of software developers who gathered at the Snowbird ski resort in Utah, USA. This group, which included individuals like Kent Beck, Martin Fowler, and Ward Cunningham, among others, came together to discuss lightweight and more flexible approaches to software development.

While the Agile Manifesto marked a significant milestone in the formalization of Agile principles, the ideas and principles behind Agile methodologies had been evolving for some time before that. Practices like Scrum and Extreme Programming

(XP), which are now commonly associated with Agile, had been in development and use in the 1990s.

So, Agile as a set of principles and practices had its roots in the 1990s but was officially articulated in the Agile Manifesto in 2001. Since then, Agile methodologies have continued to evolve and gain widespread adoption in various industries beyond software development.

The Agile methodology is an iterative and incremental approach to software development and project management. It emphasizes flexibility, collaboration, and customer-centricity, allowing teams to respond to changing requirements and deliver value quickly. Agile is not a single method but a set of principles and practices that guide software development and project management. Here are the key features of Agile:

Iterative and Incremental: Agile projects are divided into small, manageable iterations or increments. Each iteration typically lasts from one to four weeks and results in a potentially shippable product increment. This allows for regular feedback and adjustments.

Customer-Centric: Agile places a strong emphasis on understanding and prioritizing customer needs. Customer feedback is sought and incorporated throughout the project, ensuring that the final product aligns with customer expectations.

Collaborative: Agile promotes collaboration among cross-functional teams, including developers, testers, designers, and business stakeholders. Teams work closely together to solve problems and make decisions collectively.

Adaptive and Flexible: Agile projects are responsive to change. Requirements and priorities can evolve as the project progresses. This adaptability allows teams to address new information and customer feedback effectively.

Continuous Delivery: Agile encourages frequent and small releases of working software. This approach minimizes risks and allows teams to deliver value incrementally, reducing the time to market.

Emphasis on Individuals and Interactions: Agile values individuals and their interactions over processes and tools. Face-to-face communication is often favoured, but modern Agile practices can adapt to remote and distributed teams.

Self-Organizing Teams: Agile teams are expected to be self-organizing and responsible for their work. They decide how to accomplish tasks and manage their own workloads.

Feedback-Driven: Agile practices, such as retrospectives and daily stand-up meetings, encourage frequent feedback. This feedback loop helps teams identify and address issues promptly.

Transparent and Visible: Agile projects often use visual tools like Kanban boards or Scrum boards to make work progress and impediments visible to all team members.

Empirical Process Control: Agile employs empirical process control, meaning that decisions are made based on observations and data rather than extensive upfront planning.

Common Agile Frameworks and Practices:

Scrum: A popular Agile framework that prescribes roles (Scrum Master, Product Owner, Development Team), ceremonies (Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective), and artifacts (Product Backlog, Sprint Backlog, Increment).

Kanban: A visual management method that emphasizes limiting work in progress and using a pull system to manage workflow.

Extreme Programming (XP): A set of software development practices that includes Test-Driven Development (TDD), pair programming, continuous integration, and frequent releases.

Lean Agile: Combines principles from Lean thinking and Agile methods to minimize waste and maximize value delivery.

Feature-Driven Development (FDD): A model-driven software development approach that focuses on features as the primary unit of work.

DevOps

DevOps (coined around 2009), like Agile, is not something that was created at a specific point in time by a single individual or group. Instead, it evolved over time as a response to the challenges and needs of the IT industry, particularly in the context of software development and operations.

DevOps is a set of principles, practices, and cultural philosophies that aim to bridge the gap between software development (Dev) and IT operations (Ops). It encourages collaboration and communication between these traditionally separate teams to streamline the software development and delivery process. DevOps seeks to create a culture of continuous improvement, automation, and agility, ultimately enabling organizations to deliver software and IT services more efficiently, reliably, and rapidly. Here are key aspects of DevOps:

Culture: DevOps emphasizes a cultural shift that promotes collaboration, shared responsibility, and open communication between development and operations teams. It encourages a "one-team" mindset where everyone works together to achieve common goals.

Automation: Automation is a fundamental pillar of DevOps. It involves automating repetitive and manual tasks, such as code deployment, configuration management, testing, and infrastructure provisioning. Automation helps reduce errors, increase efficiency, and accelerate the delivery pipeline.

