DevOps Business Model: Work from Home Environment

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ABSTRACT

DevOps is a culture-oriented software development and operations methodology, and software organizations increasingly adopting it due to its flexibility and good business gains. Especially, in Covid situations DevOps give a good support to software development organizations to carry development and operations activities through cloud-native DevOps in work from home environment and starting new businesses. The technological advancement makes the world a global village, though, there is dire need of guidelines and standards for the adoption of DevOps across the boarders and out of office. Considering the significance of DevOps in current era of software business, we plan to develop a roadmap aiming to assist the software development organizations to adopt DevOps process over the globe and in work-from-home format. In this study, we are proposing an initial idea towards the development of robust and comprehensive guide for DevOps adoption in geographically distributed environment.

CCS CONCEPTS

•DevOps • Work from home •Theoretical Roadmap

KEYWORDS

DevOps, work from home, roadmap, distributed development

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1 INTRODUCTION

Due to advancement in technology, many business organizations are moving towards permanent fixture (business models) of work from home. People are using smart devices to be able to connect with their business online and some are trying to make their business automated. However, still business organizations are facing problems like speed, automation, security, integration and quality control while work from home. DevOps in such a situation has an ability to control problems by sync, automate and organize the pace of new software release. DevOps is capable of adopting change in surrounding according to the business needs. At this point companies are trying to hire right person having necessary software and technical skills to bring benefits to DevOps by pushing it towards cloud. The business organizations need to begin implementing automation in software development process to avoid delays in release of software products. For better DevOps business models, proper road map is required to maintain the perfect balance in an organization, so that business could work in current remote setting.

To resolve problem of automation and software process improvement (SPI) several reference models have been adopted and designed in a software organizations. At present, the frameworks and strategies available to adopt DevOps activities are many but, using scenario of work-from-home there is no specific framework or guidelines to implement DevOps. For example, framework is developed secure DevOps services improvement strategy [2], DevOps framework for large agile based financial enterprise [3], DORA platform for DevOps benchmarking and assessment [4], DevOps framework for quality driven self-protection for web software [5], and DevOps testing maturity analysis to make DevOps compostable [6] etc.

This research study has been motivated by significance gap found in available literature of DevOps. Since, there is no comprehensive roadmap constructed to help an organization facing challenges i.e., technical skills, integration issues and collaboration between teams while implementing DevOps activities in an environment where employees are working from home. To address these challenges, this research will design a roadmap that will highlight all the consideration points necessary for DevOps implementation in situation like work from home. This roadmap will be developed by following CMMI model [7] and explore factors and best practices to overcome problems hindered while implementing DevOps across the borders and out of office infrastructure.

Furthermore, according to literature study more importance is given to continuous release and integration of data from various sites, ignoring facts of quality assessment [8], DevOps outsourcing, and integration of low-code frameworks with DevOps [9]. DevOps

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is also trying to manage such situations by continuous integration between developers and operation teams using practices like, sharing of data and resources in cloud environment and continuous monitoring etc. [34]. However, still there are obstacles in quality assessment of applications, DevOps outsourcing (as it is expensive for small businesses to hire trained developers) and integration of techniques like low-code to maintain the cost of overall project [10]. The proposed roadmap will help to overcome CCHs by implementing success factors and best practices to perform DevOps activities well. The roadmap will be validated in real company by case study technique which has been adopted by many other studies [11], [12], [13] and [36] to test the model.

2 DOMESTIC AND OVERSEAS RESEARCH SURVEY

Considering DevOps, process improvement techniques were ignored causing problems to adopt DevOps activities in new businesses. In short, despite the significance of DevOps, no roadmap has been designed to control DevOps challenges in work-from-home situation. There is a pressing need to develop a technique or roadmap that could help software companies to successfully assess and execute processing in a situation like work-from-home.

The basic structure of DevOps and work-from-home is presented in Figure 1.

We have reported the limitations of existing DevOps models and standards in following subsection.

