

Challenges in adopting agile methodology in public organisations IT project management – A systematic literature review

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Abstract

Agile methodology has existed for over a decade – its potential benefits have made it attractive and popular. As part of innovation, public organisations increasingly invest in information technology systems. Nevertheless, complex information technology adaptive systems require adaptability and flexibility to improve public organisations' delivery systems. Even though the Agile methodology can increase productivity and quality, adopting agile scrum methodology in public organisations is challenging. This study investigates public organisations where IT projects have unclear requirements and cross-functional team environments – which the scrum methodology is typically best suited for. However, despite the widely spread agile method concept and the need increased in the last two decades, still public organisations are not fully adapted to agile scrum methodology, and researchers have noticed slow and ineffective changes in adopting it. While many studies are available on challenges in adopting agile scrum methodology in public organisations' IT project management, there is a lack of comprehensive understanding of these challenges. Therefore, challenges in adopting Agile scrum methodology in public organisations' IT project management context were studied in this literature review. This study aims to report on a systematic literature review about adopting agile scrum methodology in public organisations' IT project management and provide empirical evidence about its current situation and challenges. This research has used a systematic literature review as a research strategy and thematic analysis to analyse the secondary data, where the analysis is conducted based on the filtered themes, sub-themes and codes. The systematic literature review uses the preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework; inclusion and exclusion criteria systematically assess the quality of chosen papers and either include or exclude them for this research. Most relevant studies for final inclusion were selected, screened, and shortlisted based on the keywords from academic databases and other online resources to investigate and analyse the research question. The implementation of the agile scrum methodology in IT project management can present notable challenges for public organisations. A number of sources have identified these challenges, and a thorough examination of the matter reveals their frequency.

Keywords: Agile scrum methodology, public organisations, information technology, IT systems, Project management.

Synopsis

Background

The need for agile methodology has increased in the last two decades. Public organisations use IT systems extensively to be productive and adaptive to a rapidly changing world. However, as service providers, improving their IT delivery systems is critical for public organisations. Complex IT adaptive systems require some more flexible methods than traditional ones. Nevertheless, as the agile scrum methodology is more challenging to implement in larger IT projects, public organisations need help to cope with the dynamic world in adopting it to provide better service.

Problem

Public organisations are struggling to adopt Agile methodologies due to their top-down hierarchical structures – as they have spent years changing their culture to define and follow the traditional processes. As a result, it is challenging to switch to an agile model in which the agile team's operations are informal and defined. Hence, the agile methodology adoption in public organisations is still slow and very limited. Furthermore, while many studies are available on challenges in adopting agile scrum methodology in public organisations' IT project management, there is a lack of comprehensive understanding of these challenges. Therefore, this study aims to report other studies' findings to provide empirical evidence about its current situation and challenges.

Research Question

What are the challenges in adopting Agile scrum methodology in public organisations' IT project management?

Research Methodology

This thesis uses a systematic literature review to answer the research question and an in-depth empirical inquiry into the existing literature to analyse the state of agile scrum methodology issues in public organisations. PRISMA is used in this systematic literature review – the inclusion and exclusion criteria systematically assess the quality of the chosen papers.

Analysis

The systematic literature review used keywords to extract the relevant articles and was limited to articles published in the last five years. Only full-text, English-language

articles that specifically address the use of agile approaches in public organisations are included in the study, and those that do not meet the requirements are excluded. Then, the data was analysed using thematic analysis to identify patterns from the scientific articles, draw themes regarding the research question, and represent some level of patterned discussions within the data set to answer the research question.

Result

The Systematic Literature Review used thematic analysis to identify themes relevant to the research question based on fifteen scientific papers. Thematic analysis was conducted based on the filtered five themes: resistance to change, lack of understanding of agile, cultural differences, lack of leadership support and Inability to measure progress, and eleven sub-themes.

Discussion

Adopting agile scrum methods is challenging in a public organisation. However, it is still widely used despite being slower and more complex. Public organisations still need to test and exploit agile scrum methods sufficiently. Therefore, as there is a restricted set of scientific evidence to extract conclusive results to say that scrum methodology is effective, the aspects of adopting agile methods in the public organisation should be empirically evaluated.

Limitations

A systematic literature review is a valuable method. Nevertheless, as with any other method, some limitations come to light in this study. Some studies that could be related to the subject were not analysed – they were excluded because of the exclusion criteria.

Conclusion

Agile scrum methods could be adopted in public organisations; however, only some of the implications of adopting agile scrum methods are widely known. Technology is critical for both private and public organisations to provide better services, which requires investment in infrastructure, human resources, and building a wealth of knowledge and experience. Despite investing in modern technology, cultural differences, limited resources, lack of leadership support, limited experience, and difficulties in measuring progress are challenges in adopting agile scrum methodology. However, by recognising and addressing the challenges, public organisations can advance an environment conducive to agile practices, ultimately improving efficiency, collaboration, and project outcomes to achieve organisational goals.

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List of Abbreviations

Dynamic Systems Development Method	DSDM
Feature-driven development	FDD
Information Technology	IT
National Health Service	NHS
Reporting Items for Systematic Reviews and Meta-Analyses	PRISMA
Systematic Literature Review	SLR
Thematic Analysis	TA
Research Question	RQ

Chapter 1

Introduction

This chapter provides an overview of Agile methodology and public organisations, followed by the research problem and research question (RQ).

1.1 Background

The agile methodology is a popular and highly implemented software development model in the software industry that requires minimal planning and divides tasks into small increments (King, 2014). Agile methodology is iterative, people-oriented, driven by client requirements, and collaborative and requires minimum documentation (Singh, 2019). Agile methodology development has introduced new ways of thinking about Project Management, which impacts project management organisations in various ways. As a result, many companies, especially those focusing on software development, implement variations of Agile methodology to manage Information Technology (IT) projects more effectively and meet customers' expectations faster and better than the traditional approach (Rasnacis et al., 2017). According to KPMG International Limited (2022), there are different approaches to agile methodologies, for example, Scrum methodology – which can play a crucial role in enabling project success and customer happiness. Agile scrum methodology focuses on continuous collaboration between managers and stakeholders to provide consistent, real-time feedback and improvements at all project stages (Ma'arif et al., 2018). All the stakeholders can evaluate results continuously, so project members have a natural mechanism for responding to change quickly and appropriately (Schwaber & Sutherland, 2020).

The past decades have seen a shift in policymakers' attention to the importance of appropriateness and effectiveness. As a result, public organisations are implementing technology assessments to aid the selection and management of technology (Sargolzaei et al., 2017). Although the approval and implementation are dawdling, technology's potential benefits acknowledge that the need for IT is vital in improving outcomes (Rasnacis et al., 2017). Therefore, adopting an appropriate project management methodology is crucial for public organisation IT innovation, providing stakeholders with a more personalised and improved experience (Lane, 2019). However, although several studies have revealed that Agile can significantly increase productivity and quality, public organisations face challenges in adopting it – as the agile scrum methodology is more challenging to implement in larger IT projects (Miller, 2013).

1.2 Research Problem

As stated in the introduction section, Russo (2021) highlighted that agile methodologies were first implemented in small teams, projects, and companies. However, agile practices have been scaled up for use in public organisations. Nevertheless, due to hierarchical structures, public organisations are struggling to adopt Agile methodology. For example, many public organisations and service providers, such as the UK's National Health Service (NHS), have spent years changing their culture to define and follow the traditional processes. So, it is challenging to switch to an agile model in which the processes are informal and defined by the agile team. Therefore, there have been evident challenges related to adopting agile methodology in public organisations' project management, which is still slow and very limited (Nuottila et al., 2016).

These problems are also reflected in academic research; many studies have been conducted and are available on challenges in adopting agile methodology in public organisations, indicating that further research in the field is needed (Abrahamsson et al., 2009). For example, Vacari et al. (2015) have conducted SLR on 'Adopting Agile Methods in the Public Sector' in the context of software development, which focused on reasons and benefits, problems and challenges, and lessons learned; however, there is a lack of comprehensive understanding of these challenges in the context of IT project management. For these reasons, this study aims to report on a systematic literature review (SLR), which has not been conducted before, about the challenges in adopting agile scrum methodology in public organisations' IT project management and provide empirical evidence about its current situation and challenges.

1.3 Research Question

This thesis investigates the challenges public organisations face in adopting agile scrum methodology in IT project management. As highlighted in previous sections, this thesis focuses on answering the RQ.

- What are the challenges in adopting agile scrum methodology in public organisations' IT project management?

This chapter has attempted to summarise the literature relating to Agile methodology and public organisations, followed by the study's problem, which leads to defining the research question. Further discussions and a summary of the main findings are provided in the next chapter.

Chapter 2

Literature Review

The previous chapter has discussed a summary of the study. This chapter offers an extended background of the previous chapter in general, particularly about agile, the development of agile scrum methodology, the challenges in adopting them, and public organisations in the context of IT project management. Before examining the literature review and understanding current discussions, it should first be explored what exactly agile, scrum and public organisations mean.

2.1 Agile in IT Project Management

2.1.1 Agile

Agile comes from the idea that changes are inevitable, and it is all about thinking through how to understand the current market, identify the uncertainty, and adapt to that as one goes along (Kaelin, 2005). Agile is described by Meick (2021) as an iterative approach that responds to change quickly and helps teams deliver value to their users on time. According to Atlassian company (2019), Agile is a project management method that divides tasks into small tasks and continuously reassesses and adapts plans. Agile is a general terminology expressed as a set of methods and practices that reflect on the values (Wettergren, 2021), and there are different approaches to agile methods; Kanban, Scrum, Extreme Programming (XP), Crystal, Feature-driven development (FDD), Dynamic Systems Development Method (DSDM) and Lean (Keita, 2020a). In addition, agile offers the ability to balance flexibility and stability to create and respond to change to benefit from the turbulent market (Agile Alliance, 2019).

Agile methodology has emerged as a dynamic and iterative approach to project management, emphasising flexibility, collaboration, and adaptability (Malakar, 2021). Agile methodology is guided by a set of core principles that prioritise customer satisfaction, iterative development, and constant collaboration (Amorim et al., 2020). Customer involvement is one of the key principles of agile methodology emphasises the active participation of customers or stakeholders throughout the project lifecycle. So, involving customers in the decision-making process, agile methodology ensures that the final product meets their evolving needs and expectations (Almeida, 2017). Another fundamental principle of agile methodology is iterative development. Instead of following a linear and sequential approach, agile projects are divided into short iterations, often referred to as sprints (Atlassian, 2019). Each sprint focuses on delivering a working product increment, allowing continuous feedback and improvement. This iterative approach enables teams to respond to changes, adapt to

new requirements, and address potential issues early in the development process (Schneider et al., 2020).

Collaboration is also a vital aspect of agile methodology (Almeida, 2017). Cross-functional teams work closely together, promoting effective communication, knowledge sharing, and collective ownership of project outcomes (Edison et al., 2021). Collaboration extends beyond team members to include customers, stakeholders, and other relevant parties. Regular meetings, such as daily stand-ups and sprint reviews, facilitate transparent communication, alignment, and decision-making. Agile methodology values adaptability and embraces change as a natural part of the project lifecycle. It acknowledges that requirements and priorities may evolve over time and thus encourages flexibility in project planning and execution. Agile teams continuously assess and adjust their strategies to accommodate changing circumstances and maximise value delivery (Schneider et al., 2020).

Agile methodology offers several distinct advantages compared to traditional project management approaches, such as the Waterfall model. Unlike Waterfall, which follows a linear, sequential process, Agile embraces an iterative and incremental approach (Al-Saqqa et al., 2020). This allows for early and frequent delivery of working product increments, providing stakeholders with tangible results and the opportunity for feedback and course correction (Gerster et al., 2020). Agile allows the team to respond quickly to changes and adjust their plans accordingly. These make it well-suited to projects with high uncertainty or complexity, where traditional, more rigid approaches may be less effective (Keita, 2020c). Another significant difference is the customer-centric focus of agile methodology.