Continuous Integration (CI): CI is the practice of frequently integrating code changes into a shared repository. Automated tests are run to detect and address integration issues early in the development process. CI helps maintain code quality and reduces the risk of integration problems.

Continuous Delivery (CD): CD extends CI by automating the process of deploying code changes to production or staging environments. It ensures that code is always in a deployable state, allowing organizations to release new features and updates more quickly and reliably.

Infrastructure as Code (IaC): IaC is a practice of defining and managing infrastructure using code. It allows for the automated provisioning and configuration of infrastructure resources, making it easier to maintain and scale IT environments.

Monitoring and Feedback: DevOps promotes the continuous monitoring of applications and infrastructure in production. This provides valuable feedback on system performance, user experience, and potential issues. Monitoring helps teams proactively respond to problems and improve overall system reliability.

Microservices and Containerization: DevOps often leverages microservices architecture and containerization technologies like Docker to break down applications into smaller, independently deployable components. This enhances scalability, flexibility, and the ability to manage complex systems.

Collaboration Tools: DevOps teams use various collaboration and communication tools to facilitate information sharing and coordination. Tools like chat platforms, issue tracking systems, and version control systems help streamline communication and workflow.

Security: DevOps integrates security practices throughout the software development lifecycle. DevSecOps extends the DevOps philosophy to include security considerations, ensuring that security is a shared responsibility and not an afterthought.

Continuous Improvement: DevOps promotes a culture of continuous improvement through regular retrospectives and feedback loops. Teams reflect on their processes, identify bottlenecks and areas for improvement, and iteratively enhance their practices.

DevOps is not a one-size-fits-all approach; it can be adapted to fit the specific needs and goals of an organization. Ultimately, DevOps aims to enhance collaboration, automate processes, and accelerate software delivery while maintaining high-quality standards and reliability.

The integration of Agile and DevOps practices into IT Service Management (ITSM) can have several positive impacts, leading to more efficient, collaborative, and customer-focused IT processes. Here are some of the possible impacts:

Faster Delivery of IT Services: Agile and DevOps emphasize iterative and incremental development, leading to quicker delivery of IT services and features. Agile methodologies, such as Scrum, break down work into smaller, manageable increments (sprints), allowing for faster releases. DevOps practices further streamline the development-to-operations pipeline, minimizing delays and bottlenecks.

Improved Collaboration: Agile and DevOps promote collaboration among cross-functional teams, including developers, operations, and other stakeholders. Agile frameworks encourage frequent communication and collaboration between team members, fostering a shared understanding of goals. DevOps extends this collaboration by breaking down silos between development and operations teams, creating a more integrated and collaborative environment.

Enhanced Flexibility and Adaptability: Impact: Agile principles enable teams to adapt to changing requirements, while DevOps promotes continuous feedback and improvement. Agile methodologies allow for flexibility and responsiveness to changing business needs, as teams regularly reassess and adjust priorities. DevOps emphasizes continuous integration, continuous delivery, and continuous monitoring, enabling teams to adapt quickly to evolving circumstances.

Increased Customer Satisfaction: Agile and DevOps prioritize customer needs and feedback, leading to improved customer satisfaction. Agile incorporates customer feedback through regular reviews and iterations, ensuring that the delivered products meet customer expectations. DevOps extends this focus by emphasizing rapid delivery of features and addressing issues promptly, contributing to overall customer satisfaction.

Reduced Time-to-Market: Agile and DevOps practices aim to shorten the time it takes to deliver new features and services to end-users. Agile's incremental approach and DevOps' emphasis on automation and collaboration contribute to a streamlined development and deployment pipeline, reducing the time it takes to bring new services and features to the market.

Optimized Resource Utilization: Agile and DevOps help optimize resource allocation by promoting cross-functional teams and efficient workflows. Agile teams are typically cross-functional, reducing dependencies on specialized roles. DevOps automates repetitive tasks, allowing teams to focus on higher-value activities. Together, these practices contribute to better resource utilization and efficiency.

Continuous Improvement Culture: Agile and DevOps foster a culture of continuous improvement and learning within ITSM teams. Agile encourages retrospective meetings to reflect on what went well and what could be improved in each iteration. DevOps promotes continuous monitoring and feedback loops, allowing teams to identify areas for improvement and implement changes incrementally.