2.1 Existing Models of DevOps

We reviewed existing solutions and models developed in past by researchers designed for adoption and architecture development of DevOps. There are many models constructed in past verified from available literature one of such model is Unicorn framework [2] is a DevOps framework that provides microservices in the cloud environment for rapid and continuous delivery. However, this model's ability to provide continuous release is limited. Another proposed model i.e., The Unified DevOps Model (UDOM) [30] aids in reducing deployment time, risk, and productivity while meeting client needs, although it still has issues with continuous integration and feedback management which is a key term in situation working away from office buliding. As the quality and performance of applications are important in software development life cycle, Samarawickrama and Perera [31] developed a scrum-based framework. This framework support rapid delivery and continuous integration of product, but their study was not focusing on all components required for software development and continuous integration in work from home situation. Rafi et al [3], developed a model RMDevOps for adoption of DevOps in software organizations, but work from home factor is not covered in their research. Mohamed [32] developed a model to established a DevOps maturity model based on CMMI features. Quality, automation, governance, and communication were the four parameters he used to evaluate his model levelling. However, his model has some flaws, such as the lack of a mapping between DevOps factors. Second, rather than assessing the influence of his model on businesses using DevOps, he focused on global software engineering processes. At each level of development, the maturity model lacks sufficient guidelines (mapped: challenges, success factors, and practices).

Hemon et al. [32] developed a maturity model covering only three concepts agile, continuous integration and continuous delivery. The authors evaluate the model by conducting a case study in the company and receive applicable outcomes. They expressed about soft skills as fundamental requirements where we are considering smartness of software system functions in DevOps. Since, there is no comprehensive Roadmap based Model for DevOps to provide proper guidelines to industrial experts while implementing DevOps in situation like work-from-home and in new business with low cost.

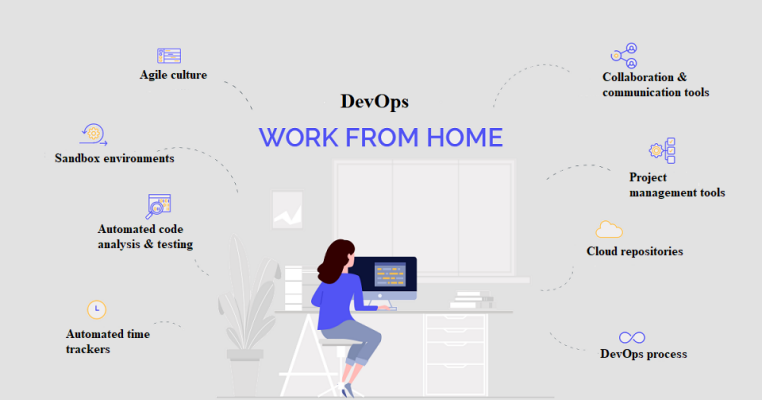

Figure 1: Basic structure of DevOps and Work from home

2.2 Existing Readiness Maturity Models in Other Fields of Software Engineering

Capability maturity model integration (CMMI)

CMMI is an extension of CMM and it includes the five maturity levels and each maturity model gives some process areas that need to be adopted by the software development organizations [7]. In this study, we used the basic structure of CMMI to format the maturity level for proposed DevOps roadmap in outsourcing context [23].

Software Outsourcing Vendors' Readiness Model (SOVRM)

SOVRM was developed to guide the software organizations while dealing with software development activities in global software development context. But, does not provide detailed information about implementation of practices and guidelines in software outsourcing companies, especially in DevOps environment [14].

Software Process Improvement Readiness Model (SPIRM)

To develop SPIRM, CMMI approach was adopted and developed a maturity model for software process improvement (SPI) in order to guide companies in assessing and improving their SPI implementation processes. SLR and empirical study approach was used to extract critical success factors (CSFs) and critical barriers to construct maturity model. However, this model has some limitations to work in DevOps environment as only three dimensions i.e. CSFs maturity stages and assessment was addressed in SPIRM [16].

2.3 Proposed Roadmap Model for DevOps Work at Home (WHDevOps)

The WHDevOps is based on a concept of software outsourcing vendor readiness model (SOVRM) [14], RiSE RM [15], capability maturity model integration CMMI [7] and software process improvement readiness model (SPIRM) [16], SRCMIMM [26]. This model has several levels that were formed as a result of the above-mentioned literature review. The mention models [14-16, 26] were utilized to design the WHDevOps readiness levels by influencing aspects (i.e. factors and practices). As there is no roadmap based model exist for DevOps that help employee to use DevOps environment at home, therefore we proposed roadmap using critical challenges (CCHs), crucial success factors (CSFs), and practices based on current readiness models from other software engineering domains. We will map the identified best practices with every CCH and CSF in five levels of WHDevOps to develop a proper roadmap. Before doing the external case study, we did a pilot study with research experts to ensure that the mapping process was reliable. The phases used to design the levels of WHDevOps are shown in Figure 2.