Traditional project management approaches often rely on detailed upfront planning, where requirements are determined at the beginning of the project and remain relatively fixed throughout (Almeida, 2017). In contrast, agile methodology places a strong emphasis on customer collaboration and the ability to adapt to evolving customer needs and market dynamics (Otero et al., 2020). This customer involvement increases the likelihood of developing a product that meets user expectations. Furthermore, agile methodology promotes cross-functional collaboration, breaking down silos and fostering a shared sense of responsibility (Mishra et al., 2017). Traditional project management approaches often assign specific roles and responsibilities, limiting collaboration and flexibility. Agile's team-based approach encourages frequent communication, knowledge sharing, and collective decision-making, resulting in enhanced collaboration and a greater sense of ownership among team members (Amorim et al., 2020).

According to Almeida (2017), other critical aspects of Agile include continuous delivery. Also, cross-functional teams, encompassing diverse skills and expertise, work collaboratively instead of relying on specialised roles. Face-to-face communication, facilitated by daily stand-up meetings and retrospectives, promotes transparency and

open dialogue (Amorim et al., 2020). The Agile approach embraces flexibility, adapting to changing requirements and priorities, aiming to deliver value quickly while fostering collaboration and continuous learning. In public organisations, Agile's emphasis on stakeholder collaboration, transparency, and accountability aligns with the need for involving key stakeholders and meeting regulatory requirements (Otero et al., 2020). Besides, agile's adaptability assists public organisations in responding to changing priorities and managing risks associated with legal and regulatory constraints, ultimately enhancing the success of IT projects in public organisations (Eriksson et al., 2020).

2.1.2 IT Project Management

Effective IT project management is of paramount importance in public organisations due to several reasons. Firstly, public organisations increasingly rely on IT systems and technologies to enhance service delivery, streamline operations, and improve citizen engagement (Miller, 2013). IT projects enable the development and implementation of innovative solutions that address critical societal challenges, improve public services, and optimise resource utilisation (Mergel et al., 2021). Secondly, IT projects in public organisations often involve sensitive and confidential information, necessitating robust project management practices to ensure data security, privacy, and regulatory compliance with the data protection act (Ribeiro et al., 2018). Also, public organisations are responsible for safeguarding citizens' personal information and ensuring the integrity of data systems complained with General Data Protection Regulation (GDPR). Effective project management is vital in mitigating risks, adhering to legal requirements, and maintaining public trust. Furthermore, successful IT project management in public organisations helps achieve organisational goals and objectives (Musawir et al., 2020).

Projects delivered on time, within budget, and with the expected quality outcomes can significantly impact public service delivery, policy implementation, and operational efficiency (Domingues et al., 2017). Effective IT project management enables public organisations to optimise resource allocation, manage risks, and achieve desired project outcomes, ultimately contributing to organisational effectiveness and public value creation (Goncalves, 2022). Additionally, IT projects in public organisations often involve collaboration and coordination among multiple agencies or departments. Effective project management practices facilitate interdepartmental or interagency cooperation, enabling streamlined communication, shared decision-making, and efficient resource allocation. Successful collaboration enhances the overall effect of IT projects' effectiveness and efficiency of organisations to leverage synergies and achieve collective goals.

However, according to Rigby et al. (2017), IT project managers face challenges in adopting agile methodology in public organisations. For example, the lack of

communication may hinder the stakeholders' efficiency and transparency and inflate risk. Additionally, a lack of training and support prevents employees from understanding and adopting agile practices. As a challenge, the late involvement of stakeholders in the process makes them unsupportive of the project and misunderstands the value it will bring. Additionally, the gap in working with senior leadership and the bureaucratic barriers may slow IT projects (Domingues et al., 2017). However, this may involve getting buy-in from senior leaders or working with them to streamline processes. Finally, as public organisations may have strict budget constraints, it may not be necessary to be flexible and adaptable to work within these constraints, and this disallows prioritising certain features or adjusting the IT project scope (Goncalves, 2022).

2.1.3 Scrum

Scrum is an agile methodology that can address complex adaptive problems while productivity and creativity deliver products of the highest possible value (Goncalves, 2022). Scrum is a process framework developed in early 1990. Scrum helps teams work together and manage product development (Schwaber and Sutherland, 2020). In the scrum methodology – the product develops in the sprint; the product must be delivered within the sprint, with people working as a single team and constantly delivering a functioning product (Nair, 2021). So, the plan, do, check, and actions are done based on continuous customer feedback (Schwaber and Sutherland, 2020). When the product is delivered in a sprint, get the feedback from the stakeholder, where those feedbacks are the most valuable feedback, and work on them until the users are satisfied. So, this methodology allows the stakeholders to be part of the whole process, from planning to delivery.

According to Agile Alliance (2019), Scrum allows teams to hypothesise how something works for them and their tasks, practice it, reflect on the experience, and make functional alterations. In addition, Scrum inspires teams to learn from experiences, self-organise, and continuously reflect on their work to improve (Keita, 2020c). Software development teams most frequently use Scrum; however, its principles and lessons can be utilised in all kinds of teamwork, which is why Scrum is so popular (Clarizen, 2021). By contrast, there are limitations with other agile methodologies, such as Kanban; how many tasks can be in progress at a time – which means new tasks begin once others have been completed, less effective in a shared-resource environment and may cause a problem product demand change (Shoo, 2017). According to Almseidin et al. (2015), statistically, Scrum is the dominant technique in public organisations, with XP a close second. As the Scrum process is iterative and incremental – changes may be made at any point in the process, allowing new legislation to be included in the project without slowing it down. However, the remaining Agile methods have limitations (Santos, 2018). For example,

- Crystal gives the team too much discretion in determining how to operate in non-standardised project management (Singh, 2019a).
- Feature-driven development (FDD) is not well-known, and it does not offer measures that suppress pre-existing concerns in the organisation (Firdaus et al., 2014).
- The Dynamic Systems Development Method (DSDM) does not offer any capabilities for tracking ongoing projects (Farooq, 2018).

Public organisations' IT projects have unclear requirements (Rigby et al., 2017); Scrum is typically best-suited for projects with unclear requirements, likely to experience change and require frequent testing. Therefore, the study focuses on Scrum as a result of being capable of breaking large projects into small portions and fast response to changing requirements (May, 2021).

2.1.4 Public Organisations

Public organisations are large producers and consumers of goods and services. They are publicly controlled or funded by the public – usually non-profits that provide a fair service to the taxpayers (Bratt et al., 2013). According to Privacy Sense (2016), January edition, public organisations consist of the government and other public agencies whose goals are ultimately to work for the public welfare, improve access to services or address the public's concerns, and offer public goods and services to society to achieve their goals. Additionally, these public organisations have common grounds that work towards goals set by government departments (Uyar et al., 2020) – their works are often heavily scrutinised to ensure maximum productivity and high standards (Wegrich, 2019). However, public organisations face challenges in adopting agile methodology.

Public organisations, such as government agencies, municipal bodies, and non-profit institutions, possess distinct characteristics that differentiate them from their private organisations counterparts (Eriksson et al., 2020). These characteristics significantly influence the management of IT projects within public organisations.

Firstly, public organisations often operate in a complex and highly regulated environment – legal frameworks, governmental policies, and public scrutiny bind them. These regulatory constraints impose specific requirements and procedures on IT project management, necessitating careful compliance and adherence to established guidelines (Mergel et al., 2021). The bureaucratic nature of public organisations can introduce additional layers of approval, decision-making processes, and hierarchical structures, which can impact project timelines and the agility of project teams.

Secondly, public organisations frequently face resource constraints, including budget limitations and competing priorities. Government agencies, for instance, must allocate funds to various public services and programs, making resource allocation for IT projects a challenging endeavour (Musawir et al., 2020). These constraints can affect the availability of skilled personnel, infrastructure, and technology resources, ultimately impacting project planning, execution, and outcomes.

Additionally, the procurement processes in public organisations often involve lengthy procedures and strict vendor selection criteria, leading to delays in project initiation and implementation. Moreover, public organisations are often characterised by a diverse stakeholder landscape. Projects in public organisations typically involve multiple stakeholders, including government departments, citizens, interest groups, and regulatory bodies (Eriksson et al., 2020). The involvement of numerous stakeholders introduces complexities in project governance, decision-making, and stakeholder engagement. Balancing the stakeholders' diverse needs, interests, and expectations demand, requiring effective communication, collaboration, and conflict-resolution mechanisms (Mergel et al., 2021).

2.2 Agile in the Public Organisations

Several factors influence the adoption of agile methodology in public organisations (Boehm et al., 2005). Firstly, the growing complexity and dynamic nature of IT projects in public organisations create a need for flexible and adaptive project management approaches (Holden et al., 2021). Agile's iterative and incremental nature allows public organisations to respond effectively to changing requirements, evolving stakeholder needs, and shifting project priorities (Caldwell, 2021). The ability to deliver value quickly and incorporate feedback early in the development process aligns well with the dynamic environment of public organisations. Secondly, the increasing demand for citizen-centric services and digital transformation initiatives drives the adoption of agile methodology (Caldwell, 2021). Agile's customer-centric approach strongly emphasises involving stakeholders throughout the project lifecycle. This aligns with the public organisation's focus on delivering services that meet the needs and expectations of citizens, promoting user satisfaction and engagement.

Another factor influencing the adoption of agile methodology in public organisations is the need for greater collaboration and transparency. Agile's emphasis on cross-functional teams, face-to-face communication, and stakeholder engagement facilitates collaboration among different departments, organisations, and internal and external stakeholders (Bogdanova et al., 2020). This collaborative approach promotes transparency, knowledge sharing, and collective decision-making, enabling effective coordination and alignment of efforts within the public organisation (Conboy et al., 2011). Additionally, IT project management challenges in public organisations, such as budget constraints, lengthy procurement processes, and risk management

requirements, create a favourable environment for agile adoption (Chervenkova, 2019). Agile's iterative and incremental delivery model allows public organisations to achieve early wins, manage costs more effectively, and adapt project plans based on changing priorities or constraints (Keita, 2020c). The flexibility and adaptability of agile methodology can help public organisations address these challenges more efficiently.

2.3 Challenges in the Adoption of Agile Methodologies

A software development project must overcome several obstacles before it can be called a success (Mishra et al., 2017). There have been several high-profile incidents of failed government software purchases, and public organisations are not alone in their inability to properly manage software development projects (Miller, 2013). As governments attempt to boost efficiency by digitising processes and delivering software-based online services, the challenges faced by public organisations have arisen (Alam et al., 2017). The purchasing software process in public organisations may be more complex than in private ones. During the procurement process, a set of regulations must be observed. There is a widespread belief that government technology is exceedingly complex and time-consuming. The government innovation rate is frequently slower than in private organisations. Poor management has also been identified as a reason for public software initiatives' failure (Domingues et al., 2017). Therefore, adopting agile methodology in public organisations can be challenging, as there are often stricter guidelines and processes compared to private organisations. Miller (2013) has identified some common challenges that may arise when implementing agile in a public organisation, such as:

- **Resistance to change:** Employees may resist adopting a new way of working, mainly if they are comfortable with the current process and have been using it for a long time.
- **Stakeholder management:** Public organisations often have multiple stakeholders, and getting their buy-in and support for an agile project can be challenging.
- **Bureaucracy:** Public organisations often have more bureaucracy and red tape to navigate, which can slow down the agile process.
- **Budget constraints:** Public organisations may have strict constraints that make allocating resources for an agile project challenging.

It may be helpful to provide training and support for employees to help them understand and adopt agile practices to address the challenges (Shahzad, 2016). It may also be helpful to involve stakeholders early in the process to ensure they support the project. Additionally, as Domingues et al. (2017) have stated, it is critical to work with senior management to address any bureaucratic barriers slowing the project.

Finally, it may be necessary to be flexible and adaptable to work within budget constraints (Goncalves, 2022).

Plentiful studies have been made on adopting agile scrum methodology in public organisations (Kalyan et al., 2019). However, according to BCG Global (2020), adopting the agile scrum methodology is not widely used, and unfamiliarity with agile scrum method practices in public organisations is challenging. Also, as noted by John and his colleagues in Deloitte Insights published in May 2017, if there is a plan to use agile scrum methodology, this should be visible in the procurement announcement by the public organisations. There is also an organisational observation made by Kalyan et al. (2019) that as the number of employees is high in public organisations – it is challenging to adopt an agile scrum methodology. The challenges could be structured at individual, project team and organisation levels, and the discussions will be discussed next.