Enhanced Quality and Reliability: Agile and DevOps practices contribute to higher-quality software through automated testing, continuous integration, and continuous delivery. Agile's focus on testing throughout the development process and DevOps' automation of testing and deployment processes result in more reliable and resilient IT services.

Improved Risk Management: Agile and DevOps help manage risks by encouraging early identification and mitigation of issues. Agile's iterative approach allows teams to identify and address risks early in the development cycle. DevOps practices, such as automated testing and continuous monitoring, contribute to risk reduction by identifying and addressing issues in real-time.

Cultural Transformation: Agile and DevOps contribute to a cultural shift towards collaboration, shared responsibility, and a focus on delivering value. Both Agile and DevOps require a cultural transformation within organizations, breaking down traditional silos and fostering a more collaborative and customer-centric mindset.

It's important to note that successful implementation of Agile and DevOps in ITSM requires a thoughtful approach, cultural alignment, and ongoing commitment to continuous improvement. The combination of these methodologies can lead to a more responsive, efficient, and customer-oriented ITSM environment.

III. RESEARCH METHODOLOGY

The systematic literature review (SLR) was performed leveraging the framework for literature review proposed by Kitchenham (2004), which includes three stages: planning the review, conducting the review, and reporting the review.

Here is an overview of the key components of Kitchenham's SLR framework:

1. **Define the Research Questions**: Clearly articulate the research questions or objectives that the systematic literature review aims to address. These questions guide the entire review process.
2. **Develop a Search Strategy**: Specify the search terms and criteria for identifying relevant studies. This includes defining the databases, journals, and other sources to be searched. The search strategy should be systematic and reproducible.
3. **Conduct the Initial Search**: Execute the search according to the defined strategy. Record and document the results, including the number of articles found in each database, and any excluded articles with reasons.
4. **Screening and Selection**: Apply inclusion and exclusion criteria to the initially retrieved articles. Screen the titles and abstracts to identify potentially relevant studies. Then, assess the full text of these potentially relevant studies to determine their eligibility.
5. **Quality Assessment**: Evaluate the quality of the selected studies. Kitchenham emphasizes the importance of assessing the methodological rigor of each study to ensure the reliability and validity of the evidence.
6. **Data Extraction**: Systematically extract relevant data from each included study. This may include details about the research design, sample characteristics, key findings, and other relevant information.
7. **Data Synthesis and Analysis**: Analyze the extracted data to identify patterns, trends, and common themes across the selected studies. This step involves synthesizing the evidence to draw conclusions and answer the research questions.
8. **Results Presentation**: Present the results of the systematic literature review in a clear and organized manner. This typically includes summarizing the key findings, highlighting trends, and providing insights derived from the analysis.
9. **Discussion and Conclusion**: Discuss the implications of the findings in the context of the research questions. Consider the limitations of the review and suggest areas for future research. Conclude with a summary of the key contributions and insights gained.
10. **Iterative Process**: Kitchenham emphasizes that the SLR process is iterative. If new insights or questions emerge during the review, it may be necessary to revisit earlier stages, such as refining the research questions or adjusting the search strategy.

Additionally, we have incorporated the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) methodology checklist into our review.

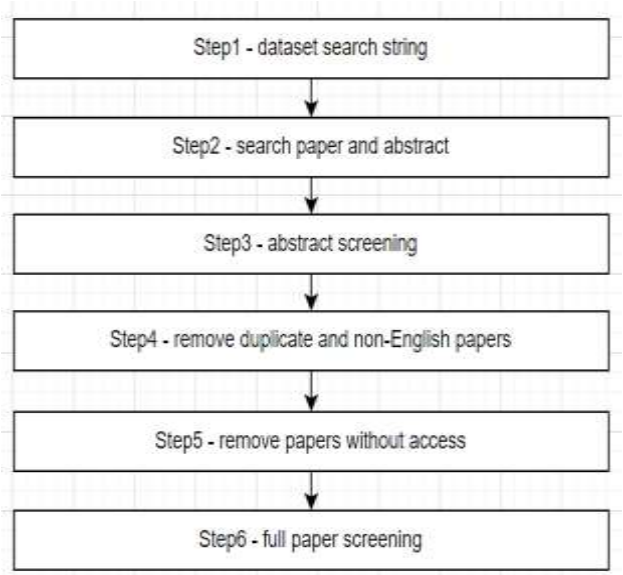

Fig 1 - PRISMA Method

Research Question 1 - How the literature regarding the application of Agile and DevOps in IT service management has been performing in recent years?

