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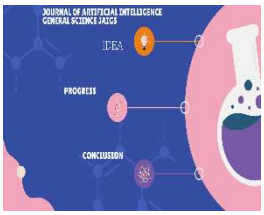

Implementing DevOps Adoption within United States SMEs

Omolola Akinola[1], Omowunmi Oyerinde[2], Akintunde Akinola[2]

[1,2]Lamar University, Beaumont Texas.

[3]Ekiti state university.

*Corresponding Author:Omolola Akinola

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ABSTRACT

DevOps is an integration of "Development" (Dev) and "Operations" (Ops) and has emerged as a transformational way of software development, with the objective of enabling rapid and efficient delivery of software. While accepted at larger scales in enterprises, there has been hardly any literature review based on the implementation of DevOps in Small and Medium Enterprises (SMEs) in the United States. This research, therefore, seeks to analyze in detail the challenges, methodologies, and outcomes of implementing DevOps adoption within SMEs in the United States. This research investigates the strategies, benefits, and barriers of SMEs toward the implementation of DevOps using mixed-methods research, including qualitative data from a case study and both interview and quantitative survey data. The results offer a contribution to an understanding of how SMEs adopt DevOps and present valuable knowledge for both practitioners and researchers.

Introduction

DevOps adoption is increasingly crucial for small and medium-sized enterprises (SMEs) in the United States. DevOps practice brings some benefits, such as increasing market agility, increasing quality, and building a culture of collaboration and efficiency among employees (Miller, 2020). This means that the very nature of the product development processes by the SMEs and also the deployment rates can be increased, while supporting the creation of a culture of collaboration between different teams, through DevOps practices (Why Adopting a DevOps Approach Is Crucial for Your Business, n.d.).

Indeed, the effective and reliable delivery of software is a fundamental part of the critical business success factors in place for both companies today, regardless of their size. DevOps is a mashup of "development" and "operations," greatly focusing on the large-scale collaboration, automation, and integration of the software development group and the IT operations group. Its implementation, although from a reasonably vast literature, within the Small and Medium Enterprises (SMEs), is a topic that remained a little-ventured one; in fact, it has become particularly notable for the United States context. Thus, this research shall bridge this gap by empirically investigating the challenges, methodologies, and outcomes of the United States SMEs towards DevOps adoption.

Literature Review

Literature of DevOps adoption synthesizes a broad view of the critical success factors and effects, including the practice of breaking the organizational silos in enhancing software quality and collaboration between the development team and the operations team within the DevOps adoption process (Azad &Hyrynsalmi, 2023; Offerman et al., 2022; Lwakatare et al., 2019).

What has developed from this is the concept of DevOps, which has now grown far from the narrow collaboration between Development and Operations to a methodology requiring transformation and collaboration across all organizational functions. It therefore leads to questions on the implications that adoption of both approaches may have on the organizational performance. The use of DevOps varies from business unit to business unit and from team to team within an organization. Key literature feels that a much clearer idea is required of how DevOps is being put into practice and its alignment with organizational objectives (Strieker et al., 2022).

The present work, therefore, categorizes common DevOps practices into broad and narrow concepts; it is meant to link these to a proper understanding of the relationship between practices and organizational achievements. This research was based on the evidence of definitions, practices, and roles associated with the adoption of DevOps.

And so was born DevOps, a formal response to problems posed by even more traditional software development methodologies, like Waterfall. DevOps emphasizes the smoothing of the process of software delivery through closer collaboration of the development and operations teams that will result in an increased deployment frequency, eventually contributing to improved overall quality of software delivered (Kim et al., 2017). Most of the research in this space has been centered on large organizations because the benefits reaped from DevOps adoption are also great. The benefits that accrue include faster time to market, high-quality software, and increased customer satisfaction (Forsgren et al., 2018).

Nevertheless, the suitability of implementing DevOps in SMEs raises much controversy. SMEs can enjoy fruits from DevOps practices in their very own businesses, even though, most of the time, limited by not the same source of resources and organizational complexities as large enterprises. Prior research identified that in relation to SMEs, resistance to change, lack of specialized expertise, and limitation of budget might form potential barriers towards the implementation of DevOps (Cohn, 2010).

The entire literature review mentions the fact that the nature of DevOps adoption is changing from simple teamwork to every aspect of organizational methodology. This clearly calls for proper understanding and distinction of the narrow and broad sense of DevOps practices in future studies, which could be a guideline to implement strategies that offer organizations the maximum performance benefit through effective DevDevOps adoption.

Methodology

In this research, the qualitative and quantitative approaches have been used through interviews and survey questionnaires administered, respectively, in order to find out the DevOps adoption in the United States for SMEs.

The leading people, representatives of key stakeholders, IT managers, software developers, and operation persons, have been interviewed through semi-structured qualitative interviews from a varied sample of SMEs. The key issues covered within interviews that have been made are issues of reasoning for DevOps introduction, strategies used, and difficulties on the way to its implementation, and outcomes that seem to be achieved as a result of its implementation.

Quantitative Surveys: The survey questionnaire applied for this study will be applied to a broader sample of SMEs belonging to varying industries in the United States. It assessed the extent to which they were practicing DevOps, what specific practices the firms had put in place, what they thought the benefits and challenges of DevOps were, and their overall satisfaction of practicing DevOps.

