

# Adopting Open Source to implement DevOps toolchain for SMEs in New Zealand

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## ABSTRACT

Continuous integration and delivery are significant issues in software development, which involves many software releases in a specific time and the latest version of the software product installed or shown to end-users. Yet, DevOps is a popular solution in the software development industry to resolve problems of integrating software product's development, delivery and operation. However, there are many challenges when implementing DevOps toolchain in organizations, especially in those small and medium businesses. The research proposed will consider how to utilize open source applications to implement DevOps toolchain for SMEs in the New Zealand context. An initial DevOps toolchain framework will be designed and trialed with a local SME. By using open source applications, SMEs could have a low cost DevOps implementation and get support from open source community.

**Keywords:** DevOps, SDLC, software development, quality assurance, I.T operation, New Zealand.

## 1. INTRODUCTION

Delivering high quality software products to market in a short development period has become a top priority for different kinds of organizations. Continuous integration and delivery enhance software development performance, but there are issues when organizations use the two processes, because it is hard to organize different teams to integrate together to frequently release software in a short time. In addition, there are more activities for software development including the latest version of software product will be tested, delivered and deployed before showing to end-users. Therefore, it is a challenge to frequently deliver the high quality software product in a short time with all the functions passing tests, not to mention the support required by the operation team to end-users with the new functions.

DevOps is one of the popular topics in software industries and discussions include; benefits, challenges, practices and implementations. Although, there is some research on DevOps in academic area, it is found that most related studies are low quality (Erich, Amrit, & Daneva, 2014). In addition, there is a lack of research the topic of implementation DevOps, especially for small and medium enterprises (SMEs).

According to New Zealand government (2015), investment in I.T is \$311 million which accounts for 25% of total investment in New Zealand (NZ). In addition, in NZ most small companies have no employees or are a single contractor, and that the I.T project success rate is very low (KPMG, 2013).

## 2. AIMS

This research proposes to implement a framework for DevOps toolchain by utilizing open source applications. There is existing research and guidelines for implementation, but it is scarce for SMEs especially for the NZ context. Hence, this research aims to develop a framework of implementing DevOps toolchain for SMEs in NZ by utilizing the selected open source applications. The framework will be created by continuously updating the preliminary framework, from user feedback and observations from a medium-sized technology company in New Zealand, and therefore it will be achievable and relevant.

## 3. RESEARCH QUESTION

The research question of this proposal is "How to utilize open source applications to implement DevOps toolchain for the SMEs in New Zealand?"

Due to the definition of DevOps, it is a culture for software development and I.T operations (Ebert, Gallardo, Hernantes & Serrano, 2016). Culture is defined as "the characteristics and knowledge of a particular group of people, defined by everything from language, religion, cuisine, social habits, music and arts" (Zimmermann, 2015). So, this research assumes that:

H1. Adopting DevOps toolchain could help SMEs perform DevOps culture.

H2. The seven tools (plan, create, verify, pre-product, release, configure and monitor) could be implemented by open source applications.

## 4. LITERATURE REVIEW

According to Bass, Weber and Zhu (2015), DevOps provides a set of processes for software development and businesses by combining development, delivery and operations. Williams and Murphy (2016) suggests a DevOps toolchain which covers seven general software development activities (plan, create, verify, pre-product, release, configure and monitor). Another DevOps toolchain list is from UpGuard (2016) and it divides the toolchain to versioning and source control,



Figure 1. The poster of this research proposal.

Interestingly, most commercial implementations of DevOps involve open source applications for some of their major components. One reason is that open source is popular in software development industry because it helps this industry move forward and innovate (Mahapatra, Manzar & Bhaduria, 2015).

continuous integration and orchestration, testing and validation, configuration management, containerization, application performance management, continuous security testing and monitoring and system of record. However, the tools of system of record and continuous security testing and monitoring and testing are specific for UpGuard (2016). Therefore, this research will adopt the guideline of Williams and Murphy (2016) to select the related open source applications for DevOps toolchain.

## 5. METHODS

For this research a qualitative methodology is chosen that examines the why and how of decision making, not just what, where, when, or "who" to understand the reason behind a phenomenon (Creswell, 2013).

In the software industry, this could guide other organizations to overcome similar problems. In addition, the software industry is a highly innovative area that circumstances are changed frequently. Hence, it requires researcher to do the research within an organization and be involved in the changes to update the research topics or directions and that the result will be useful before the researched topic out of date.

Hence, this proposal will conduct a qualitative research to find out the issues, challenges, and users' feelings about the suggested DevOps toolchain. In this study, it also tries to explore the reasons behind the specific phenomenon and get more practical experience. An action research method approach would be appropriate and this is supported by, Baskerville (1999) who found that action research is highly adopted in information system research.

## 6. LIMITATION

Some limitations include the NZ definition of SME, may mean the final result might not suitable for other countries. In addition, the selected SME may have a business, culture and various levels of employees that the collected data will be limited to this specific situation. For the findings, according to David (2002), action research might trend to advocate the result.

The initial framework will be updated continuously based on the feedback of the users in the SME, therefore challenges are that the amount of feedback is limited, the users have different knowledge and beliefs so the feedback may have bias and personal opinions that it could not cover the general situation in software industry.

## 7. ETHICAL CONSIDERATIONS

According to Creswell (2013), the ethical considerations could be divided by the timeline of the research, prior study, begin study, collection data, analysing data, and reporting.

- Prior Study: This research will find a reliable local SME and who will support the research. The purpose, aim, potential risk and other issues will be discussed with the SME before doing this research.
- Begin Study: The proposed framework will not contain any harmful applications which might cause the data lose, stolen and unsafe issues.
- Collection Data: All confidential information about participants will be eliminated and the collected data is only for research purpose and will not reveal to other parties.
- Analysing Data: All of the data will be correctly used and keep safe.
- Reporting: None of the data will expose any participant information. Copyright of the report and the framework will be discussed with the supervisor and the SME.

## 8. RISKS

Risks about physical risk, psychological risk, social / economic risk, legal risk, loss of confidentiality are considered. A major risk is that since open source solutions are proposed some of them may not be allowed in commercial environment which may have legal problems for the SME.

## 9. CONCLUSION

This research will conduct qualitative research to find out what proper open source applications can be used to conduct DevOps toolchain for small and medium enterprises in New Zealand. The results will help SMEs to adopt the suitable open source applications to implement their DevOps culture. By using open source solutions, SMEs will have low spending on their DevOps implementation and get help from the open source community. With the findings, senior managers, software architects and developers could know and understand the new advances in technology in the open source community, so that they could utilize the specific applications or whole solution to change and enhance their software development process and product quality. Because it provides detail steps of the implementation, other companies could follow the solution quickly and start to get benefit from it. On the other side, results of this research can contribute open source community to forward the research on DevOps in the community. Hence, it could encourage more researchers to share knowledge and communicate to make the community more active.

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