2.3.1 Individual Level

According to Miller (2013), public organisations face challenges in adopting agile scrum practices. These practices highlight the human factor in agile project management, focusing on individuals' talent and skills. The agile scrum set-up is self-driven and self-disciplined, so the staff must follow the agile definition of different roles (Raza, 2019). The challenges are critical for successfully implementing an agile scrum approach to get stakeholders to comprehend their roles and responsibilities in an agile project set-up (Miller, 2013). There can also be psychological challenges to success with agile methodology. Conboy et al. (2011) absorbed the people-related challenges in a study with several public organisations, and they found that employees worry that their possible skill deficiencies could be exposed in an agile team, which can cause social stress and resistance to agile scrum adoption.

Even though teamwork and consultation are part of agile principles – depending on social skills and teamwork in completing tasks could be problematic for some individuals (Conboy et al., 2011). The agile approach is based on different ideologies than traditional methods; the challenges are in successfully implementing it. Therefore, individual mindsets must be receptive to agile principles to enable the organisational environment to accept agile scrum methodologies (Kashyap, 2018). Chervenkova (2019) has also noticed that it is challenging for employees to adopt agile practices if they have previously worked on control-oriented project management methodologies. In addition, the lack of motivation to use agile methods is also a problem; this is usually related to employees' familiarity with agile practices but not embracing the values and principles of an agile approach (Rigby et al., 2017).

2.3.2 Project Team Level

Teams utilising agile practices need proper training to implement agile scrum methodologies (Keita, 2020a). The training is crucial for ensuring the organisation has sufficient knowledge of agile practices and growing individuals' understanding of how different roles work in an undertaking organisation utilising agile scrum methodologies. Furthermore, customers must also apprehend their roles and participation in agile development. Another issue is that developers can lack business-related expertise regarding the system they may be working for. Additionally, according to Learnovative Scrum Training (2020), project managers' concern is knowledge transfer which has also been acknowledged as a possible challenge in an agile set-up, where the Agile practices promote minimum project documentation, which might make it challenging to conduct a proper knowledge transfer when employees leave the team.

Furthermore, researchers have found that people-related and social factors are more important than technical factors in adopting agile practices (Riaz et al., 2018). However, according to Agile Alliance (2018), there is one exception: communication tools are essential for agile practices if several individuals or teams are working on a project from different locations; for example, the advent of better communication tools such as Teams and Zoom during the COVID-19 pandemic. Agile practices are centred on efficient communications; if the personnel work remotely, they must have available virtual communication tools, and the personnel and the teams should be comfortable using them. Even if in the situation where in different time zones it is still more challenging (Dayibas, 2021).

2.3.3 Organisational Level

Prior research has identified some critical issues in organisational readiness for agile methodologies. Domingues et al. (2017) recognise that it is essential to have management involvement in the transition to the utilisation of agile scrum methodologies, so the management needs to support the changes required to optimise processes. Also, management support is essential to get the stakeholders' acceptance and buy-in for using agile methodologies in senior-level company discussions (May, 2016). Public organisations' difficulties are topical as governments seek to increase efficiency by digitising their operations and providing online services (Miller, 2013). Public organisations have characteristics that make their agile scrum methodology adoption more challenging than private organisations (Ribeiro et al., 2018); for example, their projects are usually substantial and complex (Kannampallil et al., 2011). Therefore, as a result, there are significant failures in agile projects (Nuottila et al., 2016).

Additionally, the innovation speed and the pace of agile development are generally slower than in private organisations (Rigby et al., 2017); for example, the requirements are unclear, unlike a private organisation, which is time-consuming to make clear and progress to the next stage. Furthermore, the process is slow as all actions are motivated by cost savings. Finally, the lack of appropriate management has also been a salient factor that causes challenges in public organisations' agile projects (Ghiasi-pour et al., 2017). Therefore, the agile scrum methodology adoption processes are not optimal in public organisations and adopting agile scrum methodology in public organisations is still challenging, and more research is needed (ReQtest, 2020). Nevertheless, there have been different approaches in research to suggest improvements for these challenges (Vacari et al., 2015). However, this research focuses on conducting a SLR on the challenges in adopting agile scrum methodology in public organisations, which the integrated and scientific findings will contribute to the existing knowledge.

To conclude this chapter, the literature identifies the challenges of agile scrum methodology adoption and public organisations. As indicated earlier, there are different approaches to agile methods; however, it is essential to emphasise that Scrum is a popular and effective way to implement Agile principles (Sargolzaei et al., 2017). Furthermore, the study investigates public organisations and cross-functional team environments; therefore, Scrum best suits cross-functional teams working in a product development setting (Langley, 2018). However, despite the widely spread agile method concept and the need increased in the last two decades, public organisations have not fully adapted to agile methodology, and researchers have noticed slow and ineffective changes in adopting it (Dingsøy et al., 2012).

The next chapter discusses the research strategy, the procedures and the method used in this investigation.

Chapter 3

Research Methodology

This chapter provides an overview of the rationale behind the research strategy and aims to subject in-depth empirical inquiry to the existing literature to investigate the challenges in adopting agile scrum methodology in public organisations' IT project management. In addition, there are enlightenments on selecting the research strategy, data collection process and method, including identifying keywords and the criteria for inclusion and exclusion, and data analysis.

3.1 Research Strategy

Generally, a research strategy can be defined as the overall plan for conducting research. As Kothari (2004) explained, a research strategy guides planning, execution, and monitoring; in most cases, a research strategy could influence the research method the author selects. There are different research strategies, such as, survey, case studies, experiments, ethnography, phenomenology, grounded theory, systematic literature review (SLR) and mixed methods (Denscombe, 2014; Mackenzie et al., 2006). This chapter evaluates the SLR strategy by examining its pros and cons and the research methods that could be appropriate for this strategy.

The author appreciates the practicality, possibility, and limitation of addressing the research question in the allocated timeframe for the thesis. However, it can contribute a small portion of knowledge about the challenges in adopting agile scrum methodology in public organisations to the agile community. Therefore, this research aims to subject in-depth empirical inquiry to the existing literature to investigate the challenges in adopting agile scrum methodology in public organisations. The SLR process involves selecting, screening, and shortlisting the most relevant studies for final inclusion in the study (Cooper et al., 2018; Page et al., 2020). This study gathers and evaluates the findings from past studies (listed in Table 2) to create an integrated form of information on the matter under investigation. In addition, studies from academic databases and other resources will be systematically collected.

This thesis could have considered using a case study strategy as an alternative. A case study is a detailed study of a specific organisation or target. The benefits of conducting a case study are providing stories that connect readers emotionally and provide intellectual justification of data (Denscombe, 2014). For a case study to achieve the most effective balance of success, it should incorporate several best practices, including proper planning, sharing the specifics, understanding participants and transparency (Yin, 2009). In contrast, the weaknesses are lacking scientific evidence,

being time-consuming and expansiveness. However, to summarise prior studies on a particular theme, data accessibility and availability limitations, COVID-19 restrictions, and time – the SLR is most suitable for this study as an analytical method (Gray, 2018). So, the author can gain a rich and in-depth understanding of the challenges in adopting agile scrum methodology in public organisations and analyse them to answer the RQ.

3.2 Data Collection/PRISMA

Scientific authors use preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to report an extensive array of systematic reviews and meta-analyses in an evidence-based set of criteria. Based on Prisma-statement (2015), it is evident that PRISMA focuses on ways in which authors can ensure a transparent and complete reporting of research. First, PRISMA offers authors to figure out research objectives that answer the RQ, state the keywords, and set exclusion and inclusion criteria. Then, in the review stage, search for relevant articles, exclude irrelevant ones and analyse articles according to pre-defined categories and keywords (Gray, 2018). In this study, the SLR will use the PRISMA framework. Hence, inclusion and exclusion criteria systematically assess the quality of chosen papers and either include or exclude for his research – which is valuable and critical for literature analysis and meta-analysis (Majumder, 2019).

Questionnaires and interviews are alternative data collection approaches that could be appropriate for a case study. Case studies can give insight into phenomena that cannot be learned in any other way (Denscombe, 2014). So, questionnaires and interviews could have been chosen to fulfil the objectives of this study, given that its aim to investigate the challenges in adopting the agile scrum methodology in public organisations is a holistic approach (Niehaves et al., 2014). According to Gray (2018), intensive study and development of new research could be the benefits, whereas the Hawthorne effect, research bias, and time intensiveness could be the challenges (Gray, 2018). Nevertheless, PRISMA is relevant for this study as it is an evidence-based set of items aimed at helping the author report a wide array of scientific articles (Covidence, 2021).

Searching for a term/word exact match in literature search engines is challenging. However, it has advantages in striking a balance between broad and specific searching. For example, subjects of high interest, such as 'Agile', are heavily investigated, so a simple search of 'Agile' pulls a huge list of results. Hence a specific search using descriptive keywords is critical to simplify the targeted results of published studies in any one paradigm. Therefore, the author has looked at various digital resources; however, the author has selected Web of Science, ScienceDirect and ResearchGate to provide a comprehensive citations search. Also, they give access to multiple databases that reference cross-disciplinary research, which allows for in-depth exploration of

specialised sub-fields within an academic or scientific discipline. Abstracts and titles will be examined before obtaining full texts of articles published from 2018 to 2022. An appropriate search string for a search engine is specific, inclusive, and aware of the variability in terminology/reporting.

3.2.1 Inclusion/Exclusion Criteria and Reasons

This study focuses on challenges in adopting agile scrum methodology in public organisations' IT project management, and eligibility criteria examined in the titles and abstracts. The articles must meet the inclusion criteria established by the author before they can be considered for review. The papers to be included in the analysis must have been peer-reviewed research, available online, written in English, describe the challenges in adopting agile scrum methodology in public organisations' IT project management and are limited to the most recent published from 2018 – 2022. Those that do not meet the requirements are excluded.

3.2.2 Keywords

After reviewing the relevant literature review, the author selected the following keywords for this study to extract the relevant scientific articles. Therefore, the keywords are defined based on four main categories: those related to 'Agile methodology', 'Organisations', 'Information technology' and 'project management' to extract the relevant peer-reviewed research articles. Table 1 outlines the keywords.

Categories	Keywords
Agile methodology	Agile scrum methodology (1)
	Adoption (2)
	Challenges (3)
Organisations	Public organisations (4)
Information technology	Information technology (5)
Project management	Project management (6)

Table 1. Keywords for the review process

The author used different search strings to find the challenges in adopting the agile scrum methodology in public organisations' project management within the elegant method domain from 2018 – 2022. The search string in box 1 is an example of the Web of Science.

The search is a combination of four categories and six keywords – the search string is defined as (1 OR 2 OR 3) AND (4) AND (5) AND (6). The search queries for the relevant articles were conducted, as shown in box 1.

Agile scrum methodology (Topic) OR Adoption (Title) OR Challenges (Title) AND Public organisation (Title) AND Information technology (Title) AND Project management (Title) AND 2022 – 2018 (Publication year).

Search queries box 1

The researcher has used various digital resources; however, the researcher selected to use Web of Science, ScienceDirect and ResearchGate. These resources provide a comprehensive citation search, give access to multiple databases, and allow for in-depth exploration of specialised sub-fields within an academic or scientific discipline.

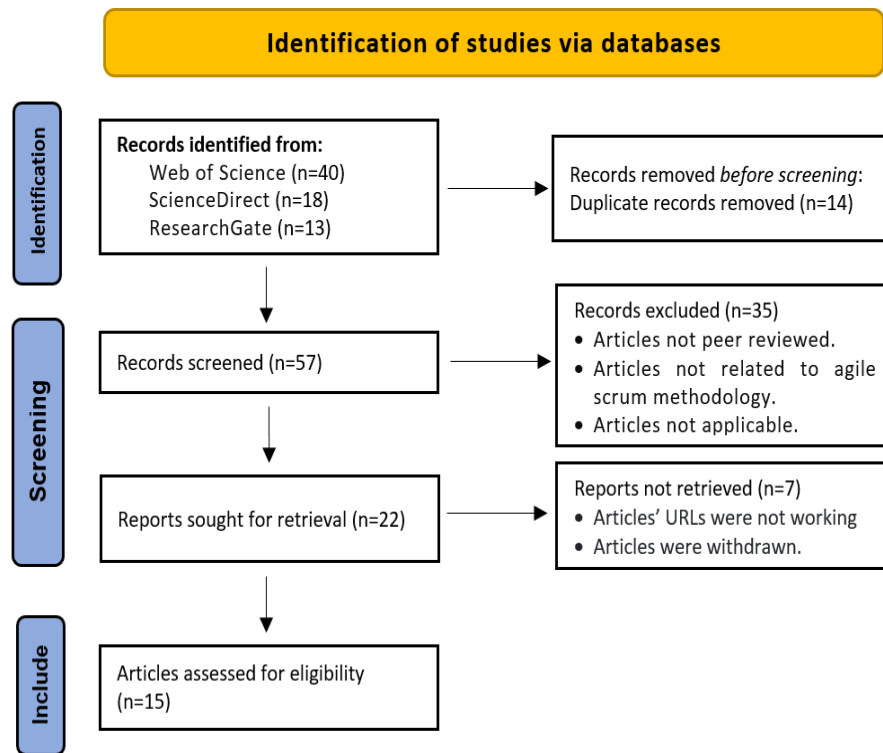
As indicated in diagram 1 – based on the articles meeting criteria that do not meet and articles not retrieved were excluded. In contrast, the papers in category [Include] were analysed carefully and included based on the reading of the introduction, conclusion, and specific parts related to the main contribution. Then, a subset of papers in [Include] related to agile Scrum methodology in public organisations were selected for the next step. Finally, a new subset of documents in [Include] were chosen – keeping only those addressing the challenges in adopting agile scrum methodology in public organisations' IT project management.