Research Question 2 - What are the potential challenges and future research directions regarding the application of Agile and DevOps in IT service management?

The **first activity** was to define search terms and search string used to perform the search on the selected databases. The final search string used was "(Agile OR "DevOps") AND (ITSM OR "IT Service Management")". This search string was constructed based on the research domains of this work (IT service management). This string was adapted for performing the search in each database. The period between January of 2015 and August of 2023 was considered in this research.

was defining the search string.

The **second activity** was defining the scientific databases where to perform the search for articles. Table 1 shows the selected databases. The criterion used for selecting these databases was the importance of the digital database to the information technology/engineering area, to cover the most relevant scientific literature on Agile and DevOps.

Table 1- Database

Data Source	Reference
Web of Science	https://clarivate.com/products/web-of-science/
Emerald Insight	https://www.emeraldinsight.com/
Taylor and Francis	https://taylorandfrancis.com/
IEEE Xplore	https://ieeexplore.ieee.org/Xplore/home.jsp
Science Direct	https://www.sciencedirect.com
ACM	https://dl.acm.com
Scopus	https://www.scopus.com
Google Scholar	https://scholar.google.com.br

The **third activity** was to perform the search in the databases, obtaining BibTeX and RIS files. The fifth step was to import all the retrieved BibTeX and RIS files that were generated by the databases after each search with the search results into the reference management software Mendeley (https://www.mendeley.com, accessed on 22 August 2022), classified by scientific data source. The numbers of papers returned by each scientific data source are shown in Table 2.
The **fourth activity** was to remove duplicate papers. The **fifth** activity was to remove papers without access.
The **sixth activity** was to conduct the "first selection" process on the papers of each database, achieving the relevant results shown in Table 2.

Table 2 - Results

DATABASE	STEP1	STEP2	STEP3	STEP4	STEP5	STEP6
WEB OF SCIENCE	15	15	14	7	7	2
EMERALD INSIGHT	5	5	4	4	1	0
TAYLOR AND FRANCIS	21	4	4	1	0	0
IEEE XPLORE	326	7	7	7	1	0
SCIENCE DIRECT	580	64	52	6	5	0
ACM	157	36	28	5	5	1
SCOPUS	31	19	18	7	5	3
GOOGLE	28	28	27	22	20	7
TOTAL	**1163**	**178**	**154**	**59**	**44**	**13**

The final list has 44 screened papers, which will be assessed in the following section of this work.
In **step 1**, the search string was applied to all fields in all documents for each dataset resulting in 1163 papers. In **step 2**, the same search string was used to filter in research and peer-reviewed publications with keywords either in titles, paper content or abstracts, resulting in a total of 178 papers for screening. The discrepancy from step 1 to step 2 is justified by the fact that initially the keywords could be found anywhere within the returned item, and some search engines return more literature than just academic papers. In **step 3** after applying a review in the abstract and removing papers not written in English, non-peer-reviewed or inaccessible papers a total of 154 articles remained. In **step 4** a more detailed review to ensure the paper subject was around this research resulting in 59. This led to **step 5**, which involved removing duplicates from the list of results to obtain a set of documents for abstract screening resulting in 44 papers. Following the screening, a full-text document assessment was conducted in **step 6**, resulting in the identification of 13 eligible documents for further analysis and extraction of relevant information for this research.

Table 3 - Final List of papers

#	Year	Authors	Publication
1	2023	Faustino, J. et al	The influence of DevOps practices in ITSM processes
2	2022	Sabharwal, N. et al	Hands-On Guide to AgileOps
3	2021	Adriano, D. M.	DevOps and Information Technology Service Management: A Problem Management Case Study
4	2021	Valdivia-Bedregal, J. et al	Private LTE Network Service Management Model, based on Agile Methodologies, for Big Mining Companies
5	2021	Cherinka, R. et al	The Impact of Agile Methods and "DevOps" on Day 2+ Operations for Large Enterprises
6	2020	Faustino, J. et al	Agile information technology service management with DevOps: An incident management case study
7	2020	Woo, H. et al	Impact of ITSM military service quality and value on service trust
8	2020	Maroukian, K., and Gulliver, S.	Exploring the link between leadership and Devops practice and principle adoption

