Challenges for Implementing in DevOps in Legacy in Org with Legacy Systems

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Abstract: *This study has aimed to find out the potential challenges present in the implementation of devops in the legacy systems of organisations. It has highlighted the significance of organisational culture and change management in devops practices. Challenges have been identified here along with efficient strategies to mitigate them.*

Keywords: Devops, Legacy Systems, Monolithic Strategy

1. Introduction

Project Specification
Devops is a widely known methodological concept in software development and the information technology industry used as definite practices to improve the development life cycle of the systems. It directs mitigation of the gap between technological operations and software development by collaborating with them in fostering operational efficiency and less errors [1]. The primary objective of devops is to minimise the development life cycle of the software and promote higher accuracy and reliability. Devops practices include several elements such as operational collaboration, automation, constant integration and smooth service deliverance.

2. Aim and Objectives

Aim: To investigate potential challenges encountered by organisations with legacy systems in terms of implementation of devops practices. This research will recognise effective strategies to mitigate the challenges to ensure the successful adoption of devops.

Objectives:
- To examine the significance of change management and organisational culture for adopting devops in legacy systems.
- To observe key challenges present in the integration of devops in the organisational legacy systems.
- To suggest strategies for addressing the challenges and imply successful adoption of devops in organisations.

Research Questions
- What is the significance of change management and organisational culture for adopting devops in legacy systems?
- What is the key challenges present in the integration of devops in the organisational legacy systems?
- How the identified challenges can be addressed with the successful adoption of devops in organisations?

Research Rationale
Incorporation of devops in the business context requires an immense shift in organisational culture and management procedures rather than only focusing on technological adjustments. The purpose of devops boost technological adoption cycles while enhancing software quality as well as operational agility [2]. The inclusion of devops has helped in maintaining collaboration between operation and software development in information technological teams where systems can decline automation centrality in devops. This study will find out comprehensive challenges in legacy systems and provide recommendations for promoting consistent services.

3. Literature Review

Research Background
The devops practices is aligned with two major organisational concepts such as operations and development to enable a healthy, collaborative and integrated culture. It helps in maintaining a balanced control of technological upgrades and market demands which nurtures consistent digital transformation in different industries. Devops practices are associated with cultural transformation within organisations which can be disrupted by teams due to intense changes in their existing working patterns [3]. Legacy systems are controlled by business experts with knowledge of outdated technologies, can show their negative involvement towards new practices due to heavy workflow. Challenges are present in the adoption of devops in legacy systems due to the absence of flexibility for automation and constant development. Businesses can find issues in adapting required changes with the existing infrastructure that may not support modern tools for achieving expected agility.

Critical Assessment
Organisations that have efficiently evolved integration of devops practices with legacy systems hold the ability to capture long-term sustainability and competitive advantages. Though having key challenges, devops pose numerous benefits for businesses such as expansion in markets, team collaboration, better operational efficiency and customer satisfaction. For this reason, organisations should find strategies to address the issues in legacy systems and capture the benefits.

Linking with Aim
The proposed research aim is significantly interlinked with the research background. The stated aim has proposed exploration of the potential challenges encountered by

businesses in legacy systems at the time of incorporating devops practices and propose mitigation tactics. For this reason, challenges present in terms of culture, technology and organisational operation have been highlighted here.

Encapsulation of Application

Theoretical Framework
The theory of constraints: The concept of theory of constraints is dependent on philosophical management that defines the recognition of limited elements to mitigate them effectively [4]. According to this theory, limitations need to be identified before commencing any task and focus should be made to improve them. This theory implies that the adoption of devops in the legacy systems requires the identification of potential obstacles creating barriers towards its successful establishment. For this reason, organisations should implement efficient strategies that can support the proper development of devops.
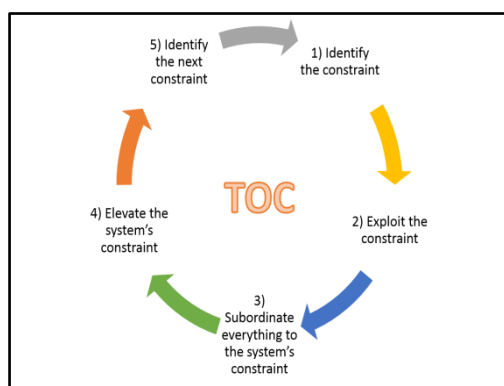

