

Why Startups Outpace Multinationals in Leveraging DevOps

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Abstract. *This paper explores the differential impacts of DevOps across varying organizational structures, specifically analyzing why startups may outpace multinational companies in leveraging the benefits of DevOps methodologies. DevOps drives organizational efficiency and innovation. Comparative studies often examine its implementation in startups versus large-scale enterprises. The literature pinpoints the agility, culture, and size of an organization as key determinants influencing the adoption of DevOps principles. In response, this study employs an extensive questionnaire distributed to DevOps and related professionals to investigate the hypothesis that startups are uniquely positioned to harness DevOps for technological advancement and cultural synergy. The survey gathered quantitative and qualitative data reflecting experiences with DevOps adoption, challenges faced, and the perceived benefits drawn from such practices. The findings reveal that while startups and multinationals share common challenges, the former's organizational agility, innovative mindset, and less encumbered cultural practices offer startups a distinct advantage in the effective assimilation of DevOps practices. This paper contributes to the field by providing evidence supporting the notion that startups possess intrinsic advantages over multinationals in DevOps implementation, chiefly due to their flexibility and lean structures for rapid innovation. By mapping out the relative successes and impediments to DevOps adoption in diverse corporate environments, this research extends the understanding of how organizational characteristics can be leveraged to optimize DevOps strategies in the evolving landscape of software engineering.*

Keywords: DevOps, Startup, Enterprise, Scalability in Startups, Enterprise Software Development

Introduction

The sphere of software engineering has seen a major shift because of the transition from conventional software release to DevOps. The necessity of increased cooperation between the development and operations teams has prompted this change (Pendyala, 2020). It has been discovered that DevOps improves collaboration and communication within companies, which enhances software delivery and deployment (Dr, 2019). Adopting an agile mentality, which aided the software releases, made a change regarding the risk evaluation and automation (Mahanta et al., 2016). DevOps, a practice that merges development and operations teams, extends the Agile methodology to foster continuous integration, delivery, and improvement. It aims for quicker customer feedback cycles, facilitating a more responsive adaptation to customer needs (Gokarna et al., 2020). This approach not only emphasizes end-to-end automation in software development and delivery but also breaks down the barriers between previously isolated development and operations units, creating a cohesive environment for innovation (Ebert et al., 2022; Wettinger et al., 2014).

The shift that DevOps generated within organizations created a foundation where the response to market changes will be more swiftly made, product quality will be improved, and

delivery accelerated. Since DevOps is more of a methodology than a role, it is based on various concepts that include both technology and business aspects. All these aspects resume mainly on reducing the costs and streamlining the time on both building and delivering software applications.

Organizations that are integrating DevOps represent a broad spectrum, they may be distinguished not just by size and industry but also by organizational culture, enterprise maturity and financial resources. This varied set is classified as both startups and multinational companies in the market. Startups are well-known for having an entrepreneurial spirit, agility, and innovative mindset. These are typically marked by fresher, more adaptable approaches to business challenges that can pivot quickly in response to technological advancements or market demands and are more willing to take risks. Their streamlined organizational structures expedite decision-making, enabling more seamless integration of state-of-the-art technology. But frequently, this flexibility comes at the cost of financial stability and resource availability. For startups, DevOps is often seen as a natural fit. Startups typically have fewer rigid structures, enabling them to embrace DevOps practices from their inception more easily and adopt new innovative technologies. This is because startups often prioritize agility, flexibility, and rapid innovation to quickly adapt to market trends and customer feedback. Startups may faster build a continuous integration and delivery culture and enable frequent updates and short development cycles by including DevOps from the very beginning (Hamunen et al., 2016). Multinational corporations, on the other hand, often possess bigger resources and more seasoned employees; nonetheless, they struggle with bureaucratic deployment procedures, risks operation management and require more precise definition and strategic guidance when it comes to DevOps adoption.

The adoption of DevOps is not without its challenges, including communication barriers, cultural shifts, and technical obstacles (Riungu-Kalliosaari et al., 2016). To improve their skills in response to changing business requirements or to maintain their competitiveness in the market, these large companies may use DevOps as part of a transformative plan. These organizations' scale and complexity creates a need which must adopt DevOps. On the other hand, it frequently necessitates major adjustments to technology, culture, and processes. Another layer of complexity for multinationals is the need for organizational and cultural transformations that align with DevOps principles, defining roles and responsibilities, and fostering engagement and managerial support to sustain these initiatives (Signoretti et al., 2019).

