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Identifying Success and Failure Factors of DevOps Software Development in Afghan Software Companies

Fazal Rahim Naeemkhel*
Lecturer, Department of Software Engineering, Rana University, Kabul, Afghanistan

***Abstract*: Software development and operations have been transformed by DevOps, which fosters agility and efficiency. However, there are particular difficulties in implementing it in poor nations like Afghanistan. The success or failure of DevOps approaches in Afghan software organizations is examined in this study. The research employs a mixed-method approach to identify key success elements including managerial support, training, and effective communication. It also exposes challenges like insufficient infrastructure, skilled workforce shortages, and opposition to change. The results offer Afghan businesses a road map for improving their DevOps adoption and addressing context-specific difficulties.**

***Keywords*: DevOps Implementation, Success Factors, Failure Factors, Software Development, Developing Countries.**

1. Introduction

DevOps is a software development methodology that integrates development and IT operations teams to improve collaboration, automation, and the delivery pipeline. The core goals of DevOps are to increase the speed, efficiency, and quality of software development while reducing time-to-market. Key practices include continuous integration (CI), continuous delivery (CD), automated testing, infrastructure as code (IaC), and monitoring.

Global adoption of DevOps has shown its potential to revolutionize how software is developed, deployed, and maintained. However, the specific challenges and successes in implementing DevOps can vary significantly depending on the region, culture, and maturity of the industry. In Afghanistan, software companies face unique challenges due to socio-economic, political, and infrastructural constraints. As such, understanding the factors that contribute to the success or failure of DevOps in Afghan companies requires a deep dive into both general DevOps literature and region-specific insights.

2. Problem Statement

The main problem that this paper will address is to explore the Identifying Success and Failure Factors when adopting DevOps during software development in Afghan Software companies. It's not uncommon for development and operations to clash when a company is providing useful new software to its clients. To resolve the tension between the development and operations teams, the developing idea of DevOps has been presented. DevOps is being used by an increasing number of businesses and organizations. The notion of DevOps is still relatively new, so it's important to know what problems it might help solve as well as how to mitigate them.

3. Problem Definition

In the software development lifecycle, there often exists a conflict between development teams (who focus on developing software) and operations teams (who focus on deploying and maintaining that software). This conflict can hinder the efficient delivery of software products. Afghan software companies are increasingly adopting DevOps practices to enhance their software development processes. Understanding the factors that contribute to the success or failure of DevOps adoption in this specific context is critical for these companies to maximize the benefits of DevOps.

- *Success Factors*: Identifying key elements that contribute to the successful adoption of DevOps in Afghan software companies. This could include organizational culture, tool selection, team collaboration, and management support.
- *Failure Factors*: Identifying common obstacles and challenges that hinder the successful implementation of DevOps. These might include resistance to change, lack of expertise, insufficient training, and inadequate infrastructure.

A. Purpose and Scope

Cross-functional teams are used in DevOps, a software engineering culture and philosophy, to develop, test, and deliver products more quickly and reliably [24]. Automation is primarily used to do this. The goal of DevOps is to enhance software development teams' cooperation between development and operations. There are numerous positions and points of view on DevOps among the scientific community. Two opposing viewpoints are presented by Macarthy & Bass [24]: (1) that DevOps is a cultural movement that helps with

*Corresponding author: fazalrahimnaeemkhel@gmail.com

quick software development, and (2) that DevOps is more like a job description that calls for both IT operation and development skills. Automation alone does not equate to DevOps, as is evident when considering various perspectives on the field and its application.

4. Literature Review

DevOps is a set of software development practices that aim to unite software development (Dev) and IT operations (Ops), emphasizing collaboration, automation, and continuous delivery. It integrates automation, collaboration, monitoring, and feedback loops to reduce development time, improve software quality, and enable continuous integration and delivery (Lwakatare et al., 2019). In recent years, DevOps has gained traction due to its potential to enhance productivity, speed, and quality in software development (Kim et al., 2016).

