DevOps' Culture Challenges Model (DC2M)

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Abstract

DevOps is a set of practices and culture values that reduce the barriers and enhance the collaboration between development team and IT operations. DevOps is a roadmap for business organizations to achieve their business goals. Despite adoption of DevOps and its infrastructure, many organizations faced several challenges which affecting software process. The main objective of our research project is to develop DevOps' Culture Challenges Model (DC2M) to overcome the most critical challenge "culture" between the development professionals and operation professionals. In this research, we tackle this challenge by means of a Systematic Literature Review (SLR), Empirical Study (ES) and Analytical Hierarchy Process (AHP). Data will be collect by SLR and validated by ES and then applying AHP methodology that gives alternate solutions of issues. Finally we will develop a model which provides better understanding the culture issues. This model will explain the specific role and relationship among every personal in DevOps organization. With this model we will show that culture is the core element in the successful adoption of DevOps.

Key words: *DevOps, Culture, Culture Challenges, Software Process, Model Development*

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1. Introductions

Today's a new approach DevOps emerging in Software development that support fast and short delivery of applications and services at high velocity. The main objective of DevOps is to reduce the obstacles between the development team and operation team without any negative effect on Software quality [1]. The term DevOps has many definitions because it covers a wide range of related activities [2]. DevOps is a set of practices in which all authors are agree about their future goal. DevOps is set of collaborative cultural values and set of practices that focus on resolving the issues of silos between the development team and operation team to decline miscommunication and increase productivity and flexibility [3, 4]. We can also classified DevOps into three parts i.e. Culture, tools and practices. Culture defines a mindset or way of thinking with some principles. While tools are required to be implemented practices. Practices represent the tangible implementation of culture [2, 5].

DevOps assure advantages and has received remarkable attention in the software engineering community [6]. Annual State of DevOps reports in 2017 reveal that DevOps practices increases every year from 19% in 2015 to 22% in 2016 to 27% in 2017 and DevOps practices yield tremendous results [6, 7]. Many popular Organizations adopts DevOps practice to improve software quality, reliability, stability, cost reduction, save time and continuous fast production and delivery. Google, Netflix, Facebook, LinkedIn, Amazon and Spotify are some examples who are adopting DevOps practices [8].

However, this approach is young and little known about best practices [8]. Current research shows that there is insufficient DevOps literature provides which does not support the actual implementation and practices of DevOps in effectiveness of continuous software development [6]. Adoption of this approach is still a challenging task and does not guarantee to adopt this methodology in every organization. There are abundance of scattered information, practices and tools related to this practice and it is very difficult to implement this approach in every organization [8-10].

The main challenge in DevOps culture is different environment among different teams. Development environment continuous changes and want something new while Operation environment want stability. Quick production and delivery in a stable environment without interruption is a major challenge in DevOps culture [4]. These challenges crash the business goals. Key elements required for a successful acceptance to grow DevOps collaborative culture in an organization. The goal of this study is a need to develop a model to overcome the challenges for successful acceptance of collaborative culture in an organization.

2. Background

In a world of competition every organization needs to provide better products with a good quality, low price, and fast delivery to their customers [11]. The Waterfall model or Traditional model was introduced by Royce in 1970. The Waterfall model methodology is linear and sequential in software development. All stages executes one after another in a sequence. Waterfall model has five stages: requirements, software design, implementation, software testing, deployment and maintenance. The advantages of waterfall model are: it is simple and easy to use and understand, better for small projects, easy to control and each stage have a specific task. The major disadvantage of waterfall model is that each stage should be finished only after completion of previous stage which effects in a lengthy process and also gather all requirements before starting the project [12].

Agile methodology is based on iterative and incremental development approach. In agile methodology

each project is split up into various iterations and at the end of each iteration a working product should be delivered. The iterative process consists of plan, design, develop, testing and deploy. The advantage of agile model is to fast delivery of software to market. Agile model is not good for complex decision making projects.

In 2008 an Agile Conference in Toronto was held where DevOps emerges, where Patrick Debois spotlight to solve the barriers between development personnel's and operation personnel's and work in same environment to produce fast delivery of applications to customers [8, 13]. DevOps became popular in 2009 [14]. DevOps is a combination of two words Development and Operation. Thompson and Shafter [14, 15] name this "Wall of Confusion" that has be to eliminate. Today DevOps is the most popular and modern practice both in IT and business organizations than traditional waterfall model and agile model [12].