Although, at first glance the traditional methods used by these large businesses may appear incompatible with the ideas of DevOps, when executed correctly, DevOps may result in increased productivity, higher-quality goods, and a quicker time to market—all of which are advantageous results for a global organization. Additionally, they may have more resources to spend in the shift due to their magnitude (R. Anandya et al., 2021). Both types of organizations share common difficulties, such overcoming resistance to change and merging the mindsets of the development and operations teams, adopting new technologies, learning curve for new technologies, the scope and nature of these challenges vary. While multinationals may find it difficult to overcome the inertia of their current structures and cultivate widespread commitment to the change that comes with implementing DevOps, startups may be more receptive to the DevOps culture due to their dynamic and fluid nature.

Given the aforementioned factors, this research hypothesizes that startups are uniquely equipped with the technological agility, collaborative culture, and innovative mindset that align more profoundly with DevOps methodologies.

Subsequently, this paper will analyze the specific dynamics through which startups can more effectively leverage DevOps paradigms for not only technological advancement but cultural synergy as well, in contrast with the efforts presented in multinational corporations. The focus will be on examining the challenges, learning curves and adoption of DevOps in differing landscapes within startups and multinationals companies.

Literature review

The beginning of the research was based on reading multiple papers and by identifying various aspects required for designing the subject addressed. The papers were filtered by having foundational pillars that resemble the direction of the research such as: DevOps as an overview; organizational adoption of DevOps; DevOps in different organizational contexts; multinational efforts and DevOps integration. The literature that has already been written about DevOps methods and their implementation in various organizational structures is systematically examined in this part. The study focuses on two main areas: first, it summarizes important DevOps ideas, theories; second, it examines the differences between DevOps adoption by startups and large enterprises.

DevOps as an overview presents the concept of DevOps, its guiding principles, and the primary goals it aims for within the context of an organization are covered at the beginning of the literature study. The DevOps movement's history is outlined, along with an explanation of how agile approaches and lean thinking came to be. To provide a basic know-how of the area with various key components of DevOps.

Organizational adoption of DevOps shows the study on the variables influencing DevOps adoption in enterprises is examined in this subsection. It is a research that emphasizes technological and cultural changes required for DevOps adoption to be successful, highlighting the procedures of DevOps and the significance of the cooperation between development and operations teams. This multi-cultural bridge increases the quality of software development. (Zhu et al., 2016).

DevOps in different organizational contexts presents the literature study that explores major distinctions in cultural receptiveness, resource availability, and existing IT infrastructure as it compares the deployment of DevOps in startups and global corporations. This comparison heavily relies on the advantages and disadvantages that are particular to each kind of organization (Lwakatare et al., 2016).

Multinational Efforts and DevOps Integration which is focused on gathering insights on how multinational companies integrate DevOps to scale practices to face different hierarchical structures.

Methodology

The paper's methodology involves designing a survey to assess how DevOps practices vary in effectiveness between startups and multinational corporations. The target audience meant for this survey were IT professionals actively engaged in DevOps or related fields. It aims to capture wide experiences and insights relevant to understanding the adoption, implementation, and result of impact in DevOps practices in different organizational entities with different sizes.

Survey Design and Structure

The survey was designed with a clear structure to capture a comprehensive view of DevOps adoption across different organizational environments. Each section was selected based on the specific aspects of DevOps integration and its impact on the organization ecosystem.

- Demographic Information: this section collects data on the respondents' roles, experience, and organizational background.
- DevOps Adoption and Implementation : questions in this section explore the duration and maturity of DevOps practices within organizations.
- Technological Agility and Innovation: this part evaluates how organizations adapt to technological changes and the role of DevOps in driving innovation
- Collaborative Culture: respondents rate the level of collaboration within their organization's culture.
- Challenges and Learning Curves: this section inquires about the obstacles faced during DevOps adoption.
- Comparison with Multinational Efforts (Additional – included for respondents with experience in both contexts)

Data Collection was made by having the survey be distributed electronically through professional networking platforms, forums, and communities where professionals in DevOps, software development, and IT operations are likely to be engaged. Participants were assured of their anonymity, and the survey included a consent form detailing the purpose of the study, the use of the collected data, and the voluntary nature of participation.