The systematic review process includes three stages (see diagram 1), and this process ultimately determines the final research articles needed for the study.

The three stages are explained as follows.

- **Identification** – This is the initial stage for identifying relevant articles.
- **Screening** – This stage includes three sub-stages
 - **Screened articles** show the total number of identified articles minus removed records due to duplicate records.
 - **Retrieved articles** show the number of articles after the first elimination round based on title and abstracts.
 - **Articles assessed for eligibility** show the number of articles after second round elimination due to the articles not being retrieved.
- **Included** – This is the last stage, where the final articles will be filtered out – excluded articles due to exclusion criteria.

Diagram 1. PRISMA Flow Diagram



Source: Adapted from Page et al. (2020)

Table 2, illustrated below, is a comprehensive overview of the correctly labelled article based on effectively utilising a precise project management approach and the value achieved by employing the Agile scrum methodology. In concise terms, the references provide the paper source, article, URL, author name, publication year and method used in the study for each mentioned article.

3.3 Papers Quality Assessments

As part of the identification method, seventy-one publications were chosen for in-depth examination from the initial electronic databases search – as shown in PRISMA Diagram 1 above, in chapter three. Initially, fourteen duplicate records and as a consequence of the exclusion criteria, thirty-five were removed, and seven articles were not retrieved. Therefore, only fifteen of the initial records were selected for this study and reviewed by the author to see if the main focus matches the study goals. This was followed by conducting an assessment of their quality on Google Scholar, and others referenced all the papers. To conduct a quality assessment of articles on Google Scholar, the author considered the source's reputation, author credentials, peer review status, citations, and impact factor. It also evaluated the research methodology, literature review, theoretical framework, results, and conclusions.

Study	Source	Article	URL	Author/s & year	Method used
Paper 1 [P1]	ScienceDirect	Adapting the scrum framework for agile project management in science	https://www.sciencedirect.com/science/article/pii/S2405844018340635	Hidalgo, S (2019)	Case study
Paper 2 [P2]	ScienceDirect	A Scrum-based framework for new product development in the non-software industry	https://www.sciencedirect.com/science/article/pii/S0923474821000230	Cano et al. (2021)	Case study
Paper 3 [P3]	ScienceDirect	Acceptance of an agile methodology in the public sector	https://www.sciencedirect.com/science/article/pii/S1877050918317290	Ribeiro, A. and Domingues, L. (2018)	Case study
Paper 4 [P4]	ScienceDirect	Agile project management	https://www.sciencedirect.com/science/article/pii/B9780128243398150011	Collins, G. (2021)	Case study
Paper 5 [P5]	ScienceDirect	Agile project management challenge in handling scope and change	https://www.sciencedirect.com/science/article/pii/S187705092102367X	Marnada, P., Raharjo, T., Hardian, B. and Prasetyo, A. (2022)	Systematic literature review
Paper 6 [P6]	ScienceDirect	Considerations about the efficiency and sufficiency of the utilisation of the Scrum methodology	https://www.sciencedirect.com/science/article/pii/S1574013720304147	Morandini, M., Coleti, T.A., Oliveira, E. and Corrêa, P.L.P. (2021)	Case study
Paper 7 [P7]	ScienceDirect	Factors Affecting Agile Adoption	https://www.sciencedirect.com/science/article/pii/S016412122200084X	Altuwaijri, F. and Ferrario, M. (2022)	Interview
Paper 8 [P8]	ScienceDirect	Innovation, agile project management and firm performance in a public sector-dominated economy	https://www.sciencedirect.com/science/article/pii/S0038012119303817	Ju, X. Ferreira, F. and Wang, M. (2019)	Case study
Paper 9 [P9]	ScienceDirect	Hybrid methods and practices associated with agile methods, method tailoring and delivery of projects...	https://www.sciencedirect.com/science/article/pii/S1877050918317447	Papadakis, E. and Tsironis, L. (2018)	Case study
Paper 10 [P10]	ScienceDirect	Requirements engineering challenges and practices in large-scale agile system development	https://www.sciencedirect.com/science/article/pii/S0164121220302417	Kasauli, R., Knauss, E., Horkoff, J. and Liebel, G. (2021)	Multiple case study
Paper 11 [P11]	ScienceDirect	Sustainability meets Agile: Using Scrum to develop frugal innovations	https://www.sciencedirect.com/science/article/pii/S0959652622005091	Endres, Bican and Wöllner (2022)	Semi-structured interview
Paper 12 [P12]	ResearchGate	The benefit of implementing agile scrum in project management	https://www.researchgate.net/publication/338139300	Nabilah, A. (2019)	Case study
Paper 13 [P13]	ScienceDirect	The role of the project manager in agile software development projects	https://www.sciencedirect.com/science/article/pii/S0164121220302612	Shastri, Y. Hoda, R. and Amor, R. (2020)	Questionnaire
Paper 14 [P14]	ScienceDirect	Transitioning to agile software development: Lessons Learned from a government-contracted Program	https://www.sciencedirect.com/science/article/pii/S1047831018300294	Patanakul, P. and Rufo-McCarron, R. (2018)	Case study
Paper 15 [P15]	ScienceDirect	Why and how is Scrum being adapted in practice: A systematic review	https://www.sciencedirect.com/science/article/pii/S0164121221002077	Hron, M and Obwegeser, N. (2021)	Semi-structured interview

Table 2. Selected articles

3.4 Data Analysis

This study analyses the data using thematic analysis (TA). The thematic analysis was adopted to identify patterns from the scientific articles and draw themes to answer the RQ. According to Braun and Clarke (2006), TA is the method used to identify, analyse, and report patterns (themes) within data. It is often used in qualitative research to identify themes within interview transcripts, focus group transcripts, and other types of textual data while also analysing this data in a critical and in-depth manner. The method minimally organises and describes the data in detail and can sometimes go as far as interpreting various aspects of the research topic. In TA, a theme captures something essential regarding the data concerning the RQ and represents some level of patterned discussions within the data set (Braun & Clarke, 2006). Notably, a theme's keyness depends not on quantifiable measures but on whether it captures something important about the RQ.

In this study, inductive TA is used to assess the data. Braun and Clarke (2006) indicate that an inductive or bottom-up TA identifies themes strongly linked to the data. Notably, this approach allows discussion on the data collected specifically for the research to elicit themes related to challenges in adopting agile scrum methodology in public organisations' IT project management. Therefore, the data is coded using inductive analysis without trying to fit it into a pre-existing coding frame – which means coding is data-driven (Creswell, 2015; Basias and Pollalis, 2018). The study identifies themes from a semantic level. Braun and Clarke (2006) state that a TA typically focuses on one level. As such, the data analysis focuses on a semantic level whereby the themes are identified within the surface meanings of the data. Furthermore, the author investigates anything beyond what has been reported in the peer-reviewed articles. The analytic process involves a progression from description where data is organised to indicate patterns, summarised, and interpreted to theorise the pattern's significance, broader meanings, and implications.

MAXQDA software is used for the data coding, whereby notes on the texts were analysed to indicate potential patterns. MAXQDA software provides a comprehensive and user-friendly platform for conducting thematic analysis in qualitative studies. It streamlines the analysis process, enhances organisation and collaboration, and offers powerful tools for data exploration and interpretation. Even though there are other options to choose from to conduct TA within qualitative literature, due to its popularity and usability, the author uses the method defined by Braun and Clarke (Kiger and Varpio, 2020). Braun and Clarke's (2006) process has six steps to analyse the qualitative data. So, the author got familiarised with the articles, coding, labelling, organising, analysing, and writing the report to address the challenges in adopting agile scrum methodology in public organisations' IT project management.

The author followed the following thematic analysis steps (Braun & Clarke, 2006).

- **Familiarisation:** This is the first step of thematic analysis, where the author gets familiarised with the articles/data and understands the challenges in adopting agile scrum methodology in public organisations' IT project management.
- **Coding:** The author categorised the data and identified concepts, creating initial themes and sub-themes and identified several codes.
- **Labelling:** In this stage, the author generated seven themes and identified relationships between them.
- **Organising:** The author ensured that none of the data had been left from analysis during these steps – categorised on themes, sub-themes, and codes.
- **Analysing:** In this stage, the author named each theme, sub-themes, and codes and documented them accordingly – the themes have meaning in relation to the challenges in adopting agile scrum methodology in public organisations' IT project management.
- **Reporting:** Finally, the author analysed each theme and sub-theme in detail and produced a report on the findings.

The thematic analysis conducted based on the filtered codes, themes, and sub-themes. Therefore, the author grouped the article's filtered data and systematically established trends from the articles. The author further categorised the themes and sub-themes based on the particular type of TA and the level of the data analysis; coding was data-driven, and the data was coded by identifying its semantic feature. Finally, analyse the articles to answer the challenges in adopting agile scrum methodology in public organisations' IT project management.

3.5 Ethical Considerations

There are ethical issues in conducting research – during the investigation involving scientific papers that the author will deal with, such as including other people's work (Creswell, 2015). However, unlike primary researchers, the author does not collect deeply personal, sensitive, or confidential information. Instead, the study uses publicly accessible documents as evidence and is seldom required to seek Stockholm University ethics approval. However, the final selected scientific papers will be referenced appropriately.

This chapter has described the method used in this investigation – and has reviewed the four key aspects. The chapter that follows moves on to evaluate the results.

Chapter 4

Result

This section presents the key findings of a systematic literature review on the challenges public organisations face in adopting an agile scrum methodology for IT project management. The growing popularity of agile approaches in private organisations has sparked interest among public organisations seeking to improve their project delivery processes. However, public organisations' unique characteristics and constraints present distinct challenges that need to be addressed when implementing agile scrum methodologies. The literature review encompassed a comprehensive analysis of scholarly articles, conference papers, and industry reports, focusing on the experiences and insights gained by public organisations while adopting the agile scrum methodology. By synthesising the findings from a wide range of sources, this review aims to provide a consolidated understanding of the challenges that public organisations commonly encounter in their efforts to embrace agile scrum practices.

Examination of the distribution of agile scrum methodology articles by year indicates yearly peaks and troughs correspond to the beginning and end of the collecting periods. The publication types of method used were ten case study, three interview, one systematic literature review and one questionnaire – the selected papers and their descriptive data such as source, URL, author, published year, and method used are recorded in table 2.

This study is significant as it focuses on public organisations at every level worldwide. Moreover, the study is unique; it is devoted entirely to these types of public organisations as the central forces in shaping the structure, directions, changes, and progress in society and civilisation, as well as their centrality in the governance and administration of society. So, the study focuses on 'public', broadly defined, to include governmental, non-profit, and non-governmental organisations, and their impacts on human life and society and their influence in shaping human civilisation (Bratt et al., 2013). So, in this study, the author focuses on public organisations – that provide services for the public, so the information obtained could represent the holistic term of the public organisation (Khandaker et al., 2016).

4.1 Thematic Analysis

The thematic analysis related to adopting agile scrum methods sheds light on the key challenges and obstacles that detract from the effectiveness of the agile scrum methodologies. The results, as mentioned earlier and findings can be critically

analysed through thematic analysis based on the sequential framework outlined in chapter three concerning the filtered themes, sub-themes and codes. When it comes to challenges in adopting agile scrum methodology in public organisations, several themes, sub-themes and codes may emerge.