9	2020	Zaydi, M., and Nassereddine, B	DevSecOps practices for an agile and secure IT service management
10	2020	Sliep, C., and Marnewick, C.	The quest in delivering quality IT services: The case of a higher education institution
11	2020	Galup, S. et al	What Do Agile, Lean, and ITIL Mean to DevOps?
12	2018	Kaiser, A. K.	Reinventing ITIL® in the Age of DevOps: Innovative Techniques to Make Processes Agile and Relevant
13	2017	Abdelkebir, S. A. H. I. D. et al	An Agile Framework for ITS Management In Organizations. A Case Study based on DevOps

IV. RESULTS

This section shows the results of this research regarding the 13 final papers screened. Sections below discuss the results regarding, respectively, research questions 1 and 2, and provide answers to such questions.

RQ1 - How has the literature regarding the application of Agile and DevOps in IT Service Management has been performing in recent years?

As shown in the figure below the number of research which relates to one of the three topics has an increase after 2020 although there is very few research in this area since 2015.

This increase of papers in 2020 could be due to the launch of ITIL V4 and the maturity of Agile and DevOps and increase usage in organizations.

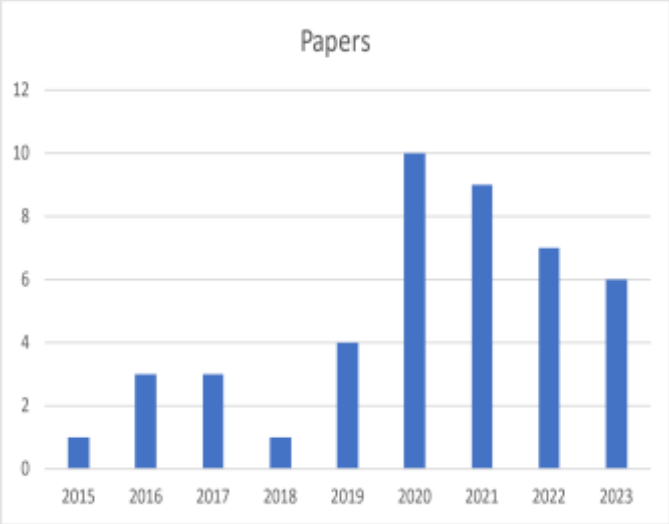

Figure 2 - Number of Papers per year

The coverage of papers per area is shown in the following figure. As identified, 30% of papers (13) cover the three areas of the subject of this SLR.

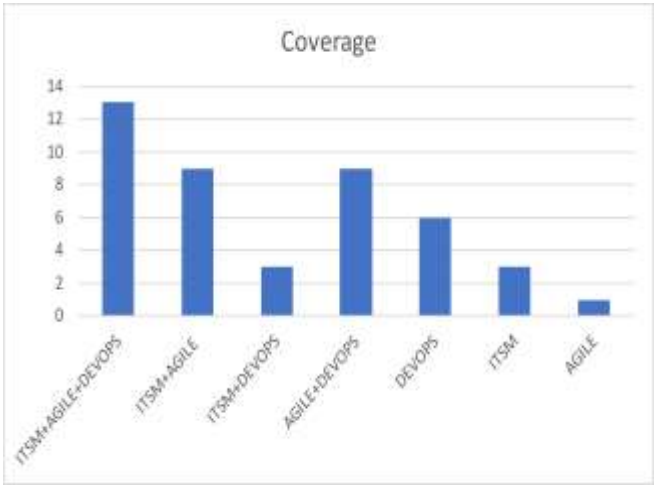

Figure 3 - Coverage papers per area

Regarding the research that matches the three topics (13), the figure below shows the breakdown of research per year.