The sample consists of 20 individuals currently holding a role in an organization that practices DevOps or have related experience. The sample is intended to include a diverse range of respondents with varying years of experience, types and sizes of organizations, and depth of implementation of DevOps practices.

Data analysis is represented by quantitative data collected from multiple-choice and rating scale questions that will be analyzed using statistical methods to identify trends, correlations, and differences between startup and multinational respondents. Descriptive statistics will provide insights into the demographic make-up of the respondents and the maturity level of DevOps practices in their organizations. Inferential statistics may further elucidate the relationship between organization type or size and the efficacy of DevOps practices. Qualitative responses from open-ended questions will be analyzed through thematic analysis to distill the insights and narratives provided by the participants, particularly focusing on the motivations for adopting DevOps, the nature of challenges faced, and the perceived advantages of startups in leveraging DevOps compared to multinational companies. The combination of quantitative and qualitative data analysis will allow for a comprehensive understanding of the status of DevOps practices, challenges and how different organizations experience and benefit from DevOps culture and implementation.

From an ethical point of view, the study will cover the ethical standards concerning the confidentiality and privacy of the participants.

Survey responses are subject to the voluntary participation and self-reporting of individuals, and therefore may not be representative of all organizations. The sample size and respondent demographics may further limit the generalizability of the findings. Additionally, qualitative responses, while rich in detail, will be subjective and based on personal experiences and perception.

Survey Questions

In order to make the analysis of the obtained results easier to understand, the survey questions are presented below, grouped by topic and carried out in a logical order.

Demographic Information: which gathers basic information about the respondents, including their role within the organization, their experience in DevOps or related fields, and the type of organization they work for (startup or multinational). This foundational data provides context for understanding the perspectives shared in subsequent sections.

DevOps Adoption and Implementation: focus on the duration of DevOps practices within organizations and the primary motivations behind adopting DevOps. This section aims to uncover how long DevOps has been a part of the organizational culture and what drove the organization to integrate DevOps practices.

Technological Agility and Innovation: evaluates how swiftly organizations can adapt to new technologies or market changes, along with open-ended questions about the role of DevOps in driving technological innovation. It seeks to understand the impact of DevOps on an organization's ability to remain competitive and innovative in a rapidly evolving tech landscape.

Collaborative Culture: by asking respondents to rate the level of collaboration within their organization, this section assesses the cultural aspect of DevOps adoption. The focus here is on understanding how DevOps practices have influenced or been influenced by the organization's collaborative dynamics.

Challenges and Learning Curves: this segment identifies the major obstacles encountered during the adoption of DevOps, including cultural resistance, lack of expertise, and challenges with toolchain integration and process redefinition. It highlights the hurdles that organizations must overcome to fully embrace DevOps methodologies.

Comparison with Multinational Efforts (if applicable): for respondents with experience in both environments, this section provides a platform to compare and contrast DevOps adoption efforts between startups and multinational companies. It delves into the differences in adoption processes, as well as the advantages startups may have over larger corporations in leveraging DevOps practices.

The questionnaire outlines the methodology for data collection and the specific questions participants will be asked. They provide a foundation for understanding the approach to data gathering and the themes around which the survey is constructed.

Results

The survey was sent to over 100 IT professionals that are part of communities across social platforms from which 30 have visited the questionnaire and 20 managed to fully respond. The focus was on collecting results based on the factors that were mentioned in the questionnaire methodology from which it was gathered that:

Size of the Organization (Question 4: what is the approximate size of the organization?): most respondents are from very large organizations with 1000+ employees. This indicates that while the survey includes perspectives from different sized organizations, the majority viewpoint is from those in large companies.

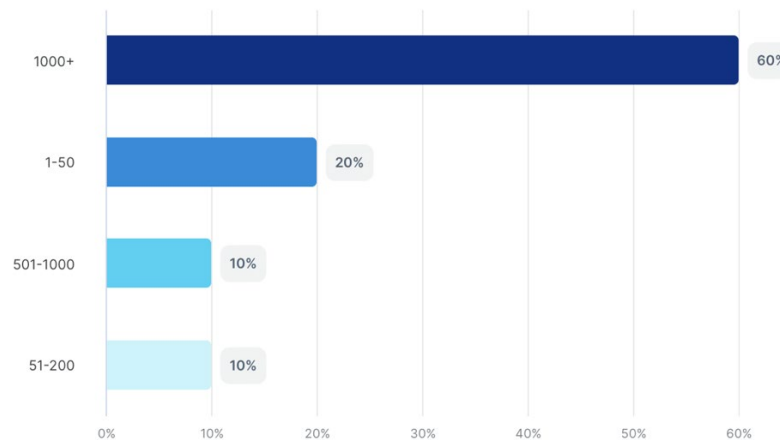


Figure 1. Organizational size distribution among respondents

Source: Author's own research.