The author adopted Braun and Clarke (2006) thematic analysis process steps.

Step 1 – familiarisation with the data: The author rapidly read, took notes, and marked words/sections to get familiarised with the content of the fifteen selected articles (see Table 2) related to the Agile Scrum methodology.

Step 2 – generating initial codes: The data categorized in a meaningful way as a result the author created twenty-three codes based on articles related to Agile Scrum methodology that appear interesting (potential themes and subthemes).

Step 3 – Searching for themes: After gathering all the codes, they were carefully combined and sorted into appropriate seven themes and twenty-one sub-themes (see figure 1). Each code was then given a descriptive label, which was presented in an organized table format for easy reference. This method allowed for a comprehensive and thorough analysis of the data.

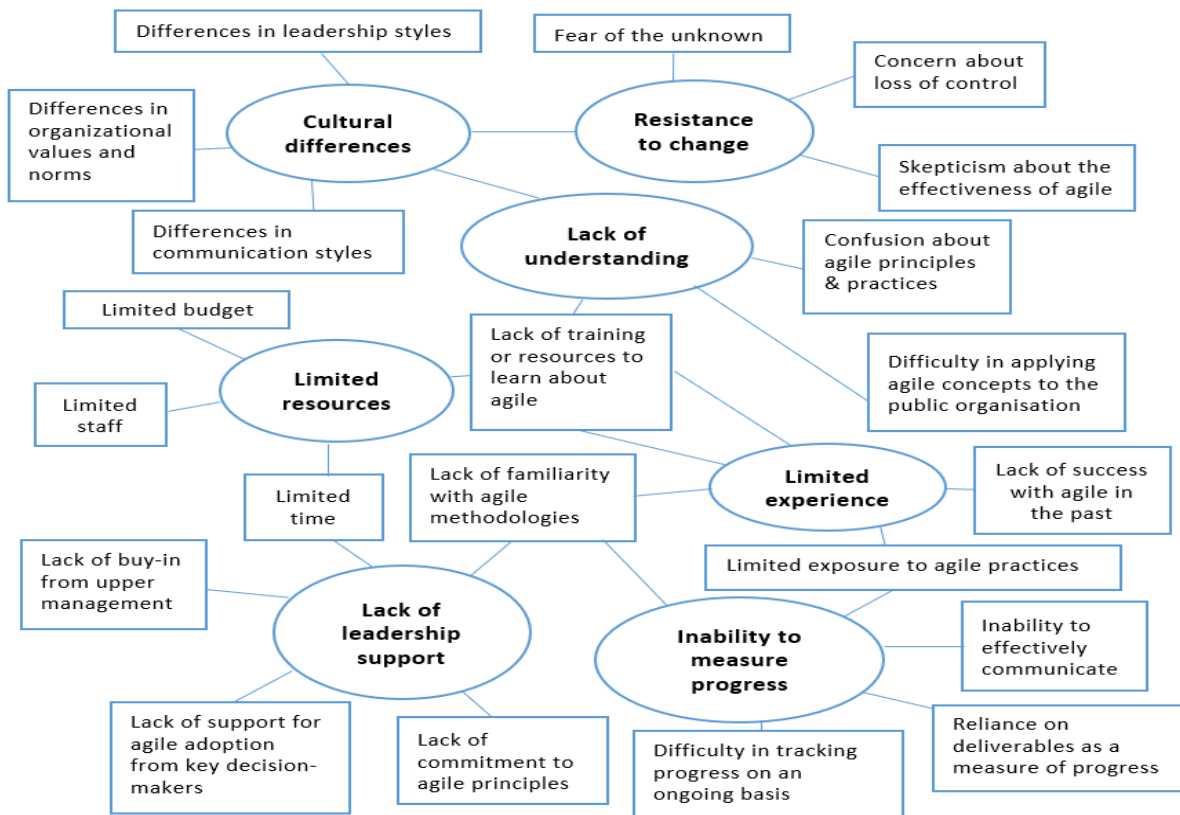


Figure 1. Initial produced thematic map

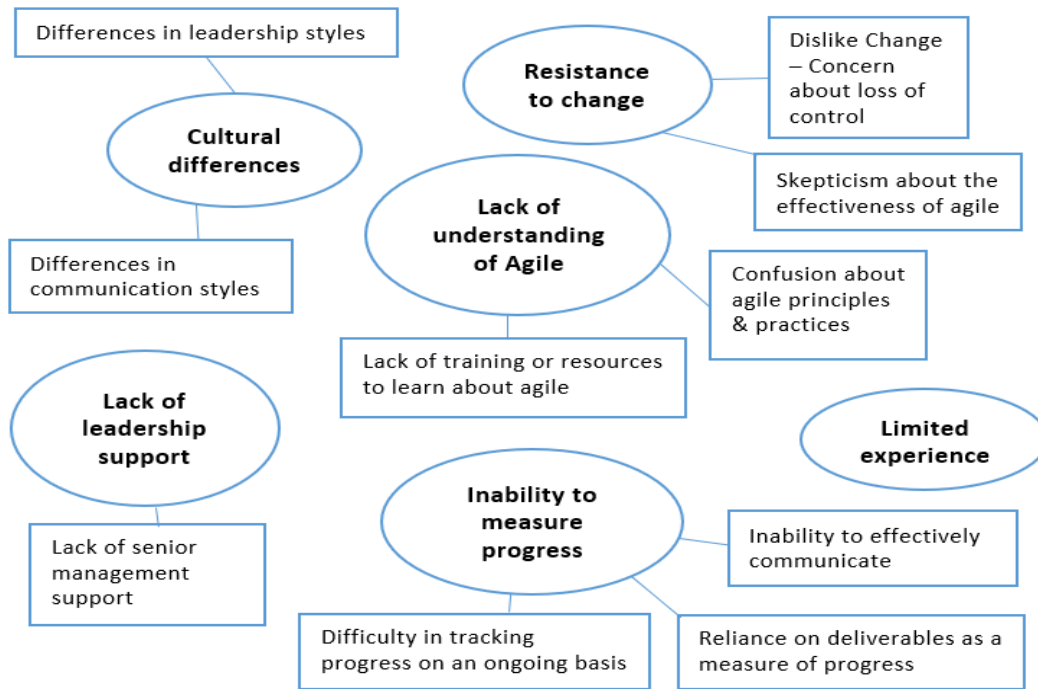


Figure 2. Developed thematic map

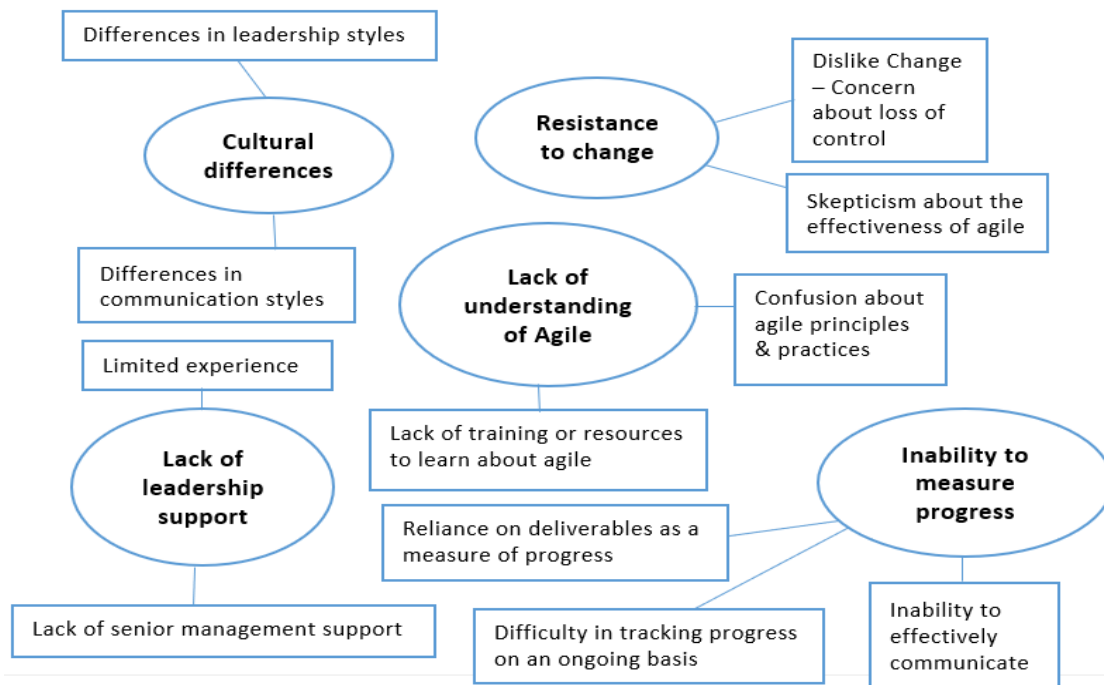


Figure 3. Final thematic map

Step 4 – Reviewing themes: The selected articles were reviewed multiple times to carefully identify any themes, sub-themes, and codes. The author rearranged them until they formed clear and logical patterns. Any data that did not fit or lacked enough supporting information for categorization was excluded.

Step 5 – Defining and naming themes: The author initially identified potential seven themes, twenty-one sub-themes, and twenty-three codes. However, after rereading selected articles, irrelevant codes were disregarded, and themes and sub-themes were merged (See Figure 2). Further adjustments were made during the final check, resulting in the assignment of the 'limited experience' theme as a subtheme to the 'lack of leadership support' theme see figure 3.

Step 6 – Produce the report: After careful consideration, the author has ultimately decided on five main themes and eleven sub-themes, and twenty codes – please see figure 3, the final thematic map for more information.

Therefore, the thematic analysis is conducted on these five filtered themes and eleven sub-themes categorized in table 3 or figure 3 final thematic map and discussed accordingly in turn. It is worth noting that these themes are merely examples and could be added more.

Themes	Sub Themes	Codes	Study
Resistance to change	<ul style="list-style-type: none"> Dislike change – Concern about loss of control Skepticism about the effectiveness of agile 	<ul style="list-style-type: none"> Resistant to changing their familiar ways of working 	[P1] [P4] [P6] [P7] [P8] [P9] [P10] [P13] [P14] P15]
Lack of understanding of Agile	<ul style="list-style-type: none"> Confusion about agile principles and practices Lack of training or resources to learn about agile scrum 	<ul style="list-style-type: none"> Difficult to understand and implement Misunderstandings about how to best use agile approaches 	[P1] [P2] [P3] [P4] [P5] [P6] [P7] [P8] [P9] P10] [P13]
Cultural differences	<ul style="list-style-type: none"> Differences in leadership styles Differences in communication styles 	<ul style="list-style-type: none"> Agile scrum may not be a good fit for all organisations Cultural differences 	[P1] [P2] [P3] [P4] [P6] [P7] [P8] [P9] [P10] P13] [P15]
Lack of leadership support	<ul style="list-style-type: none"> Lack of senior management support Limited experience 	<ul style="list-style-type: none"> Agile adoption requires strong leadership support Level of experience with agile methodologies 	[P3] [P4] [P6] [P7] [P8] [P12] [P13] [P14]
Inability to measure progress	<ul style="list-style-type: none"> Difficulty in tracking progress on an ongoing basis Reliance on deliverables as a measure of progress Inability to effectively communicate – progress to stakeholders 	<ul style="list-style-type: none"> Challenges in check-ins and progress 	[P1] [P4] [P7] [P9] P10] [P14]

Table 3. Thematic analysis – themes, sub-themes, codes and relevant studied papers.

4.1.1 Resistance to Change

The systematic literature review results indicate that resistance to change is a predominant challenge limiting the implementation of IT projects using agile scrum methodology in public organisations. Out of the fifteen articles and papers evaluated, ten of them emphasised resistance to change as the main hurdle in adopting agile scrum practices. This resistance often manifests as reluctance or opposition from individuals or groups within the organisation who resist embracing new ways of working and prefer to adhere to traditional project implementation approaches. Besides, the adoption of Agile Scrum, a popular agile methodology, is not without its challenges. The reviewed articles highlighted various obstacles, including resistance to change, poorly defined guidelines, and inflexible and lengthy processes (Hidalgo, 2019; Marnada et al., 2022; Kasauli et al., 2021; Patanakul et al., 2018; Hron et al., 2021). However, public organisations may still adopt agile scrum methods despite these challenges due to their potential benefits. The reviewed literature identified efficiency improvement, fostering innovation, and enhancing responsiveness to changing demands as motivating factors for public organisations to adopt agile scrum practices. Studies conducted by Morandini et al. (2021), Altuwaijri et al. (2022), Papadakis et al. (2018), and Shastri et al. (2020) highlighted that the positive outcomes and advantages that public organisations can achieve through the adoption of agile scrum methodologies, despite the initial resistance faced.