According to Battina and Dhaya Sindhu (2021), the intangible and complex nature of software leads to rapidly changing requirements, making it challenging for development teams to meet client expectations while ensuring desired functionality and quality. In their study, "Enhancing Lean Software Development by Using DevOps Practices" (2017), they assert that traditional lean software development struggles to integrate development and operations teams. DevOps, however, merges these teams, integrating operational tasks into the development process and keeping them up-to-date, which reduces errors during deployment. Their research conducted on two departments in the Faculty of Commerce at Helwan University, demonstrated that applying DevOps practices to lean software development improved response times for customers and provided rapid feedback, leading to more accurate fulfillment of customer needs and reduced deployment issues and change fail rates.

Noor Mohammed Noorani and Abu Taha Zamani (2022) discuss the multidisciplinary nature of DevOps and its widespread use in the software development industry to produce high-quality software on schedule and within budget. However, they note that implementing DevOps is challenging and that existing literature does not offer sufficient guidelines for effective implementation. Their study aims to develop a readiness model by investigating factors that impact DevOps activities positively or negatively in the software industry.

Fernando Almeida and Jorge Simões (2022) explore the combined adoption of Agile and DevOps methodologies, which helps organizations manage the growing complexity of customer requirements and requests. This integration fosters a collaborative and agile framework, replacing traditional waterfall models and bridging the gap between development and operations teams. Their study aims to highlight the benefits of adopting both Agile and DevOps models simultaneously.

5. Data Collection

- *Surveys*: Given to staff members of Afghan software firms in order to collect numerical data regarding their DevOps experiences.
- *Interviews*: To obtain qualitative insights, interviews were conducted with important stakeholders, such as managers, operations personnel, and developers.
- *Case Studies*: In-depth analyses of particular Afghan software firms that have adopted DevOps techniques.
- *Focus Group*: Identifying success and failure factors when adopting DevOps in Afghan software companies, a focus group can provide valuable insights from practitioners and stakeholders who have experience with DevOps implementations.

6. Success Factors in Afghan Software Companies

Local Adaptation of Global Best Practices Afghan companies that have succeeded with DevOps have adapted global best practices to suit their specific context. This includes leveraging local tools and solutions, such as locally hosted CI/CD servers, to mitigate internet connectivity issues.

International Collaboration Some Afghan software companies have formed partnerships with international organizations and clients that have more advanced DevOps infrastructures. This collaboration allows Afghan companies to gain access to better tools, skills, and cloud services, while also adopting best practices and building trust in their development processes.

Incremental Approach Given the infrastructural limitations and resistance to change, some Afghan companies have adopted DevOps incrementally, starting with smaller projects or teams. This allows them to mitigate risks and demonstrate the value of DevOps practices before scaling across the entire organization.

7. Failure Factors in Afghan Software Companies

Resource Constraints: Many Afghan companies face significant resource constraints that make it difficult to invest in the necessary infrastructure for DevOps. This includes both human and technical resources. Without the proper tools, cloud access, and automation, it is challenging to realize the full benefits of DevOps.

Resistance to Change: Cultural resistance to change remains a significant barrier. Traditional development methodologies such as waterfall are deeply ingrained, and many employees are hesitant to adopt the collaborative, risk-taking culture that DevOps demands.

Political and Security Instability: Ongoing security concerns and the political environment in Afghanistan hinder the adoption of global technologies and tools, further exacerbating challenges for software companies looking to implement DevOps.

8. Recommendations/Actions to be Taken

The following advices are given to Afghan software businesses in light of the findings:

- *Encourage a Collaborative Culture*: Create an atmosphere where the development and operations teams can work together.
- *Invest in Training*: To keep teams up to date on the newest DevOps techniques, offer opportunities for continuous training and growth.

- *Adopt Effective Automation Practices*: To streamline procedures, leverage Infrastructure as Code and put in place CI/CD pipelines.
- *Ensure Management Support*: Obtain resolute backing from the top down to allot essential resources and foster a DevOps-friendly environment.
- *Track Performance Metrics*: Establish and keep an eye on KPIs to gauge progress and pinpoint areas that need attention.

9. Conclusion

The success of DevOps in Afghan software companies is contingent upon addressing a range of factors including leadership support, technical infrastructure, and cultural readiness. While some companies have managed to navigate challenges by adapting global best practices, the overarching issues related to infrastructure, political instability, and skills shortages remain significant barriers. Further research is needed to develop region-specific models that account for these unique factors, which can aid in the widespread adoption of DevOps in Afghanistan and similar regions.

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