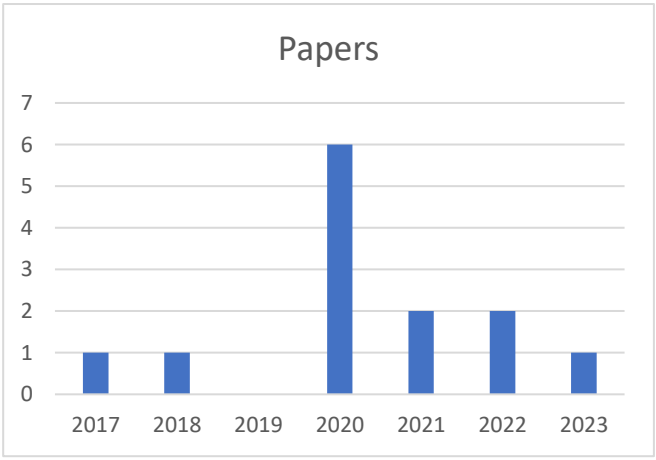

Figure 4 - Papers with three topics

As seems in figure 4 there are not many papers that reference the three topics in the same research.

RQ2 - What are the potential challenges and future research directions regarding the application of Agile and DevOps in IT service management?

Among all the research that discusses the three topics below we provide an overview of what they are discussing about.

Abdelkebir et al. (2017) proposes an Agile framework to improve ITSM service management processes with the addition of DevOps practices. It also defines an ITSM agility maturity model based on DevOps that can guide organizations to improve ITSM.

Kaiser (2018) provides a very detailed walkthrough of ITIL and DevOps and how ITIL fits into the DevOps scheme of things. Some services such as incident and change management are described in more detail. It also describes how could integrate and align with DevOps processes.

Galup et al. (2020) analyses the importance of having skills in Agile, ITSM and DevOps since integration of ITIL with Agile and Lean is a positive step in establishing a practical framework to enable the implementation of DevOps.

Sliep and Marnewick (2020) propose a conceptual multi-dimensional framework to improve quality-of-service delivery to customers.

Zaydi and Nassereddine (2020) investigate how DevSecOps culture can be applied in IT service management. The analysis is based on interviews of practitioners that are adopting SecOps in ITSM.

Maroukian and Gulliver (2020) in their paper is more focused on DevOps principles adoption other than ITSM. It concludes that it benefits from the existence of highly structured service management approaches from the existence of change management, release and deployment management, service level management, incident management and service catalog management.

Woo et al. (2020) looks at the impact of quality of service on value, satisfaction, and trust in a military organization. It does not really preclude investigating how DevOps can improve ITSM.

Faustino et al. (2020) investigate how DevOps culture can be applied in the incident management process and concludes it can be improving Incident Management. Analysis was based on a set of interviews.

Cherinka et al. (2021) in their paper focuses on the "Ops" of DevOps discussing key findings and challenges that operations organizations face in the era of continuous engineering. It provides a set of lessons learned based on experience from authors.

Valdivia-Bedregal et al. (2021) proposes a model framework to leverage DevOps, Agile and ITSM. It does not provide much detail about where and how DevOps and Scrum will be used to support ITSM. It only mentions it will be used with the implementation of new services.

Adriano (2021) aims to research how DevOps practices can be applied to Problem Management. The research was conduct through a set of interviews with subject matters experts in PM of a big German multinational company. As a result, authors conclude that DevOps practices have varying degrees of significance for a Problem Management process and continuous planning and collaboration are prone to having greater significance in a Problem lifecycle, with the potential of enabling benefits such as quicker Problem identification, higher quality Root Cause Analysis, and improved resolution times. The authors emphasize that the research has some limitations like the lack of some DevOps practices such as Infrastructure as a Code.

Sabharwal et al. (2022) describe the fundamentals of ITSM, DevOps and Agile and provide some insights where they can be applied together to improve service management in cloud operations.

Faustino et al. (2023) research how DevOps practices can assist ITSM processes. This research concludes that automated deployment is the most useful practice and incident, and problem management is the most beneficial process. They also identify some ITSM processes where the implementation of DevOps practices could be applied, such as RM, IM, PM, and ChM and DevOps practices like automated deployment, continuous integration, automated tests, and shift-left can be leveraged. They conclude as future research the need to investigate other ITSM processes and the analysis of the adaptation of the existing ITIL processes and not only how the DevOps practices can fit in these processes.

As identified in the literature review there are few research around usage of Agile and DevOps in ITSM. Most of the research either focuses on one or another, but not on both. This is understood because they mostly claim that DevOps is considered an Agile method. The research of DevOps application in Problem Management and Incident Management are very good examples of research in this area.