These findings suggest that while resistance to change poses a significant challenge in adopting agile scrum methodology, public organisations recognise the potential benefits and are willing to overcome the obstacles to improve their project management practices. By understanding the specific challenges associated with resistance to change and addressing them proactively, public organisations can create a more conducive environment for the successful implementation of agile scrum methodologies in IT project management.

Therefore, the result shows that in public organisations' IT project management, the adoption of agile scrum methodologies is often hindered by resistance to change. This theme and sub-themes emerged consistently in several studies, highlighting the challenges organisations face during the transition process.

4.1.1.1 Dislike change

The challenge of dislike for change and concern about losing control is a significant barrier to Agile scrum adoption in public organisations' IT project management. People naturally prefer predictability and stability, and when confronted with the need to change established practices, they often resist due to fear of the unknown (Hidalgo, 2019; Marnada et al., 2022; Kasauli et al., 2021; Patanakul et al., 2018; Hron et al., 2021). This resistance can manifest at various organisational levels, from

individual team members to higher-level management. At the individual level, employees who have been accustomed to traditional project management methodologies may feel anxious about adopting Agile scrum practices. They might be worried about their ability to adapt to a new way of working or fear that their skills and expertise might become obsolete in an Agile environment (Marnada et al., 2022; Patanakul et al., 2018; Hron et al., 2021). The prospect of change can be particularly daunting if they perceive that Agile's emphasis might compromise their positions, privileges, or decision-making power on collaboration and self-organisation (Hidalgo, 2019; Kasauli et al., 2021).

Also, neurologically, people tend to fall back on well-established habits and behaviour patterns under stress, making it even harder to break away from familiar routines and embrace Agile scrum principles (Papadakis et al., 2018). Overcoming this resistance requires a significant shift in mindset and an understanding that Agile scrum adoption is a gradual process that demands patience and perseverance (Morandini et al., 2021; Altuwaijri et al., 2022; Shastri et al., 2020). Providing adequate training, support, and reassurance during the transition can help ease individuals' concerns and build confidence in the new Agile approach. At the organisational level, leaders and managers play a crucial role in driving Agile adoption. However, they may also face resistance due to concerns about losing control over project outcomes and decision-making processes (Kasauli et al., 2021). Hierarchical structures in public organisations can exacerbate this fear, as Agile's emphasis on decentralisation and empowered teams challenges traditional top-down management approaches (Hidalgo, 2019). Leaders may need to relinquish some authority and trust their teams to make decisions, which can be daunting in a risk-averse bureaucratic environment.

Creating a supportive and inclusive culture that values experimentation, continuous learning, and adaptability is essential to overcome these challenges. Communicating the benefits of Agile adoption, such as improved project outcomes, increased stakeholder engagement, and faster response to changing requirements, can help alleviate concerns and build buy-in from all levels of the organisation (Patanakul et al., 2018; Hron et al., 2021). Moreover, involving employees in the decision-making process and providing opportunities for training and upskilling can empower them to embrace the change and feel more in control of their roles within the Agile scrum framework. Addressing the dislike for change and fear of losing control is critical for a successful Agile transformation in public organisations' IT project management.

4.1.1.2 Skepticism about the effectiveness of Agile

Scepticism about the effectiveness of agile is a prevalent challenge in adopting agile scrum methodology in public organisations' IT project management. Despite the proven effectiveness of the agile scrum methodology, there is still a sense of uncertainty and scepticism among stakeholders and agile teams (Hidalgo, 2019;

Morandini et al., 2021; Altuwaijri et al., 2022; Papadakis et al., 2018; Shastri et al., 2020). Resistance to change often arises when organisations attempt to adopt agile scrum, as it challenges established historical truths and introduces a new way of working (Morandini et al., 2021; Altuwaijri et al., 2022; Papadakis et al., 2018; Shastri et al., 2020). This resistance can hinder the successful implementation of agile scrum practices and create additional barriers and complexities.

To overcome this challenge, it is crucial to understand and address the concerns of stakeholders and involve them in the process of adopting the agile scrum methodology (Altuwaijri et al., 2022; Papadakis et al., 2018; Kasauli et al., 2021). By actively engaging stakeholders, organisations can alleviate doubts, clarify misconceptions, and build trust in the effectiveness of agile scrum practices. Failure to address scepticism and involve stakeholders in the agile adoption process can lead to ineffective implementation and exacerbate existing challenges (Altuwaijri et al., 2022; Papadakis et al., 2018). Acknowledging the concerns and perspectives of those involved and creating a collaborative environment that encourages open communication and knowledge sharing is essential. By actively addressing scepticism and involving stakeholders in the agile journey, organisations can enhance the effectiveness of the agile scrum methodology and mitigate the additional layers of uncertainty and complexity that may arise (Altuwaijri et al., 2022; Papadakis et al., 2018). This inclusive approach fosters a shared understanding of agile scrum principles and promotes a culture of continuous improvement and adaptation in public organisations' IT project management.

4.1.2 Lack of Understanding Agile

Insufficient knowledge or familiarity with new working methods is another significant challenge in adopting agile scrum methodology in public organisations' IT project management. This lack of understanding can impede effective communication and hinder goal alignment among team members (Hidalgo, 2019; Cano et al., 2021; Ribeiro et al., 2018; Collins, 2021; Marnada et al., 2022; Morandini et al., 2021; Altuwaijri et al., 2022; Ju et al., 2019). When team members are not well-versed in agile scrum practices, they may struggle to adapt to the new approach, leading to misinterpretations, misunderstandings, and difficulties in collaborating effectively. This, in turn, can result in delays, reduced productivity, and a lack of synergy within the team (Hidalgo, 2019; Collins, 2021; Marnada et al., 2022). Moreover, insufficient knowledge of agile scrum principles and practices can limit the team's ability to fully leverage the methodology's potential (Papadakis et al., 2018; Kasauli, 2021; Altuwaijri et al., 2022). Agile methods emphasise flexibility, continuous improvement, and iterative development, but teams may struggle to implement agile practices effectively without a solid understanding of these concepts. As a consequence, inefficiencies may arise, and the expected benefits of agile, such as faster delivery of value, improved quality, and increased customer satisfaction, may not be fully realised

(Papadakis et al., 2018; Altuwaijri et al., 2022). Insufficient knowledge of agile scrum practices can also result in a lack of confidence in the methodology, leading some team members to revert to traditional approaches, thereby negating the benefits that agile can bring. To address this challenge, organisations must invest in comprehensive training and education on agile scrum principles and methodologies for all team members (Hidalgo, 2019; Cano et al., 2021; Ju et al., 2019). Providing proper training and support can enhance team members' understanding of agile scrum practices, instilling confidence and proficiency in applying agile scrum methodologies effectively. Furthermore, fostering a learning culture that encourages continuous improvement and knowledge sharing is vital (Ribeiro et al., 2018; Morandini et al., 2021). Regular workshops, feedback sessions, and knowledge exchange platforms can help team members continuously grow their understanding of agile and adapt their practices to achieve better project outcomes.

Therefore, the study shows that in public organisations' IT project management, the adoption of agile scrum methodologies encounters challenges related to a lack of understanding.

4.1.2.1 Confusion about agile principles and practices

No agile scrum methodology can succeed if the stakeholders are unclear on their actions and why. Too often, education efforts begin and end with a couple of days of agile behavioural training but do not impart a deep understanding of the mindsets, values and underlying agile scrum principles. When people do not understand why a particular agile scrum practice is necessary, the results can be unpredictable and ineffective (Altuwaijri et al., 2022; Hidalgo, 2019; Morandini et al., 2021; Collins, 2021). The lack of knowledge leads to misunderstanding, miscommunication, unrealistic expectations and, unsurprisingly, low morale (Collins, 2021; Marnada et al., 2022; Morandini et al., 2021; Altuwaijri et al., 2022; Kasauli et al., 2021). Not knowing or understanding what to do is uncomfortable, and that discomfort leads people to resist the agile transformation (Collins, 2021; Marnada et al., 2022; Morandini et al., 2021). The information is communicated to a larger audience in public organisations than in private organisations (Collins, 2021; Kasauli et al., 2021). Many people outside the organisation want instructions on utilising the organisation's new service. For example, the development team's geographical dispersion needed constant two-way communication between the product owner and the team and numerous documentations, making it challenging to locate the necessary documents when needed.

4.1.2.2 Lack of training or resources to learn about agile-scrum

As agile scrum methodology becomes the norm in many organisations, at least in expectation, if not reality, more teams seek training to kick-start their transformation

(Cano et al., 2021; Collins, 2021; Marnada et al., 2022). Training is often the correct answer (Kasauli et al., 2021; Patanakul et al., 2018; Collins, 2021; Morandini et al., 2021). There are good reasons to refresh knowledge and expertise (Kasauli et al., 2021; Shastri et al., 2020; Morandini et al., 2021). It is one reason why I still look for time management classes and books – a refresher of fundamental principles and a look at the latest practices helps keep the skills sharp and relevant (Shastri et al., 2020; Kasauli et al., 2021; Morandini et al., 2021). It is also always impressed by how many people understand how and why to manage an organisational change such as agile adoption properly (Hidalgo, 2019; Ribeiro et al., 2018; Marnada et al., 2022; Kasauli et al., 2021; Hron et al., 2021). The budget holders and senior managers mandate a change with minimal stakeholder consultation. This change squeezes resources, eventually settling for just a little training to adopt agile, which leads to the expected results being less effective (Shastri et al., 2020; Patanakul et al., 2018).

4.1.3 Culture Differences

This theme highlights the variations in values and behaviours among different organisational groups that can significantly impact the implementation and success of agile scrum practices. These cultural differences may manifest in various ways, including differences in communication styles, decision-making processes, and approaches to risk management (Ribeiro et al., 2018; Altuwajiri et al., 2022; Patanakul et al., 2018; Hron et al., 2021; Morandini et al., 2021). The diverse cultural backgrounds within an organisation can lead to misunderstandings, conflicts, and challenges in collaborating effectively. For instance, some groups may be more accustomed to hierarchical communication styles, where decisions come from the top-down, while others may prefer a more egalitarian and participative approach (Patanakul et al., 2018; Hron et al., 2021). Such variations in communication styles can hinder effective information sharing and alignment of project goals among team members. Cultural differences can also influence decision-making processes. Some groups may be risk-averse and prefer conservative decision-making, while others may be more inclined to take bold and innovative risks (Ribeiro et al., 2018; Altuwajiri et al., 2022). These differences in risk management approaches can lead to conflicts in prioritising tasks, resource allocation, and overall project direction.

The presence of cultural issues can act as a major impediment to the successful adoption of the agile scrum methodology. Failure to understand and manage these cultural differences can result in resistance to agile practices and a lack of commitment from certain groups within the organisation (Nabilah, 2019; Ribeiro et al., 2018; Altuwajiri et al., 2022). This can ultimately hinder the organisation's ability to fully embrace agile scrum principles and realise the potential benefits it offers. To address this challenge, organisations must invest in cultural awareness and sensitivity training for all team members (Ribeiro et al., 2018; Morandini et al., 2021). Organisations can foster an inclusive and collaborative environment that respects

diverse perspectives by promoting a better understanding of cultural differences and their potential impact on project dynamics. In addition to training, it is crucial to encourage open and transparent communication among team members, enabling them to share their viewpoints and concerns freely (Altuwaijri et al., 2022). Regular team-building activities and workshops can also help bridge cultural gaps and build trust among team members, encouraging effective collaboration. Furthermore, project managers and leaders play a vital role in managing cultural differences within the organisation (Patanakul et al., 2018; Hron et al., 2021). They must be culturally sensitive and adept at adapting their leadership styles to accommodate the needs and preferences of different groups, ensuring a harmonious and productive working environment.