Duration of Implementing DevOps Practices (Question 5: on a scale of 1 to 5, how would rate the maturity of DevOps practices in organization?): 50% of the IT experts have been implementing DevOps for 5+ years, suggesting that DevOps is well-established in these organizations, potentially giving them more mature practices and insights into the long-term benefits and challenges of DevOps.

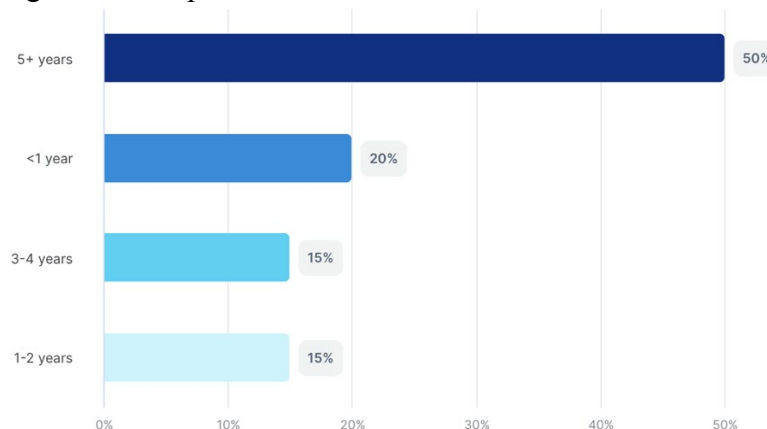


Figure 2. Duration of DevOps practice implementations in organizations

Source: Author's own research.

Maturity of DevOps Practices (Question 6: on a scale of 1 to 5, how would rate the maturity of DevOps practices in the organization?): respondents rated the maturity of their DevOps practices mostly as a 5, indicating a high level of maturity and integration within their organizations.

Primary Motivations for Adopting DevOps (Question 7: what were the primary motivations for adopting DevOps in the organization?): the leading motivations were increased efficiency, better quality control, and faster deployment. These are areas where startups often excel due to their agility and need to compete effectively with limited resources.

Adaptability to New Technologies or Market Changes (Question 8: how quickly can the organization adapt to new technologies or changes in the market?): most rate their organizations as adapting moderately to very quickly, essential for leveraging DevOps, which emphasizes responsiveness and continuous improvement.

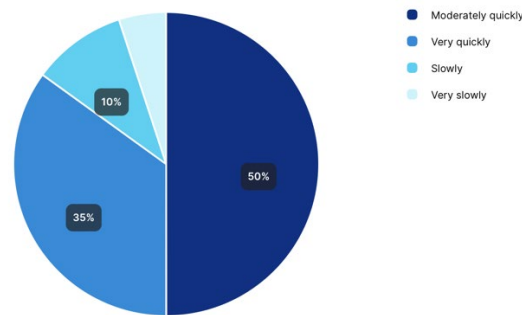


Figure 3. Organizational adaptability to technological changes and markets trends

Source: Author's own research.

Ways DevOps Facilitated Technological Innovation (Question 9: in what ways has DevOps facilitated technological innovation within the organization?): the predominant response highlights streamlining and automating configurations, pointing to the operational efficiencies gained through DevOps practices.

Collaborative Culture (Question 10: on a scale of 1 to 5, how collaborative is the organization's culture?): collaboration is rated highly, which is a cornerstone of DevOps practices, and startups often have a more naturally collaborative environment due to smaller team sizes and less rigid structures.

Challenges in Adopting DevOps (Question 11: what are the biggest challenges the organization has faced in adopting DevOps?): the biggest challenges are process redefinition and lack of expertise. Startups may have fewer entrenched processes and can attract talent motivated by new technologies and practices.