3 CURRENT PROBLEMS

Software companies are considering to move their technology wave towards adoption of DevOps. But, considering problems with DevOps adoption especially in pandemic situation where DevOps teams work from home using services of cloud there is lack of proper coordination between teams, lack of technical skills, sharing of information and techniques to resolve certain tasks, hiring developers at higher cost, giving more importance to continuous deployment instead of security and quality assessment and lack of proper trainings are some of the factors making conflict situation for DevOps implementation in such situation. There should be a proper roadmap based model (WHDevOps) that could guide new startups to implement DevOps, in their company and how to use DevOps culture in situation like work from home.

This research will find all factors (challenges and success factors) hindered in DevOps implementation and give guideline approach by building a roadmap based model to provide guidelines towards DevOps practices. This research will help organization to assess their current factors and practices, and change them accordingly to the automated business model.

4 OBJECTIVES

The primary focus of this research work is the development of WHDevOps for the work from home situation of businesses and for new businesses who wants to use DevOps automation in low cost. WHDevOps can help practitioners to identify, analyze, and address the challenges and success factors related to DevOps process implementation for work from home and new businesses, by suggesting best practices. This research project is original and significant for software organization to carry their development and operational activities, in DevOps environment. The roadmap will based on CCHs, CSFs and practices for implementation of DevOps activities in environment of work from home.

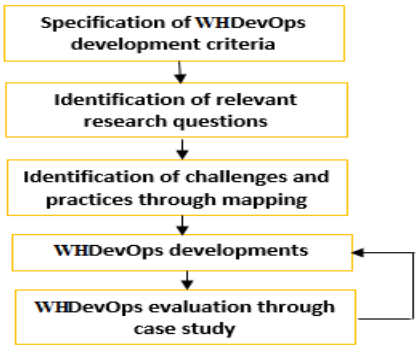

Figure 2: Phases Used to Design Roadmap

4.2 Main research contents

4.2.1 Research on identification of DevOps critical success factors (CSFs) for WHDevOps model

Task here includes identification and validation of CSFs that have positive impact while DevOps implementation for work from home environment. As success factors are the key areas where company must perform well in order to achieve certain task [24, 25, 28]. We will identify all DevOps related CSFs by using SLR and empirically investigate them through questionnaire survey in real company. Furthermore, we will prioritize CSFs based on their impact in DevOps using decision analysis technique. The factors will be mapped with WHDevOps levels; considering other readiness models in domain of software engineering i.e. (CMMI, SOVRM and SPIRM).

4.2.2 Research on identification of DevOps critical challenges (CHHs) for WHDevOps model

Task here includes the identification of critical challenges (CCHs) hindering in DevOps in work from home environment. The identified CCHs will be validated through questionnaire survey in real company to see the significance difference between challenges identified from literature and real company practice. These

validated challenges will be weighted based on their impact using decision analysis technique. The CCHs will be mapped with WHDevOps levels, considering CMMI and other existing readiness models.

4.2.3 Research on identification of best practices of DevOps for WHDevOps model

Task here is to identify best practices from literature and real company and mapped them with CSFs, CCHs and WHDevOps levels in order to address proper working of DevOps in home environment.

4.2.4 Construction of WHDevOps model for DevOps activities in work from home environment

The task performed in this step is to construct WHDevOps proposed model, by mapping all the CCHs, CSFs and practices identified in previous stages. CMMI and other software engineering models will be used to design components/levels of WHDevOps. All levels have particular factors and practices mapped with it. Figure 3 shows the technology roadmap of WHDevOps model.

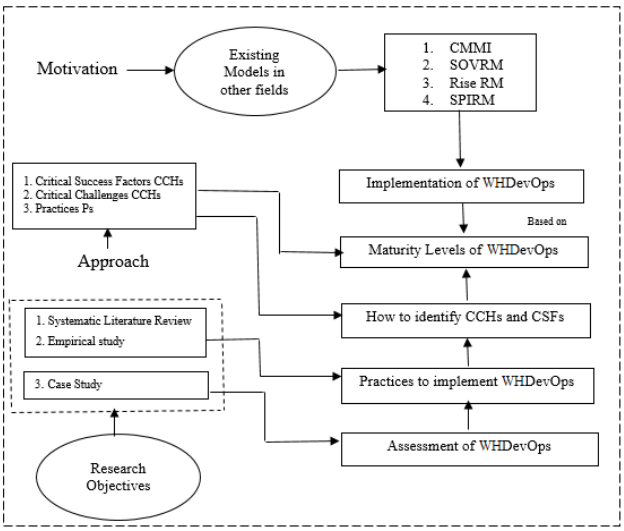

Figure 3: Technological roadmap of WHDevOps

4.2.5 Evaluation and Assessment of WHDevOps Model

In this task Motorola assessment tool and case study approach will be used to evaluate WHDevOps. The model will be addressed to two or three companies to check the efficiency of WHDevOps in work from home environment. The proposed WHDevOps model will be improved based on following criteria used in other researches also [26, 27,29].