As identified by Faustino et al. (2023) we also agree that more research is needed in applying Agile and DevOps in other areas of ITSM, particularly in change management, configuration management, inventory management, security management and release management.

Another future research is the investigation of DevOps practices of Infrastructure as Code (IaC) in these areas. This was not the primary object of this SLR, but during the analysis it was identified a capability that can bring many benefits to ITSM. Sabharwal et al. (2022) clearly defines the importance of DevOps practices to enable Agile operation management of IT infrastructure specifically in cloud environments.

V. CONCLUSION

This paper presented a systematic literature review on the application of Agile and DevOps in ITSM. The systematic literature review followed a protocol based on PRISMA.

Integrating Agile and DevOps methodologies into IT Service Management (ITSM) can bring several benefits, fostering a more dynamic, collaborative, and customer-focused approach to delivering IT services. It accelerates the end-to-end service delivery pipeline, reducing time-to-market for new features and updates, creates a culture of collaboration, enhances customer satisfaction by aligning IT services more closely with customer requirements and expectations. enhances organizational agility, allowing ITSM processes to adapt to changing circumstances and requirements. reinforces a culture of continuous improvement across ITSM processes, fostering a mindset of learning and adaptation and optimizes resource utilization by promoting cross-functional collaboration and reducing manual, time-consuming tasks.

The first research question referred to investigating the bibliometric evolution of publications regarding the usage of Agile and DevOps in ITSM. As a result, it was found only 13 publications within this area of research between 2015 and July 2023. The results show that there is very few research in this field. On the other way we found more research with DevOps and ITSM other than Agile and ITSM.

The second research question referred to indicating the potential challenges and future research directions regarding the application of Agile and DevOps in ITSM. Here again we

found very few research which combines Agile, DevOps and ITSM. One factor is that most of the research precludes DevOps is also Agile, which is not totally right because it does not follow Agile methodology entirely. Based on it we have not found any practical research which incorporates it all together (although we found a very good conceptual proposal in one reference). This is an area for future research, e.g., apply Agile with DevOps in some areas of ITSM such as release management, change management, inventory management, configuration management and security management with potential of leveraging Agile and DevOps in conjunction.

Another topic for future research that was identified as potential to bring benefits and improvements for ITSM, especially on cloud-based IT infrastructure, was the application of IaC DevOps practice. We suspect there may be research in this area, but, again, not with Agile methodology applicable.

Finally, we expect this research can bring an updated view about where we are in terms of cutting-edge research in this subject.

