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## **ВНЕДРЕНИЕ ДЕВОПС (DEVOPS) ФРЕЙМВОРК: ИЗУЧАТЬ СЛУЧАЙ**

*Аннотация:* Сделано в этом исследовании, дизайн и Внедрение Девопс (DevOps) Фреймворк, , В добавление к оценки через изучать случай, получили Фреймворк из групп из трех методологий разработки программного обеспечения: Скрам, Канбан, Девопс (Scrum ·Kanban, ·DevOps) В зависимости от сравнительного исследования основанного на почти 100 предыдущих исследованиях. . Позже, Фреймворк был использован так как изучать случай прошло в разделе информатики, в одном из колледжей Университета Аль-Баас в Хомсе, Сирия.

Он был направлен на оценку эффективности и влияния, которое он добавил на процесс разработки программного обеспечения.

*Ключевые слова:* Методологии разработки программного обеспечения, Скрам, Канбан, Девопс , изучать дело.

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## **IMPLEMENTING DEVOPS FRAMEWORK: A CASE STUDY**

**Annotation:** *In this research, a DevOps Framework was designed, implemented, and evaluated through a case study. The Framework was derived from a combination of three software development methodologies, Scrum, Kanban, and DevOps, and it was based upon a SLR (Systematic Literature Review) applied on approximately 100 research. Later, this framework was used to perform a case study applied in an IT Division in one Of Al-Baath University Faculties- Homs, Syria, to evaluate the efficiency and the impact it adds to the Software Development Process.*

**Keywords:** *Software Development Methodology, DevOps, Scrum, Kanban, Case Study.*

### **1. Introduction:**

DevOps is one of the software development methodologies that has gained great popularity in recent times, perhaps due to its introduction of a broader concept of cooperation put forward by Agile and Lean [1], where it imposed the necessary practices to establish cooperation between all the organizations' teams to obtain the benefits and the greatest value to be delivered to customers quickly and with high quality [1].

This methodology was officially approved in 2013 when the book The Phoenix Project was released, as the emergence of DevOps was considered as an urgent need by the software development community [2]. However, despite the great importance of this methodology, there is still a shortage in the applied studies of this methodology, which would help in the identification of it [4]. Based on that, we designed a DevOps Framework and then Applied it to a case study to identify the impact and the improvements that it adds to the software development community.

## **2. Design the DevOps Framework:**

The DevOps framework was designed based on several methodologies, namely Scrum with Kanban and DevOps, and it had the following workflow:

The stage of gathering requirements, setting up user stories and meetings was organized according to Scrum methodology, then they were recorded to Kanban Board, provided by Azure Boards from The Azure DevOps Server 2019. The board helped in organizing the development stages starting from the analysis and leading to deployment. It also helped in keeping up on what has been accomplished and what is in progress by transferring user stories through the board and determining the number of tasks that can be accomplished in each stage (WIP - Work in Progress). The DevOps methodology was used to add the “continuous monitoring stage” for the published product to know the extent of customer satisfaction with it. The process was completely ruled by one of the most important concepts in DevOps, which is “*Automation*”.

## **3. Study Design and Case Selection:**

### **3.1. Study Design:**

We used the Case Study Approach to evaluate the DevOps framework. The study was conducted between October 2019 to May 2020. We chose this research methodology because it gave us the ability to understand DevOps in-depth, and it is also the best-suited research methodology to use in the context of software engineering, due to the difficulties found in the extraction of quantitative data from this field of research. Therefore, we started to collect qualitative data that can be drawn from software development experiences. The foundation of the extraction of the data was based on these questions:

**RQ1: What are the difficulties encountered in the workflow?**

**RQ2: What is the impact resulted from the DevOps Framework in terms of cooperation brought to teams?**

**RQ3: What changes have occurred in the outputs of each stage of the development process?**

### **3.2 Case Selection:**

The case study was conducted in the IT Department of Faculty of Medicine - Al-Baath University in Homs, Syria. The DevOps framework was used to develop a web application that serves as an “Electronic Library Management System” linked to an internal network within Al-Baath University, which provides quick access to the scientific references the students of the Faculty need, through a simple and a friendly user interface.

The tools used: Azure DevOps Server 2019 to manage the full development process through its features. The developers team used Visual Studio 2019 Enterprise Edition, with Microsoft SQL Server 2016 Enterprise database Edition, Windows Server 2012 Server Configuration, and IIS Server 8.x.

### **3.3. Data Collection and Analysis:**

We used a set of qualitative data collection methods, which are interviews, and focused group discussions. Then, we analyzed the data and documents we obtained based on the objectives and questions set for this study, which aimed to explore the obstacles that faced the development process, and the impact that the DevOps framework added to the process.

## **4.Results and Discussion:**

### **4.1. Answers to the research questions:**

**RQ1: What were the difficulties encountered in the workflow? And What are the Solutions?**

The main obstacle we found in this process was the new tools and how to introduce them to the team, but once learned, it contributed to speed up work and increase productivity. The process of collecting and understanding requirements is the only stage that was not improved because it required the “*Requirements Engineering*” skills. Usually, the deployment was done during the extra hours, which was a burden, but this problem was solved when we used automated deployment pipelines.

**RQ2: What is the impact resulted from the DevOps Framework in terms of cooperation brought to teams?**

All teams were combined to achieve one clear goal, and the use of Azure Board emphasized that, as it gave us the ability to display all requirements from user stories, test cases, and technical one to all team members at any time, which made the process visible, the matter that It is considered a solution to a real problem facing the software development community.

**RQ3: What changes have occurred in the outputs of each stage of the development process?**

The process of organizing requirements using Azure Board added clarity to the tasks assigned to each team member, and the ability to track the overall work. This has speeded up the work in all stages and reduced the time required for each cycle through the continuous improvement of the flow. As we mentioned before. There was an improvement in the rate of tests conducted and detecting errors which was a result of integrating automated and manual tests. The percentage of information loss decreased by nearly 90%, because of recording it using a central server and managing it from its control panel.

**Results:**

Through previous studies [5][6], we were able to determine a starting point for our study, which was the attempts to create a framework that integrates the best practices in the software development methodologies with DevOps concepts and principles. So, we decided to combine the most famous models, such as Scrum and Kanban, with DevOps. As a result, we found that the more we make teams get used to the concepts of agile, lean, continuous improvement, and DevOps tools earlier, and motivated the organizations to adopt this approach, the better the development processes and customer satisfaction it is. We also found that automation is inevitable in the development community.

Finally, we find that there is an incredible need to delve more into the best practices of software engineering and integrate them into the DevOps process to

improve the framework and in the aim of maintaining the quality of the developed software, which faces a great challenge against the rapid development taking place.

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