Figure 1: Theory of Constraints [4]

Lewin's change management model: Lewin's change management is a strategic framework used to introduce organisational change for transition, implementation of change and assurance of the new condition. This particular change management model consists of three vital stages such as unfreezing, changing and refreezing. This theory suggests that the implementation of devops in legacy systems needs change in both technical and cultural perspectives [5]. The unfreezing step implies team collaboration towards potential challenges in legacy systems while the changing step denotes alignment of devops, followed by refreezing to adopt new practices.
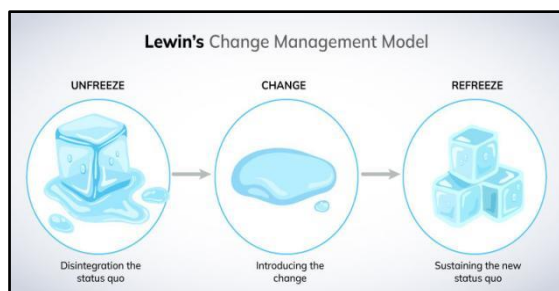

Figure 2: Lewin's Change Management Model [5]

Literature Gap
Devops practices have numerous benefits that broaden its adaptability within organisations. Hence, the existing literature has not provided detailed discussions of the potential challenges faced by businesses regarding legacy systems. It has been a major gap in this research as extensive information has not been found to support the stated objectives.

4. Methodology

Research Philosophy
In research methodology, philosophy plays a crucial role by demonstrating beliefs and assumptions regarding the selected topic to prove the objectives. Being a significant research paradigm, philosophy assigns the type and characteristics of the data needed to be searched to proceed with the task. Research philosophy can be segmented into four types which are positivism, interpretivism, pragmatism and realism [6]. Here, the interpretivism research philosophy has been optimised that helped in evaluating the collected data by aligning with relevant models and frameworks. The main reason behind choosing this philosophy is that it has broadened the nature of the qualitative information to be gathered for meeting the expected knowledge.

Research Approach
The context of the research approach heavily relies on adaptive plans and procedures that help in determining significant stages to execute data collection, analysis and interpretation in a precise manner. With the assistance of suitable approach method, research methodology can be proceeded by being directed in specific manners. Research approaches are categorised into three segments such as inductive, deductive and abductive [7]. This research has utilised the inductive approach that helped in collecting information in a particular pattern to achieve the proposed objectives. It has also assisted in gathering supporting data to connect theories and models with the topic.

Research Design
Research design can be defined as the procedure that organises collected data in such as manner so that research objectives can be met. The organisation of data is a significant step in research which maintains proper flow in the findings to achieve expected outcomes. The explanatory research design has been utilised in this study which aims to identify causes, impacts and influencing factors related to the topic from the collected information. It has also supported the exploration of qualitative data in different segments for analysis interlinking with the aim and objectives.

Data Collection Method
Identification of a specific data collection method evaluates what kind of data needs to be collected to gather the expected knowledge from the study. This research has optimised the secondary data collection technique which defines the collection of existing information present in available sources. Here, online journals, e-books, articles and other sources have been utilised to capture qualitative data assuring research accuracy and quality.

Ethical Considerations
At the time of proceeding research methodology, ethical considerations were observed. In order to ensure data accuracy and updates, secondary sources published from the year 2017 to 2021 were chosen. Information has been

collected from those sources that did not require accessibility concerns.

5. Results

Critical Analysis

Successful evaluation of devops requires further changes in the organisational culture and technological infrastructure that can interlink operational agility and team collaboration. Companies need to adopt change management strategies to make the transitions and foster a collaborative culture where innovation can be enhanced. At the time of integrating legacy systems, challenges can be encountered by businesses in terms of culture, operations and technology. For this reason, businesses should opt for implementing proficient techniques to address the identified challenges and promote directions to achieve the advantages of effective devops practices.