- **Ease of use**: the main objective of this criterion is to assess how effortlessly the DevOps companies can adopt WHDevOps in home environment.
- **User Satisfaction**: The WHDevOps should fulfill the requirements of end users, and they must be satisfied with the results after adopting WHDevOps roadmap.
- **Structure of WHDevOps**: This criterion focus on the components and levels of WHDevOps. It also emphasizes on the distribution of factors across different levels of WHDevOps.

We will designed a survey questionnaire to get feedback from practitioners assessing WHDevOps for improvement. This will help to reduce complexity level of WHDevOps.

5 KEY PROBLEMS

- How to identify Success Factors of DevOps.
- How to identify Critical Challenges of DevOps.
- How to identify Best Practices to fulfill the demand of Software companies for DevOps implementation in work from home environment.
- How to check the significance relationship between the factors and practices identified from literature and real practitioners.
- How to construct WHDevOps Model.
- How to assess WHDevOps Model in real company, to evaluate the complexity level of WHDevOps for better guidelines

6 METHODOLOGY

The concept used by CMMI model [7], software outsourcing vendors' readiness model (SOVRM) [14], Rise RM [15], software process improvement readiness model (SPIRM) [16] is adopted to structure roadmap for DevOps (WHDevOps). The main components of WHDevOps are Critical Challenges (CCHs), Critical Success Factors (CSFs), Practices and WHDevOps assessment components. The level based component consists of several maturity levels that indicate the DevOps activities improvement capability of a company in work from home situation or starting new business adopting DevOps at low cost. Each level consists of different CCHs, CSFs and Practices. This model will evaluate the current level of a company with respect to DevOps activities to improve quality of software developed in distributed area (work from home).

Systematic literature approach (SLR), empirical study (using questionnaire survey, interviews and case studies) and decision analysis techniques are the selected methods for this study. SLR approach has been used to investigate CCHs, CSFs and Practices in literature associated with specific research area and questions of interest. The literature will be extracted by using inclusion and exclusion techniques available in other literature studies [14], [17], [18], [33]. The survey questionnaire and interviews will be used to collect data empirically [18] from real company to validate the existence of all factors in real organization. The CCHs and CSFs were further prioritized using decision analysis approach (Fuzzy TOPSIS) used for prioritization and decision making in other field of research [20, 21]. Awasthi, Chauhan, and Omrani [19] adopted

Fuzzy TOPSIS to generate aggregate scores for transportation sustainability assessment and best alternative selection. Fuzzy TOPSIS was used by Yang, Bonsall, and Wang [20] for vessel selection in an uncertain environment. Wang and Lee [21] suggested a fuzzy TOPSIS approach for evaluating alternatives that integrates objective and subjective weights. The case study approach will be adopted to check the effectiveness of WHDevOps model as case study is considered to be the most influential evaluation tool and it provides real world information [1,6]. The Motorola assessment tool [11] will be used to check the effectiveness of WHDevOps. This tool has been considered in other researches also to check the effectiveness of their proposed model [14], [16], [18], [35]. The Motorola assessment method has various advantages. It is normative and has been tried and tested by Motorola. The tool is used to access the status of a company relative to CMM and CMMI, and can indicate the weak areas of a company that require further attention and improvements [22].

In order to design the maturity levels of WHDevOps, we will follow CMMI structure. Many companies have used and adopted CMMI to evaluate current processes and provide guidance for future development progress. The CMMI is divided into five levels (i.e., level 1 to level 5; the higher the level, the more maturity it contains) based on software development and maintenance process standards [7]. The same concept has been used to create maturity levels of WHDevOps.

7 POSSIBLE INNOVATIONS

- New roadmap (WHDevOps) for software companies for successful implementation of DevOps activities in work from home environment.
- A roadmap based guidelines for software practitioners to practice DevOps activities in their companies in pandemic situation or stating new businesses with low cost.
- WHDevOps model for software companies to improve and assist their maturity level and work from home environment, by implementing the practices mapped with all levels of WHDevOps.

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