4.1.3.1 Differences in leadership styles

Adopting agile scrum demands a conceptual shift and, maybe, a bigger culture shift inside the organisation, and the transition is challenging (Hidalgo, 2019; Kasauli et al., 2021; Patanakul et al., 2018; Ju et al., 2019). However, managers and employees react differently to it (Shastri et al., 2020; Altuwaijri et al., 2022; Marnada et al., 2022). While employees are more likely to resist because they lack knowledge about the change or fear the unknown, managers often cite their loss of control and authority as a reason to resist change (Shastri et al., 2020; Kasauli et al., 2021; Patanakul et al., 2018; Hron et al., 2021). In addition to a command-and-control mindset, some workers prefer a controlling leader so they do not have to worry about making a decision that leads to failure (Shastri et al., 2020; Hron et al., 2021; Nabilah, 2019). This goes back to the cultural issues cited above: the organisation must adjust its culture to value experimentation and the ability to learn from failure (Patanakul et al., 2018; Hron et al., 2021; Altuwaijri et al., 2022). People must understand that avoiding failure is not the goal, but to learn from failure and adapt to what they have learned.

4.1.3.2 Differences in communication styles

Dealing with agile is to communicate the value proposition of agile and how it aligns with the goals and needs of the stakeholders. So, agile scrum methodologies value constant and honest communication, trust in one another, and teamwork – based on a tightly defined set of processes, agile methods assume that issues are best addressed when a group or creative individuals collaborate (Cano et al., 2021; Collins, 2021; Ribeiro et al., 2018; Kasauli et al., 2021; Nabilah, 2019; Hron et al., 2021). During communication, examples, stories, testimonials, or data can be used to illustrate how agile scrum can deliver better outcomes, faster feedback, higher quality, lower risk, more transparency, and more customer satisfaction (Hidalgo, 2019; Marnada et al., 2022; Morandini et al., 2021; Nabilah, 2019; Endres et al., 2022). Open communication with stakeholders can keep them updated with the current process. The potential costs and drawbacks of sticking to traditional methods and how they can affect the

project's success can be highlighted (Marnada et al., 2022; Morandini et al., 2021; Nabilah, 2019; Endres et al., 2022).

4.1.4 Lack of Leadership Support

In the context of adopting agile scrum methods in organisations, this theme sheds light on the insufficient support from the leadership that is often required to foster a significant change in organisational culture and ways of working. Without active buy-in from the leaders, gaining the necessary commitment and resources from other stakeholders in the organisation can be challenging (Shastri et al., 2020; Ribeiro et al., 2018; Marnada et al., 2022; Papadakis et al., 2018; Kasauli et al., 2021). Hence, in its absence, adopting agile scrum methods can face resistance and lack of input among the team members, which can ultimately impede the execution of the initiative (Marnada et al., 2022; Morandini et al., 2021; Kasauli et al., 2021; Patanakul et al., 2018).

Therefore, the lack of leadership support presents a critical challenge in adopting agile scrum methodologies in public organisations' IT project management. This theme and subthemes emerged consistently in multiple studies, highlighting the pivotal role of leadership buy-in and support for successful agile implementation.

4.1.4.1 Lack of senior management support

The agile scrum adoption is determined and impacted by top management, where the senior management is aware of agile activities and scrum adoption. The senior management is not acquainted with the understanding that Agility benefits businesses, products, and essential stakeholders, but they consider the adoption of the methodology that might improve delivery and teams' productivity (Ribeiro et al., 2018; Shastri et al., 2020; Marnada et al., 2022; Ju et al., 2019). By contrast, active and supportive management that promotes agility and enthusiastically participates in the process makes the transition more realistic (Hidalgo, 2019; Kasauli et al., 2021; Nabilah, 2019). Therefore, the success of an agile scrum implementation is dependent on the leadership being available to the agile team, providing them with well-defined user stories/requirements on time, contributing to the prioritisation of user stories in the backlog, and providing support when deciding on the activities for the next sprint (Cano et al., 2021; Hidalgo, 2019; Nabilah, 2019; Shastri et al., 2020).

Decision-makers' involvement may be complex due to the iterative nature of agile project planning (Endres et al., 2022; Kasauli et al., 2021; Patanakul et al., 2018). The incremental product delivery cycle makes including consumers and stakeholders in pilot testing more difficult. Especially given the diversity of the organisation's clientele across the world. As a result, adopting the decision-makers levels attitude is challenging in adopting Agile scrum methodology (Endres et al., 2022; Patanakul et al.,

2018; Collins, 2021). Lack of support from decision-makers or even blocking ideas and changes is widespread, and all are associated with the anxiety of losing a job or control (Ribeiro et al., 2018; Patanakul et al., 2018; Kasauli et al., 2021). On the contrary, during the process of adopting the agile scrum methodology, regularly studied the managers were missing (Collins, 2021; Shastri et al., 2020). They are empowered enough to help remove obstacles and enable agile in teams, businesses, senior management, and customers (Shastri et al., 2020; Patanakul et al., 2018; Hron et al., 2021).

Therefore, key decision-makers within public organisations play a crucial role in driving agile transformation. However, the absence of their support can lead to a lack of alignment between project goals and organisational strategies, resulting in limited adoption of agile scrum methodologies.

4.1.4.2 Limited Experience

Senior management limited experience presents a significant challenge in adopting agile scrum methodologies in public organisations' IT project management. Therefore, this study highlighted that how a lack of prior exposure to agile scrum practices can hinder successful implementation and the difficulties faced by organisations due to limited familiarity with agile scrum principles and practices (Morandini et al., 2021; Ju et al., 2019; Nabilah, 2019; Shastri et al., 2020; Patanakul et al., 2018)

Agile scrum practices are relatively new for many organisations, and understanding how to apply them effectively can be limited (Collins, 2021; Morandini et al., 2021; Altuwaijri et al., 2022). The initial stage in implementing agile scrum practices was instructing the product owner and other key staff on the appropriate approach. So, before a more significant scale deployment of agile scrum practices was undertaken, the success of a pilot project must first be approved and supported by experienced senior managers. Others have stated that because agile approaches were implemented so quickly, insufficient time was spent on training and teaching at the start (Morandini et al., 2021; Hron et al., 2021; Kasauli et al., 2021). This problem is due to the organisations' continuous efforts to digitise their services. The events draw experts from many industries, widening the target audience for software development and agile approaches. As a result, people need to learn about issues outside their expertise (Papadakis et al., 2018; Collins, 2021; Maranda et al., 2022). So, the lack of experience can lead to the inefficacy of Agile scrum principles or difficulty adapting to new working methods, ultimately making it challenging to achieve the expected benefits (Morandini et al., 2021; Maranda et al., 2022). Therefore, addressing this experience gap through training and mentoring can be crucial for organisations adopting agile scrum methods.

4.1.5 Inability to Measure Progress

Agile methodologies use different metrics and measurements than traditional methods, and it can be difficult for organisations to track and evaluate progress (Collins, 2021; Maranda et al., 2022; Ju et al., 2019). This can make it challenging for organisations to determine whether they are progressing towards their goals or need to adjust their approach. This lack of visibility and feedback can also make it hard for the teams to identify bottlenecks, understand their performance and adapt accordingly (Altuwaijri et al., 2022; Kasauli et al., 2021; Ju et al., 2019). Software system dependencies must be foreseen beforehand so that all stakeholders may make the necessary changes (Ju et al., 2019; Collins, 2021; Ribeiro et al., 2018). However, according to agile planning principles, interfaces may not have been built early enough to guarantee that they were conveyed to stakeholders when required. Because of the issue's intricacy, agile initiatives must account for it. Due to the iterative nature of agile planning, certain previously agreed-upon design decisions may need to be changed, and the order in which tasks are executed may shift (Collins, 2021; Ribeiro et al., 2018; Ju et al., 2019; Kasauli et al., 2021). If any of these modifications need a change in implementation, delivering that information to the appropriate stakeholders is challenging (Kasauli et al., 2021; Nabilah, 2019; Papadakis et al., 2018).

Therefore, the inability to measure progress poses a significant challenge in adopting agile scrum methodologies in public organisations' IT project management. This theme emerged across various studies, highlighting the difficulties organisations face in accurately assessing and communicating project advancement. Three sub-themes shed light on specific aspects of this challenge.

4.1.5.1 Difficulty in tracking progress on an ongoing basis

Difficulty in tracking progress on an ongoing basis was evident in studies by Hidalgo (2019), Collins (2021), Altuwaijri et al. (2022), Papadakis et al. (2018) and Patanakul et al. (2018). Agile scrum methodologies emphasise continuous progress tracking through iterative cycles, but public organisations may struggle to implement effective tracking mechanisms. Frequent updates and adjustments require close monitoring, and the lack of appropriate tools or practices may hinder real-time visibility into project status.

4.1.5.2 Reliance on deliverables as a measure of progress

Reliance on deliverables as a measure of progress was identified in studies by Hidalgo (2019), Collins (2021), Ju et al. (2019), Kasauli et al. (2021), and Patanakul et al. (2018). Traditional project management often relies on deliverables as the primary metric of progress. Still, this approach may not align with the agile philosophy, which prioritises working software and continuous value delivery over documentation. Relying solely

on deliverables can lead to incomplete assessments of project advancement and may not effectively capture the underlying progress in an agile scrum project.

4.1.5.3 Inability to effectively communicate

The inability to effectively communicate progress to stakeholders was discussed in studies by Hidalgo (2019), Collins (2021), Altuwaijri et al. (2022), Kasauli et al. (2021), and Patanakul and Rufo-McCarron (2018). Agile practices promote transparent and frequent communication with stakeholders; however, public organisations may encounter challenges in effectively conveying progress updates. Inadequate communication channels or difficulties in presenting progress in a meaningful and accessible manner can hinder stakeholder engagement and support.

4.2 Challenges at Individual, Project and Organisational Levels

The results show that several challenges emerged from the data at the individual level. The most prominent issue was resistance to change among employees. Many IT professionals were accustomed to traditional project management methodologies and found it challenging to embrace the agile mindset, which emphasises collaboration, adaptability, and continuous improvement. Additionally, team members faced self-organisation challenges and ambiguity in their roles and responsibilities (Raza, 2019; Miller, 2013; Conboy et al., 2011; Kashyap, 2018; Chervenkova, 2019; Rigby et al., 2017). On the other hand, at the project level, certain impediments were identified. Frequent changes in project scope and requirements were common, leading to difficulties maintaining project focus and predictability. Agile's iterative and incremental nature demanded active stakeholder involvement but obtaining timely feedback and decisions from stakeholders often proved challenging due to bureaucratic procedures in public organisations (Keita, 2020c; Learnovative Scrum Training, 2020; Riaz et al., 2018; Agile Alliance, 2018 and Dayibas, 2021). Finally, at the organisation level, various barriers were observed. The hierarchical structure of public organisations hindered effective communication and collaboration across departments, inhibiting agile scrum adoption. Moreover, rigid procurement and budgeting processes clashed with Agile's adaptive planning, leading to conflicts between Agile teams and organisational policies (Domingues et al. 2017; May, 2016; Miller, 2013; Ribeiro et al., 2018; Kannampallil et al., 2011 and Nuottila et al., 2016).

4.3 Summary of the Result

The results reveal several key challenges in adopting agile scrum methodology in public organisations' IT project management. As illustrated in Table 3, organisational culture emerges as a prominent barrier, with many public organisation entities exhibiting a traditional and hierarchical culture that may resist agile's iterative and

collaborative nature. Cultural resistance often stems from ingrained bureaucratic structures, risk-averse mindsets, and a lack of flexibility in decision-making processes. Secondly, resource constraints pose a significant challenge for public organisations. Unlike their private organisation counterparts, public organisations often face limited budgets, complex procurement procedures, and stringent regulations, which can impede the adoption of agile scrum practices that require dedicated resources, quick procurement cycles, and flexibility in project funding.

Another significant challenge identified is the need for stakeholder involvement and collaboration. Public organisations typically have diverse stakeholders, including government organisations, citizens, and regulatory bodies, each with their own interests and expectations. Aligning and engaging these stakeholders in the agile project management process is crucial but can be challenging due to differing priorities, communication gaps, and the need for transparent decision-making. Also, the review highlights the importance of change management in overcoming resistance to agile scrum adoption. Public organisations must address concerns related to job security, role changes, and skill gaps that may arise during the transition from traditional project management approaches to agile methods. Table 3 displays the key findings obtained from the study, outlining the identified themes, sub-themes and codes, and the study under consideration.

