

**System Analysis and Design  
(SECP2613)**

**ASSIGNMENT 1**

*Software and Academic Paper*

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# DEVOPS

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## ABSTRACT

DevOps has emerged as a transformative approach in software development, combining development and operations through automation, collaboration and continuous improvement. While numerous studies have explored different dimensions of DevOps, most tend to focus either on technical implementations or organizational aspects, often overlooking the interaction between the two. This paper presents a comparative analysis of existing literature to examine how various studies emphasize technical practices such as continuous integration and infrastructure automation, versus organizational elements like team culture and leadership. Additionally, the paper identifies common challenges and success factors reported in DevOps adoption across different contexts. By synthesizing these findings, the study aims to highlight gaps in current research and contribute to a more holistic understanding of what drives successful DevOps implementation.

*Keywords: DevOps, Comparative Analysis, DevOps Challenges and Success Factors*

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## 1.0 INTRODUCTION

In recent years, due to the high demand for faster software delivery, improved product quality and more reliable system performance, DevOps has emerged as a modern approach that integrates software development (Dev) and IT operations (Ops). It promotes collaboration, automation, and continuous delivery to bridge the gap between traditionally siloed teams. Organizations adopting DevOps have reported improved deployment frequency, faster time-to-market and greater system stability.

Despite its growing popularity and widespread adoption, the implementation of DevOps remains complex and varies significantly across organizations. While some studies highlight the benefits of automation and continuous delivery as the core drivers of DevOps success, others emphasize the importance of cultural transformation and team collaboration. This diversity in perspectives creates ambiguity around the best practices and critical success factors for effective DevOps implementation.

The main objective of this study is to analyze and compare previous research on DevOps to understand its key components and the differing perspectives found in the literature. It also aims to identify contradictions in the literature, particularly between technical and organizational viewpoints. Moreover, it also assesses which factors most significantly influence the successful adoption of DevOps practices. This study is significant as it provides a synthesized and balanced understanding of DevOps, addressing the current gap in literature that lacks an integrated view of both technical and human factors involved in its implementation. While individual studies often focus on specific aspects namely automation, software architecture or organizational culture, there is limited research that integrates these elements to provide a holistic view of DevOps as both a technical and cultural transformation.

In order to address this gap, the study is guided by the following research questions in Table 1.

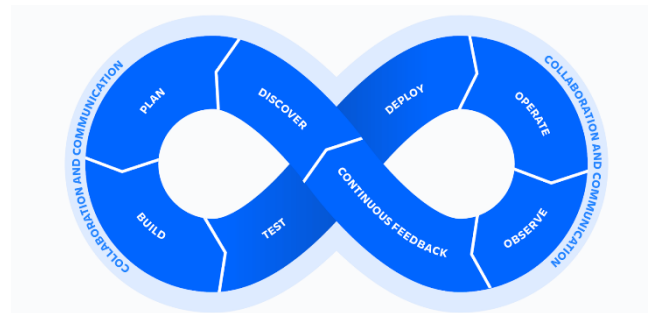
**Table 1. Research Questions (RQs)**

Research Question (RQ)	Description
RQ1: How do different studies compare in their focus on technical versus organizational factors?	To examine how existing literature emphasizes either technical aspects or organizational elements in understanding DevOps practices and outcomes.
RQ2: What are the common challenges and success factors identified in the literature regarding DevOps adoption?	To identify key barriers and enablers reported in previous studies that influence the effectiveness of DevOps implementation.

By answering these questions in Table 1, this research seeks to provide a balanced and critical evaluation of DevOps practices across different contexts.

### 1.1 DevOps

DevOps is a combination of practices, tools and a cultural mindset aimed at automating and streamlining the collaboration between software development and IT operations teams. (Amazon, 2024) The principles of DevOps can be extended to other teams beyond development. For example, when security teams adopt DevOps principles, security becomes a built-in and continuous part of the development workflow — a practice known as DevSecOps. Since DevOps operates in a continuous cycle, it is often represented by an infinity loop, illustrating how each phase of the DevOps lifecycle connects and repeats. Although the phases may seem sequential, the loop highlights the importance of ongoing collaboration and continuous improvement throughout the entire process. (Atlassian, 2024)



**Figure 1: DevOps lifecycle** (<https://www.atlassian.com/devops>)

As shown in Figure 1, the DevOps lifecycle consists of eight phases representing the processes, capabilities and tools needed for development (left side of the loop) and operations (right side of the loop). Throughout each phase, teams collaborate and communicate to maintain alignment, velocity and quality.

## 2.0 LITERATURE VIEW

DevOps is a set of practices and cultural philosophies that has reshaped modern software development by integrating development and operations. While numerous studies have explored DevOps, there remains a lack of comprehensive research comparing both its technical implementations and organizational transformations.

Humble and Farley (2010) emphasize automation practices such as CI/CD to improve deployment speed and reliability. Similarly, Bass et al. (2015) highlight architectural changes, like adopting microservices and cloud infrastructure, to enhance scalability and agility. In contrast, Erich et al. (2017) stress that DevOps success is often rooted in cultural shifts, including cross-functional collaboration and continuous improvement.

Resulting in varied adoption approaches, Jabbari et al. (2016) point to the inconsistent understanding of DevOps across organizations. Lwakatare et al. (2016) further note that large enterprises face unique challenges due to legacy systems and cultural resistance.

Overall, while technical and organizational elements are both critical, literature often treats them separately. This study aims to bridge that gap by comparing both perspectives and identifying key factors influencing successful DevOps adoption.