As DevOps is a collaborative culture of cross-functional teams where people with different background work together. IT companies and business organizations have difficulty with new practices to improve their new updated applications and delivery to customers [16]. The term DevOps is new but it is extension of agile methodology. A number of challenges faced while adopting DevOps practices in organizations. Covert traditional infrastructure into new infrastructure can be both high-cost and time-consuming job. Shifting to DevOps practice new tools are required which needs training and skills. DevOps needs a set of delivery patterns that contains planning, development, testing, deployment and monitoring. In DevOps, Continuous delivery pipeline is a fundamental procedure that amalgamates all these process which requires automation [17].

  To overcome these challenges researches made theories, models and methods.

- Grounded Theory (GT) was suggested by Glaser et al. [3] and it was found that key principal to adopt DevOps is collaborative culture.
- Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) was suggested by Fishbein et al. [10] in 1975 and seek the relationship between human perspective and his manner when doing activity.
- Researchers present competences models in DevOps practices. Competences Models are accurate illustration of skills, learning, attitudes and attributes necessary by job title [16].

Researchers emphasize that DevOps courses should be in education and proposed the Problem-Based Learning (PBL) method which enables students to solve complex issues [11].

Current research reveals that culture, misunderstanding, security, process and technology are major challenges [17]. Building new culture is the most critical issue in DevOps organizations. A survey conduct by Sandbox specialist Quali and specify that major barriers for the successful adoption of DevOps are Culture 14%, testing automation 13%, legacy systems 12%, application complexity 11%, and included other challenges and budget constraints 11% [18]. Generally people hate changes. DevOps culture comes with new ideas and needs learning new tools and knowledge. Adopting the newborn culture requires time, mindset, product thinking, face to face communications, common goals, and blameless liability.

The main focus of our research project is to reduce the gap of DevOps culture between the different team included in DevOps operations.

3. Problem Statement

From the literature many researchers reveal numerous challenges, issues, barriers and problems that affect

the software process, quality and delivery. Every researcher concentrates only in one specific issue. With heavy adoption of DevOps in organizations various IT executives founds problems while building and maintaining quality applications. Culture is the most important and critical challenge facing in DevOps between the various team engaged there. To tackle this challenge we are plan to develop a culture challenges model for DevOps organizations which reveal the weak points and solve the silos between development and operation.

4. Significance of Work

As from literature that culture is the core category for the successful adoption of DevOps. Many researchers find numerous challenges in DevOps which cause failure of your whole project. Our research work is based on to develop a model of DC2M that will reduce the gap of culture challenges between the team members of DevOps activities. Our proposed model DC2M will help to recognize factors essential for successful adoption of DevOps culture and improve the collaboration, communication and knowledge sharing between development team and operation team.

5. Methodology

We will perform our research by three steps. In first step, through SLR we will find the major issues those effects on DevOps culture. In second step, the major issues find by SLR and validated by empirical study and seek other obstacles that are influenced on DevOps culture. In third step, we will apply Analytic Hierarchy Process (AHP) which split the problem into various parts and finally gives an alternative

SLR is research methodology Kitchenhm et al. [19] "a means of evaluating and interpreting all available research relevant to a particular research question or topic area or phenomen of interst". The goal of SLR is not only to collect all proofs on research questions. It also planned to help the researchers for evidence-based suggestions [20]. Through SLR we will identify all relevant data and issues from published research studies. On the basis of SLR we will answers our research questions. We will determine any gap that are found in literature and solve conflict in previous research studies.

- Empirical Study is the collection and analysis of primary data based on observation or measurement or experiments rather than theoretical format. Empirical studies are important procedure to obtain information and make sustainable decisions [21]. Empirical studies explain the current status of an issue based on direct observations, interviews, group discussion and gain qualitative data. This qualitative data provides rich, deep and statistical associations between variables which help us to understand the problems.
- AHP is a structural method to arrange and analyze multi-criteria decisions based on complicated issues having multiple and individual criteria [22]. AHP break down their decision problem into hierarchy components. Each component can be analyzed independently and make hierarchy then decisions are emulated and compare them to one another.

6. Research Questions

The following are the research questions which are related to our study:

RQ No.1 What are the culture challenges that should be avoided by vendor organizations in DevOps development process?

RQ No.2 What the practices are as discussed in the literature to overcome in culture challenges in DevOps process?