Results

Preliminary results emanating from the qualitative interviews indicate that SMEs in the United States are gradually beginning to appreciate the role DevOps plays towards scaling their software delivery processes. Some of the major motivations that underpin the DevOps adoption involve improved collaboration between the development team and the operations staff, acceleration of time-to-market, and quality improvements in software releases.

Organizations that adopt DevOps face common challenges in that the culture and change are resisted, and there is a need to acquire new skills. SMEs have devised ways of addressing this, such as training their employees, ensuring they utilize some form of automation tool, and apply continuous improvement.

The findings in this area, determined by the quantitative survey data, have corroborated the growth of DevOps adoption among U.S.-based SMEs. This is again confirmed in the same research, which reports the diversity of practices that have taken the way of DevOps, with Agile methodologies, CI/CD, and IaC being some of the most common.

SMEs that have incorporated DevOps, on the whole, show positive results, with companies experiencing faster release cycles, less downtime, and most strongly, improved customer service satisfaction due to a positive impact. While challenges continue to be prevalent, therefore, the findings of this study suggest that DevOps does promise benefits for SMEs seeking improved software delivery capabilities.

Conclusion

The research presented has led to significant implications and contributes to DevOps adoption landscapes in the United States Small and Medium Enterprises (SMEs). The main outcome of the mix-methods approach with the integration of both the qualitative interviews and the quantitative survey in this study includes a rich account of motivations, strategies, difficulties, and outcomes associated with the implementation of DevOps among SMEs.

The results support that awareness is increasing in relevance of DevOps within the improvement of the software delivery process in SMEs. The main reasons behind DevOps adoption include improved collaboration, faster time-

to-market, and quality of the software delivered. Despite such challenges as resistance to change and cultural barriers, SMEs have proved quite stubborn with them, using their different strategies against the hindrances, which include investing in employee training and leveraging automation tools.

On the other hand, the incrementing trend of DevOps adoption is confirmed amongst the SMEs in the US with the help of the Quantitative Survey Data, where Agile Methodologies, CI/CD, IaC have come up as one of the general practices. On the other hand, SMEs report positive outcomes of DevOps adoption, such as faster release cycles, reduced downtime, and increased customer satisfaction resulting from continuous software upgrades.

In essence, DevOps offers United States SMEs a way through which they can improve their capabilities in software delivery and ultimately remain competitive in an environment that has been largely digitized. DevOps maximizes software development for SMEs and the efficient delivery process of software through collaboration, automation, and endless improvement in the process. They have to simultaneously tailor DevOps practices and devise suitable ways of dealing with the right challenges presented to them.

In sum, this research opens the way for deeper insights toward DevOps adoption within the context of SMEs and supports tremendous values for practitioners, researchers, and policymakers. This study could be the base for another study to seek more insight into different dimensions of DevOps implementation in SMEs, such as impact on organizational culture, scalability, and long-term sustainability. But deep research on, and even improvement of, the existing DevOps practices could actually lead these Small and Medium Enterprises to be in a position so that they could survive and thrive in increasing competitive business environments.

References

[1]. Azad, N., &Hyrynsalmi, S. (2023). DevOps critical success factors — A systematic literature review. *Information and Software Technology*, *157*, 107150. https://doi.org/10.1016/j.infsof.2023.107150

[2]. Bass, L., Weber, I., & Zhu, L. (2015). *DevOps*. Addison-Wesley Professional.

[3].Cohn, M. (2010). *Succeeding with agile : software development using Scrum*. Addison-Wesley.

[3]. Duvall, P. M., Matyas, S., & Glover, A. (2007). *Continuous integration : improving software quality and reducing risk*. Addison-Wesley.

[4]. Forsgren, N., Humble, J., & Kim, G. (2018). *Accelerate : the science behind DevOps : building and scaling high performing technology organizations*. It Revolution.

[5]. Kim, G., Debois, P., Willis, J., Humble, J., &Allspaw, J. (2017). *The DevOps handbook : how to create world-class agility, reliability, and security in technology organizations*. It Revolution Press, Llc.

[6]. Lwakatare, L. E., Kilamo, T., Karvonen, T., Sauvola, T., Heikkilä, V., Itkonen, J., Kuvaja, P., Mikkonen, T.,

[7]. Oivo, M., &Lassenius, C. (2019). DevOps in practice: A multiple case study of five companies. *Information and Software Technology*, *114*, 217–230. https://doi.org/10.1016/j.infsof.2019.06.010

[8]. Miller, E. (2020, July 24). *DevOps Adoption for Small Businesses*. Invensis Learning Blog. https://www.invensislearning.com/blog/devops-adoption-for-small-businesses/

[9]. Offerman, T., Blinde, R., Stettina, C. J., & Visser, J. (2022, June 1). *A Study of Adoption and Effects of DevOps Practices*. IEEE Xplore. https://doi.org/10.1109/ICE/ITMC-IAMOT55089.2022.10033313

[10]. Strieker, J., Volchkov, S., Martin, S., Karlskrona, S., & Sweden. (2022). *Broad DevOps Adoption and Organizational Performance of the Software Firm*. https://www.diva-portal.org/smash/get/diva2:1736723/FULLTEXT02

[11]. Why Adopting a DevOps Approach is Crucial for Your Business. (n.d.). Appinventiv.com. Retrieved March 12, 2024, from https://appinventiv.com/blog/devops-for-startup-business/amp/