Chapter 5

Discussion

This study examined public organisations' challenges in adopting agile scrum methodology in IT project management. Public organisations increasingly recognise the potential of advanced modern technology to enhance their efficiency, effectiveness, and operational harmonisation. However, unlike private organisations, public organisations are more inclined to adopt the traditional project management model in IT projects rather than the agile scrum framework. This chapter discusses why this is the case and proposes how public organisations can eliminate bottlenecks that hinder the effective adoption of the agile scrum method in their IT projects.

5.1 Challenges in Adopting Agile Scrum Methodology

It is not only private organisations that are increasingly trying to transform their operations using modern technology, but also public organisations have come to appreciate the importance of automation to improve work efficiency and cut unnecessary costs. Public organisations are being pushed to explore innovative solutions to match the demand as citizens expect to get a similar quality of services in private organisations. Consequently, public organisations are turning to technological developments to create value for the citizens, ensure transparency, increase work effectiveness and efficiency, and streamline processes (Keita, 2020c). Technologies are helping to build trust and meet citizens' expectations in public organisations (Malakar, 2021). However, while public organisations continually adopt emerging technologies, their implementing approaches and methods focus more on using longer project phases, planning and predictability, comprehensive documentation, and organised groups (traditional project management). Failure to adopt an IT project management implementation method that prioritises flexibility, self-organising teams, project sprints, and focusing on customer satisfaction is caused by various internal and external challenges that are peculiar to public organisations (Alam et al., 2017).

In order to identify the main challenges that limit the full adoption of scrum in implementing IT projects in public organisations, the current study carried out a comprehensive review of 15 past studies that used different methodologies to establish critical issues that make it difficult for public organisations to use scrum methodology in their IT projects fully. This review of the past literature revealed a consistent consensus among previous studies, indicating that internal organisational factors within governmental institutions significantly hinder the successful implementation of agile scrum methodology in government IT project management (Walsh et al., 2020; Almeida, 2017; Agile Alliance, 2019; Meick, 2021; Keita, 2020a).

These internal challenges pose substantial barriers to the adoption and effective execution of agile scrum practices. The literature review highlighted shows that critical challenges that public organisations face when trying to adopt scrum methodology in their IT projects include lack of training or resources to learn about agile, resistance to change, lack of proper training on scrum methodology, cultural differences, limited resources, lack of leadership support, limited experience, and inability to measure progress.

Resistance to change is a significant hindrance to effective change in public organisations, especially when adopting the agile scrum method in IT projects. Public organisations have unique internal dynamics that contribute to a culture that resists the principles; approaches advanced for scrum methodology (Conboy et al., 2011). These internal factors often contribute to a culture that resists the agile scrum method and principles, and hinders the establishment of cross-functional teams, collaboration, and iterative development. One of the issues that cause this resistance is concern about loss of control. The hierarchical nature of public organisations' management structure vests much power on senior officials. These officials may resist scrum methodology because it calls for delegation of duties to smaller groups (Layton et al., 2018). Additionally, scepticism about the effectiveness of agile methods may arise due to limited understanding or previous negative experiences with different project management approaches (Schwaber, 2004).

Public organisations are very bureaucratic and subject to many regulations. Public procurement and changes are regulated by different laws which are enforced by other governmental organisations. These laws are meant to promote accountability and transparency; however, they slow innovation and the rate at which public organisations adopt changes. As a result, most IT projects in public organisations are implemented using traditional methods (Domingues et al., 2017; Miller, 2013). Another factor found within the literature that acts as a barrier to using agile scrum methodology when implementing IT projects in public organisations is cultural differences. The bureaucratic nature of some public organisations may clash with the collaborative and decentralised approach of agile methods. Cultural resistance to change, risk aversion, and adherence to traditional project management practices can hinder the adoption of Agile scrum principles (Ribeiro et al., 2018; Conboy et al., 2011). In addition, public organisations often need more budget, human resources, and infrastructure support, which can impede the effective implementation of agile scrum methodology. Limited resources may hinder the formation of cross-functional teams, the allocation of dedicated time for agile ceremonies, and the availability of necessary tools and technologies (Edison et al., 2021).

The support and commitment of organisational leadership are crucial for successfully adopting agile scrum methodology. In public organisations, where decision-making processes may be hierarchical and risk-averse, obtaining leadership support can be

challenging (Graffius, 2016). With active involvement and endorsement from leaders, implementing agile methodologies may avoid resistance or lack of the necessary resources and authority (Ribeiro et al., 2018). Besides, public organisations may need more experience with agile methodologies due to a lack of exposure, training, or previous reliance on traditional project management approaches. Limited experience can lead to uncertainty, resistance, and a lack of confidence in adopting an agile scrum methodology (Amorim et al., 2020).

5.2 Addressing the Challenges in Adopting Agile Scrum Methodology

In order to tackle the challenges in adopting agile scrum methodologies, initiating change management strategies within public organisations is crucial. This includes cultivating a culture of openness and transparency, where employees at all tiers are inspired to adopt agile scrum principles. This process is greatly influenced by communication and education. Training programs and workshops can be arranged to improve employees' comprehension of agile scrum methodology and its advantages (Ma'arif et al., 2018). These initiatives should target the technical aspects of agile scrum practices and emphasise the underlying principles and values that propel its success.

Moreover, actively involving stakeholders and leaders within public organisations in the agile transformation process is crucial. Getting key decision-makers involved early in the implementation can mitigate concerns about loss of control. It can also develop trust in the efficiency of agile scrum methodology (Caldwell, 2021). Leaders can endorse the agile approach by giving clear guidance, establishing expectations, and demonstrating the benefits of agile through successful pilot schemes.

Challenges arising from cultural differences can be handled by focusing on change management strategies. This involves creating awareness and understanding of agile scrum principles, highlighting the benefits, and addressing misconceptions. It is essential to engage employees at all levels, promote open communication, and provide training and education to bridge the gap between traditional practices and agile scrum methodologies (Nuottila et al., 2016). Encouraging cross-functional collaboration and fostering a culture of innovation can also help overcome cultural barriers. In addition, public organisations can prioritise and allocate resources based on the project's criticality and potential impact to mitigate the impact of limited resources. This involves identifying and addressing resource gaps early in the planning phase. Leveraging cloud-based project management tools, promoting knowledge sharing and collaboration, and encouraging open-source solutions can help overcome resource limitations. Additionally, organisations can explore partnerships with external entities or consider outsourcing certain functions to optimise resource utilisation (Boehm et al., 2005).

To get leadership support, it is crucial to build awareness and understanding among key decision-makers about the agile-scrum methodology's benefits and potential outcomes. Education and training sessions tailored for public organisation leaders can demonstrate successful case studies and showcase the positive impact of agile approaches in similar public organisations (Bogdanova et al., 2020). Engaging leaders as sponsors and advocates, involving them in the decision-making process, and providing them with the necessary tools and resources to support agile initiatives can help overcome this challenge. Also, to deal with inadequacy in training, public organisations should invest in comprehensive training programs to upskill employees and build expertise in agile scrum methodologies. This can include certifications, workshops, and hands-on training to familiarise teams with agile scrum practices. Introducing pilot projects or small-scale initiatives can provide opportunities for practical experience, learning, and demonstrating the value of agile scrum methodologies within the organisation. Collaboration with experienced agile coaches or consultants can also offer guidance and support during the initial IT project implementation stages (Hobbs et al., 2017).

Finally, to conclude this chapter, measuring progress and performance is vital to manage projects effectively. However, traditional metrics and performance evaluation methods may not align with agile projects' iterative and incremental nature within the context of agile scrum methodology. Challenges in defining and measuring project success for public organisations can impede their evaluation of the effectiveness of agile scrum practices (Farooq, 2018). Public organisations require establishing relevant metrics and evaluation frameworks specific to agile projects to handle the challenge of measuring progress. This comprises specifying corresponding to agile scrum principles like velocity, customer satisfaction, and cycle time. Having regular retrospective meetings and continuous feedback loops enables obtaining valuable insights into project progress and identifying areas for improvement. Effective progress measurement is possible by implementing agile project management tools that allow real-time tracking and visualisation of project status and metrics (Almeida, 2017).

Chapter 6

Limitations

While conducting the systematic literature review, certain limitations came to light. These limitations include potential bias in the selected articles, as the search process relies on published papers and excludes unpublished or non-English articles, potentially overlooking valuable insights. The reliance on peer-reviewed articles may limit the inclusion of industry reports or grey literature that could provide practical experiences. Additionally, the study's temporal scope may need to fully capture recent developments and emerging trends in agile scrum methodology. The focus on challenges in a broad context may need to pay more attention to specific nuances and context-specific factors faced by different public organisations, limiting the generalisability of the findings.

Another area for improvement of the study is its reliance on existing literature, which may have employed small sample sizes in the original studies. When conducting a SLR, it is essential to consider that the studies referencing might have had limited participant numbers. This could affect the generalisability and representativeness of the findings. Also, there is potentially limited geographical coverage of the studies included in the literature review. Some of the original studies have focused on specific regions, countries, and cultural contexts, which might restrict the applicability of the findings to a broader global or diverse context. Different geographical locations may have unique characteristics, organisational structures, or cultural factors that can influence the challenges and adoption of agile scrum practices in public organisations.

To address these limitations, the author used robust and different types of studies, including those employing secondary and primary data-gathering methods. This approach helped mitigate the impact of small sample sizes and limited geographical coverage. By incorporating a diverse range of studies, the study provided a more comprehensive analysis and captured a broader understanding of agile adoption challenges in public organisations. However, it is essential to note that despite these efforts, the biases inherent in the original studies, including sample size and geographical limitations, may still persist to some extent. Therefore, this study recommends that future research should aim to address these limitations by conducting larger-scale studies with more diverse participant samples from various geographic regions. This will enhance the generalisability of the findings and provide a more comprehensive understanding of agile scrum implementation challenges in public organisations.

Chapter 7

Conclusion

The 21st century has brought about many changes in private and public service delivery organisations, driven by state-of-the-art technology. Successful implementation of this technology requires thorough investment in infrastructure, human resources, and building a wealth of knowledge and experience. Failing to do this means that despite investing in modern technology, an organisation can still be bedevilled by the limitations of traditional systems; for public organisations, studies have shown that they are more inclined to implement technology projects using traditional approaches. This often leads to frustration and challenges in service delivery. The complexity, bureaucracy, and internal systems of public organisations curtail the adaptability of Agile scrum methodology in IT project implementations, and not all the implications are widely known. This study has highlighted challenges that hinder the successful adoption of agile scrum methods in public organisations, including cultural differences, limited resources, lack of leadership support, limited experience, and difficulties in measuring progress. While the study has provided valuable insights into the challenges of adopting agile scrum methodology in public organisations' IT project management, it is vital to acknowledge the limitations of the research. The selected articles and the temporal scope of the study may introduce bias and limit the generalisability of the findings. Future research should consider including a broader range of literature sources and addressing the specific contextual factors unique to each public organisation. By recognising and addressing these challenges, public organisations can foster an environment conducive to agile scrum practices, improving efficiency, collaboration, and project outcomes. Agile methodologies have the potential to drive innovation and enhance the delivery of IT projects in public organisations, ultimately contributing to the effective use of technology and the achievement of organisational goals.

These findings offer valuable insights for both scholars and practitioners in understanding the intricacies of agile scrum adoption within public organisations and provide a comprehensive overview of the barriers that need to be addressed for successful implementation. For scholars, this work contributes by synthesising and organising existing research on agile scrum adoption in public organisations, highlighting the recurring challenges and themes that have been studied. It is a foundation for further investigations into specific aspects of agile scrum adoption and its implications in public organisations. Moreover, the identified sub-themes offer a nuanced understanding of the intricacies involved, facilitating more targeted research in addressing the root causes of challenges. For practitioners, this study provides actionable insights into the challenges they are likely to encounter during the agile

scrum adoption process. By recognising and anticipating these obstacles, public organisations can develop informed strategies to overcome them. Policymakers and project managers can use the findings to tailor their approach to agile implementation, design effective training programs, secure leadership support, foster a culture of continuous learning, and enhance communication with stakeholders.

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