RQ No.3 What are the real world practices that should be adopted to overcome culture challenges?

7. Research Objective

The main goal of our research project is to develop a model to overcome on the challenges faced by team member engaged in DevOps operations. We will also find the core elements which are essentials for successful collaboration culture between development and operation. We will implement this model in real world which will be fruitful to adopt DevOps culture and better understanding the complicated issues arises in development and IT operation.

- To conduct SLR for the identification of culture challenges in DevOps.
- To identify practices for the identified culture challenges in DevOps.
- To conduct Questionnaire survey for the validation of SLR findings.
- To conduct AHP techniques for the analyzation of data.

8. Model Development

In our DC2M, three phases are involved as shown below in figure 1:

In the first phase data will be collected through SLR techniques. We will collect culture challenges data of DevOps activities and their practices with the help of SLR method. In the second phase the identified data will be validated through questionnaire survey and will also try to identify some new data apart from the identified ones. In the last phase we will be defined the various level of our proposed model on the basis of challenges as identified. The level will be defined with the help of the AHP techniques, literature survey and supervisor feedback.
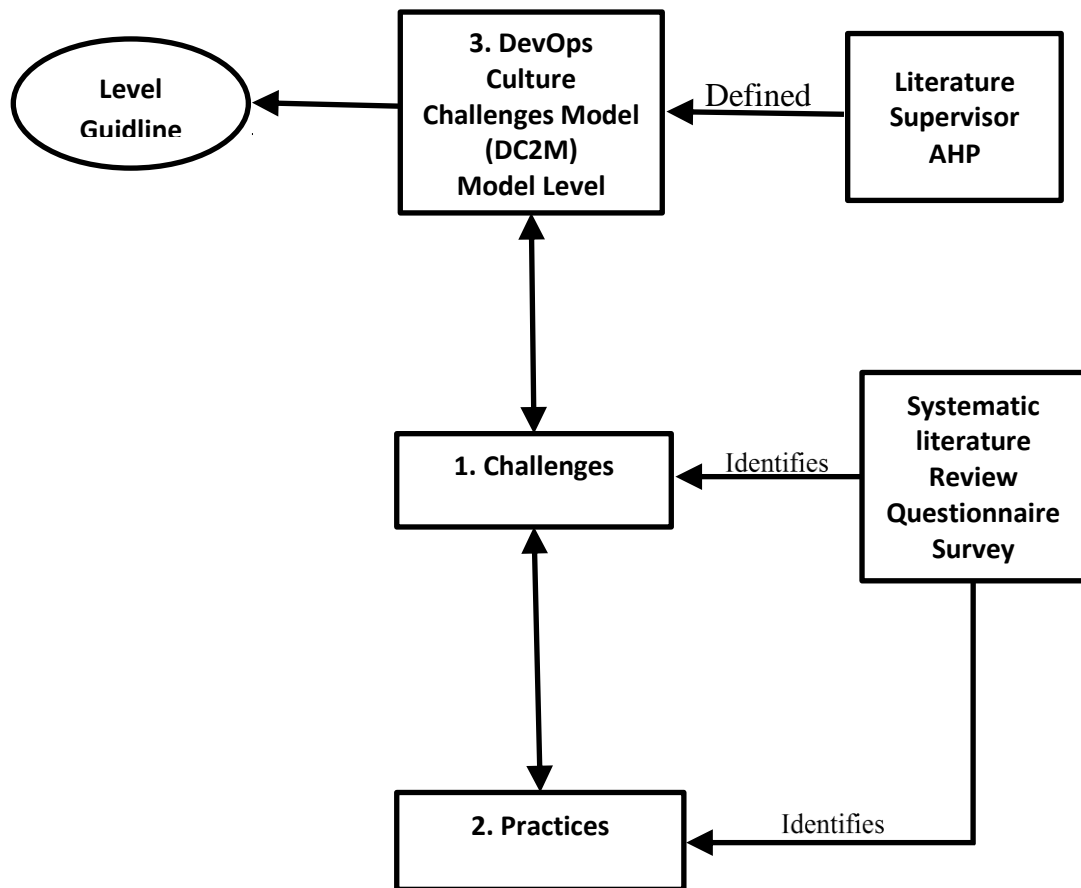
Figure 1.Architecture of DevOps' Culture Challenges Model (DC2M)

10. References

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