## 3.0 COMPARISON OF TECHNICAL VS. ORGANIZATIONAL FOCUS IN DIFFERENT STUDIES

A review of the existing literature on DevOps reveals a distinction between studies that emphasize technical implementations and those that highlight organizational and cultural factors. Humble and

Farley (2010), along with Bass et al. (2015), provide a technically oriented perspective. Their studies focus on the role of continuous integration and continuous delivery (CI/CD), infrastructure as code (IaC), deployment automation and system architecture in enabling faster and more reliable software delivery. These studies underline the importance of tools and integration strategies in enhancing software performance and operational efficiency.

In contrast, Erich et al. (2017) and Lwakatare et al. (2016) adopt a more organizational viewpoint. The successful DevOps adoption is stressed that it relies not only on technical tools but also on human and cultural transformation. Their findings emphasize the significance of cross-team collaboration, leadership commitment and open communication, arguing that resistance to cultural change often poses a greater barrier than technology itself.

Bridging both perspectives, Jabbari et al. (2016) conducted a systematic mapping study that recognizes both technical and non-technical dimensions, indicating the need for a balanced approach. Similarly, Forsgren et al. (2018), through the influential DORA (DevOps Research and Assessment) report, demonstrated that high-performing DevOps teams achieve success by integrating both robust technical practices and strong organizational support. Their research shows that metrics such as deployment frequency and lead time for changes are directly linked to factors like team autonomy, learning culture and effective collaboration.

This progression in the literature illustrates a shifting focus over time—while earlier studies emphasized technical capabilities, more recent research increasingly acknowledges the interdependence between technology and organizational readiness as key drivers of DevOps success.

#### **4.0 COMMON CHALLENGES AND SUCCESS FACTORS IN DEVOPS ADOPTION**

The implementation of DevOps within modern software development environments offers substantial operational and strategic advantages. However, one of the primary barriers to its successful adoption is cultural resistance. According to Hoffman (2023), approximately 45% of surveyed professionals identified cultural resistance as a key obstacle to DevOps transformation. This resistance often stems from long-standing habits, comfort with legacy systems and apprehension toward organizational change.

Compounding the challenge of cultural change is the significant training and upskilling required for teams to effectively operate within a DevOps framework. DevOps introduces a suite of technical competencies which differ markedly from traditional IT practices. These tools enable rapid software delivery and infrastructure management, but they also entail a steep learning curve for individuals unfamiliar with such methodologies. As Mehta (2024) notes, this can initially lead to reduced productivity and implementation delays, particularly when training programs are inadequate or not aligned with the organization's needs.

Despite these challenges, the transition to DevOps can yield transformative benefits when accompanied by a strong emphasis on collaboration. One of the defining features of DevOps is its ability to bridge the traditional gap between development and operations teams. By eliminating silos and promoting transparent communication, DevOps fosters a culture of shared ownership and accountability. This collaborative environment enables early detection of issues, faster resolution of bugs and more efficient development cycles. As emphasized by Kim, Debois, Willis and Humble (2016), such synergy not only enhances workflow efficiency but also improves overall product quality and end-user satisfaction.

Another critical success factor in DevOps adoption is the strategic use of automation. Automating repetitive and error-prone tasks such as code testing, deployment and infrastructure provisioning allows development teams to focus on higher-value activities. Automation also facilitates continuous feedback, enabling quicker identification and resolution of defects, thereby improving system stability and security. When combined with a collaborative culture, automation transforms DevOps from a technical framework into a powerful organizational capability that drives long-term success.

## 5.0 CONCLUSION

DevOps has evolved into a critical paradigm for modern software development, integrating both technical innovations and organizational change to deliver faster, more reliable and higher-quality software. This study has presented a comparative analysis of existing literature to explore the interplay between technical practices and organizational culture in the adoption of DevOps.

Findings reveal that while early research placed considerable emphasis on automation tools, CI/CD pipelines and architectural innovations, more recent studies recognize the indispensable role of cultural transformation, leadership and cross-functional collaboration. Challenges such as resistance to change, the steep learning curve associated with new tools and insufficient training remain significant barriers. However, organizations that successfully address these issues through strong leadership commitment, continuous learning, and effective communication tend to reap substantial benefits from DevOps adoption.

By synthesizing the perspectives from both technical and organizational domains, this paper highlights the need for a holistic approach in implementing DevOps. The integration of robust technical practices with a supportive organizational environment is essential for maximizing DevOps effectiveness. Future research should further investigate how these dimensions can be harmonized in various organizational contexts and how DevOps maturity can be systematically measured across industries. Ultimately, this study contributes to a more balanced and comprehensive understanding of DevOps as both a technical methodology and a cultural movement, essential for sustained success in dynamic software environments.

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## LOGBOOK

Date	Student's name	Activity	Keywords / Prompt used
1/4/2025	Angela Ngu Xin Yi Toh Shee Thong	Initial research on DevOps	- "What is DevOps" - "The use of DevOps in industry"
2/4/2025	Angela Ngu Xin Yi	Drafting of the introduction section	- "Introduce DevOps" - "What is DevOps life cycle?"
3/4/2025	Toh Shee Thong	Supplementary research	- "Give research about DevOps"
5/4/2025	Angela Ngu Xin Yi	Composition of literature review	- "Compare and summarize the research about DevOps"
6/4/2025	Angela Ngu Xin Yi Toh Shee Thong	Subtopic planning and content development	- "The topic that can be extended for DevOps" - "List down several comparison between technical and organizational for DevOps" - "Identify key challenges in DevOps adoption and suggest strategies to overcome them."
10/4/2025	Toh Shee Thong	Composition of conclusion section	- "Explain the role of collaboration in successful DevOps adoption." - "Why is DevOps considered both a technical strategy and a cultural shift?"
11/4/2025	Angela Ngu Xin Yi	Final refinement and grammar review	- "Help me to check if there is any grammatical error."