REFERENCES

1. Abdelkebir, S. A. H. I. D., Maleh, Y. and Belaissaoui, M. (2017) 'An agile framework for ITS management In organizations: A case study based on DevOps', In Proceedings of the 2nd International Conference on Computing and Wireless Communication Systems, pp. 1-8. https://doi.org/10.1145/3167486.3167556
2. Adriano, D. M. (2021) 'DevOps and Information Technology Service Management: A Problem Management Case Study', Doctoral dissertation, ISCTE-Instituto Universitario de Lisboa (Portugal).
3. Agutter, C. (2020) 'ITIL Foundation Essentials ITIL 4 Edition-The Ultimate Revision Guide', IT Governance Publishing Ltd.
4. Cherinka, R., Foote, S., Burgo, J., and Prezzama, J. (2021) 'The Impact of Agile Methods and "DevOps" on Day 2+ Operations for Large Enterprises', In Intelligent Computing: Proceedings of the 2021 Computing Conference, Volume 1 (pp. 1068-1081). Springer International Publishing. https://doi.org/10.1007/978-3-030-80119-9_71
5. Faustino, J., Pereira, R., Alturas, B., and Silva, M. M. D. (2020) 'Agile information technology service management with DevOps: An incident management case study', International Journal of Agile Systems and Management, 13(4), 339-389. https://doi.org/10.1504/IJASM.2020.112331
6. Faustino, J., Pereira, R., and Silva, M. M. D. (2023) 'The influence of DevOps practices in ITSM processes', International Journal of Services and Operations Management, 44(3), 390-407. https://doi.org/10.1504/IJSOM.2023.129464
7. Fowler, M., and Highsmith, J. (2001). The agile manifesto. Software development, 9(8), 28-35.
8. Gacenga, F., Cater-Steel, A. and Toleman, M. (2010) 'An International Analysis of IT Service Management Benefits and Performance Measurement', J. Glob. Inf. Technol. Manag., 13, 28–63. https://doi.org/10.1080/1097198X.2010.10856525
9. Galup, S., Dattero, R., and Quan, J. (2020) 'What do agile, lean, and ITIL mean to DevOps?', Communications of the ACM, 63(10), 48-53. https://doi.org/10.1145/3372114
10. Galup, S. D., Dattero, R., Quan, J. J., and Conger, S. (2009) 'An overview of IT service management', Communications of the ACM, 52(5), 124-127. http://doi.acm.org/10.1145/1506409.1506439
11. Gokarna, M., and Singh, R. (2021) 'DevOps: a historical review and future works', In International Conference on Computing, Communication, and Intelligent Systems (ICCCIS) (pp. 366-371). IEEE. https://doi.org/10.1109/ICCCIS51004.2021.9397235
12. Gotel, O. and Leip, D. (2007) 'Agile Software Development Meets Corporate Deployment Procedures: Stretching the Agile Envelope', in Concas, G. et al. (eds) International Conference on Extreme Programming and Agile Processes in Software Engineering. Springer, Berlin, Heidelberg, pp. 24–27. https://doi.org/10.1007/978-3-540-73101-6_4.
13. Jabbari R., Ali N.B., Petersen K. and Tanveer B. (2016) 'What is DevOps? A Systematic Mapping Study on Definitions and Practices', Proceedings of the Scientific Workshop Proceedings of XP2016, Edinburgh. https://doi.org/10.1145/2962695.2962707
14. Kaiser, A. K. (2018) 'Reinventing ITIL® in the Age of DevOps: Innovative Techniques to Make Processes Agile and Relevant'. Apress.
15. Kitchenham, B. (2004) 'Procedures for performing systematic reviews', Keele, UK, Keele University, p33, 1-26.
16. Koch, H. and Gierschner, C., (2007) 'Advantages of an ITIL-based Process Framework in a Complex SAP® System Landscape', In Proceedings of the 2007 4th IEEE Workshop on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications, Dortmund, Germany, pp. 431–433. https://doi.org/10.1109/IDAACS.2007.4488454
17. Maroukian, K., and Gulliver, S. (2020) 'Exploring the link between leadership and Devops practice and principle adoption', Advanced Computing: An International Journal, 11(4). https://doi.org/10.5121/acij.2020.11401

18. PRISMA, Prisma Statement. Available online: http://www.prisma-statement.org/ (accessed on 21 June 2023).
19. Sabharwal, N., Rathore, R., and Agrawal, U. (2022) 'Hands-On Guide to AgileOps'.
20. Sliep, C., and Marnewick, C. (2020) 'The quest in delivering quality IT services: The case of a higher education institution', Education and Information Technologies, 25, 4817-4844. https://doi.org/10.1007/s10639-020-10198-0
21. Valdivia-Bedregal, J., Bedregal-Alpaca, N., and Castañeda-Huaman, E. (2021) 'Private LTE Network Service Management Model, based on Agile Methodologies, for Big Mining Companies', International Journal of Advanced Computer Science and Applications, 12(4).
22. Varga, S., Barreto, G., & Battaglin, P. D. (2020). A holistic IT infrastructure management framework, International Journal of Computational Science and Engineering, 21(1), 1-9. https://doi.org/10.1504/IJCSE.2020.105222
23. Varga, S., Barreto, G., and Battaglin, P. D. (2019a) 'Increasing Information Systems Availability Through Accuracy, Awareness, Completeness and Manageability of ITSM', 2019 14th Iberian Conference on Information Systems and Technologies (CISTI), 1–4. https://doi.org/10.23919/CISTI.2019.8760686
24. Woo, H., Lee, S., Huh, J. H., and Jeong, S. (2020) 'Impact of ITSM military service quality and value on service trust', Journal of Multimedia Information System, 7(1), 55-72. https://doi.org/10.33851/JMIS.2020.7.1.55
25. Zaydi, M., and Nassereddine, B. (2020) 'DevSecOps PRACTICES FOR AN AGILE AND SECURE IT SERVICE MANAGEMENT', Journal of Management Information & Decision Sciences, 23(2).