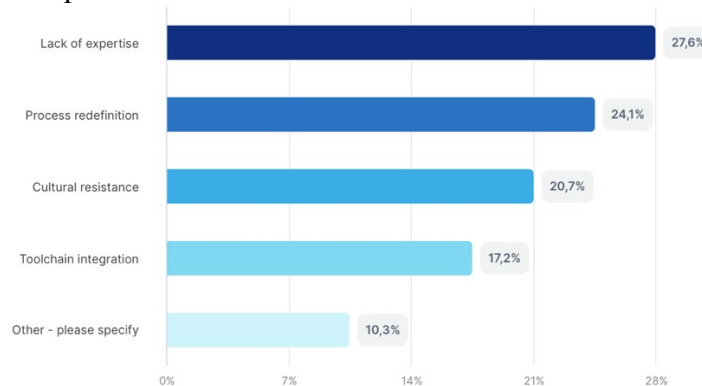


Figure 4. Primary challenges encountered in DevOps adoption by organizations

Source: Author's own research.

DevOps Adoption Efforts Between Multinationals and Startups (Question 12: If having experience in both startups and multinational companies, how do DevOps adoption efforts differ between them?): according to survey responses, startups are frequently quicker to adopt DevOps because of their less rigid operational structures and receptivity to new technology. On the other hand, global corporations typically display caution, mostly to reduce technological risks, which results in a more gradual adoption process. However, not every responder held this opinion; some did not have startup experience, which would have affected how they saw the adoption of DevOps

in such settings. It is noteworthy that although startups could have an easier time of it, large corporations have significant resources at their disposal to support DevOps approaches.

Advantages of Startups Over Multinationals (Question 13: in the responders opinion, what advantages do startups have over multinationals in leveraging DevOps?): According to the results of the survey, respondents generally believe that startups have an advantage when it comes to adopting DevOps, mainly because of their inventive and agile cultures. They contend that startups have the advantage of having no legacy technical debt and the adaptability to quickly incorporate new technologies. Startups are thought to benefit from direct lines of communication and faster decision-making when implementing DevOps principles. Multinational corporations face difficulties, particularly when transferring from traditional infrastructure, which might delay the incorporation of DevOps. These findings collectively imply that startups are better suited to deploy DevOps flows in a flexible manner in response to changing market demands.

These results collectively suggest that startups may outpace multinationals in leveraging DevOps due to their agility, ability to implement and adapt quickly to new processes, and fewer legacy systems and procedures, in many cases built from ground. The cultural aspects, such as open communication and collaboration, also play a significant role in the effective adoption of DevOps. Multinationals might have more mature DevOps practices and procedures, but their size and established procedures could slow down the adoption and innovation process. Startups can pivot and adapt more swiftly, making the most of the DevOps methodology to stay competitive. In many cases, startups need to find multiple business differentiators in order to compete with multinational companies and adopting DevOps methodology in a faster way can create a huge advantage in developing new technologies and products.

Conclusion

This research highlights the challenges of DevOps integration within startups and multinational companies, aiming at understanding the unique advantages and challenges presented by each organizational type. Based on the investigation and the alignment with previous findings, it can be inferred that startups have a natural inclination to include DevOps from the beginning, as a main pillar, which facilitates their ability to promptly react to market trends, consumer feedback, and advances in technology (Lwakatare et al., 2016,). The adoption of continuous integration and delivery procedures is made possible by their adaptability, agility, and lack of deeply ingrained legacy processes. Meanwhile, Multinational corporations have the financial resources and skilled workforce to facilitate DevOps that represents a major shift frequently necessitating significant modifications to established procedures and cultural norms which was confirmed in previous findings by Riungu-Kalliosaari et al. (2016). The study concludes that startups' predisposition to innovation, collaborative work cultures, and technological agility enable them to outpace multinationals in harnessing the full potential of DevOps.

It is imperative to acknowledge the limitations that accompany this study. The research relies on self-reported data, which can introduce bias and may not reflect the broader experiences within the field of DevOps. Additionally, the sample size and the demographic spread of respondents may impact the generalizability of the findings. Future research could benefit from a larger and more diverse sample, thereby allowing researchers to draw more definitive conclusions that are representative of the varied DevOps experiences across industries. It is also important to recognize the potential for rapid evolution within technological domains. As such, this research serves as a preliminary exploration that sets the stage for more in-depth future inquiries.

In closing, this paper highlights how startups structural advantages might help them implement DevOps more successfully than large corporations. The adoption of DevOps will, however, inevitably change as businesses continue to grow and adjust to this digital era and create a path for developing new products in an agile way according to business changes. This will require constant study and strategy improvement to meet the change in demands of software engineering.

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