6. Findings and Discussion

Theme 1 Significance of change management and organisational culture for adopting devops in legacy systems

Change management and organisational culture play a crucial role in businesses to implement devops in their legacy systems successfully. Identification of suitable change management practices helps in recognising early signs of challenges and instructs teams to evolve necessary transformation by accepting new activities. Organisational culture determines the importance of team values, collaboration and constant improvement in operations that can support the core principles of devops. The nature of legacy systems is generally promoted through traditional procedures and outdated technologies rather than focusing on strategic changes where obstacles can arise [8]. For this reason, businesses should adopt change management practices to focus on adopting a prominent culture that can foster open communication and employee engagement towards devops practices. Leadership commitment will be crucial in this tactic to support the shift in cultural change and assure that the business can understand and optimise the benefits of devops. Business entities should propose employee training and skill enhancement initiatives by which they can adopt new changes and not face any obstacles. Open communication channels should be also developed to maintain a smooth integration of devops practices within the hierarchy. Moreover, interconnectedness in culture can ensure better adoption of devops and address potential complexities.

Theme 2 Key challenges present in the integration of devops in the organisational legacy systems

Business entities can encounter different challenges at the time of incorporating devops in their legacy systems. The nature of the legacy system is heavily aligned with the optimisation of outdated technologies and complex environments which may not support modern devops practices. The traditional technologies may not hold the ability to utilise continuous delivery and continuous integration and create issues in maintaining operational flexibility. As a result, failure can occur in the obtainment of timely updates and automation, causing severe disruption in implementing devops [9]. It can also face issues while upgrading legacy systems in the business procedures. Poor upgradation in legacy systems can cause higher operational downtime as well as data integration failure. This challenge also highlights slower risk assessment due to the absence of strategic devops. Issues can be found in maintaining team collaboration in the organisational culture where employees can show their negative engagement in changing their existing work patterns rather than adopting new activities. Uncertainty can occur among employees and other staff as for having strict working patterns and changes in responsibilities. Along with that, issues can arise in terms of proposing shift in organisational culture where legacy systems may be attached to a traditional hierarchical manner. Leaders can show resistance towards the change and not optimise devops advantages.

Theme 3 Strategies to mitigate the challenges and imply successful adoption of devops in organisations

In order to mitigate the identified challenges, organisations can implement different strategies to mitigate them and capture the benefits of devops. Companies should focus on upgrading their legacy systems that can support the applicability of devops principles. This process can be developed through the involvement of microservices and monolithic tools [10]. Change management models can be used to maintain collaboration among stakeholders, employees and executives to ensure their involvement in the transformation process. Businesses can invest in leveraging automation tools that can effectively align the benefits and applicability of both traditional legacy systems and modern devops principles. Due to overdependence on traditional technological factors, legacy systems need to be improved with the help of the gradual phased strategy. It strategy will allow for the recognition of potential challenges before their severe occurrence and manage them through team collaboration. Companies need to propose further investments to provide employees and staff with inclusive training and skill development initiatives. Enhancement of skills and initiatives will help in encouraging employees to show their engagement in the change and take responsibility for their new roles.

7. Evaluation

From the above discussion, it can be evaluated that the integration of organisational legacy systems and devops practices is a definite tactic which demonstrates the importance of change management and culture. Businesses should take immediate actions such as upgradation of legacy systems, employee training and technological advancement to resolve potential challenges.

8. Conclusion

It can be concluded from the above discussion that devops has transformed organisational practices in the information technology sector to promote better operational efficiency. The application of devops helps businesses in minimising downtime and smoothen the balance between operation and software development. For mitigating identified challenges, organisations need to adopt inclusive change management practices, employee training and skill development, collaborative culture and technological advancement.

9. Research Recommendations

- Business entities can implement a staged integration strategy to support the adoption of modern devops by reducing risks and including required adjustments.
- Companies should focus on investing in monetisation where monolithic strategies will help in enhancing operational flexibilities through alignment with devops principles.
- Smooth incorporation of a strategic change management model can assist businesses to attract stakeholders and provide support through the change period.
- Employees should be provided with skill enhancement training which can assist in managing new technologies.

10. Future Work

The future scope can include the exploration of advanced tactics to integrate devops with upgraded technologies such as optimisation of machine learning and artificial intelligence in legacy systems. Future scholars can also investigate the advantages of other change management practices to evolve modern devops.

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