

*Full Length Research Paper*

# Software release management challenges in industry: An exploratory study

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Release management has an essential role in the success of large software projects and there is no doubt that correct and efficient management of producing a new release can help the quality of the product and the satisfaction of the customers to a great extent. However, there is still problem in many companies for generating a new release, despite all the necessary resources like human, financial, and time resources, sometimes a new release has a lower quality than the older ones. This can be because of the lack of management in release planning. This research shows some possible challenges that can affect management of software release projects. In other words, the study investigates what issues need to be strengthened in management of release for a better release in software companies. This study is an exploration of software projects in small companies in Malaysia. This research was conducted to investigate and understand effective challenges in release management that have been identified by effective role players in release management within software domain. In this paper, developers and managers of eleven small software companies in Malaysia were interviewed to find out the important challenges that affect release management. The study found some important challenges such as: types of release, automation of release planning, tools, foreseeing new releases, release managers, proper understating of requirements and release policy. These are important in release management and their improvement has great effect in release management, which leads to a successful release.

**Key words:** Release managements, release planning, challenges.

## INTRODUCTION

In simple words, a release is a set of features of a software application, implemented during a software development process. Release management is an important part of quality management, since it is concerned with the delivery of high quality software to users (Levin and Yadid, 1990). Release management consists of technical and management activities that are needed to take a release from a set of requirements to the delivery of a software application that implements these requirements (Sayko, 2004). The development of software applications is an incremental process, moving towards some series of sequenced and unknown goals.

These goals are usually provided in the form of a release. Release management is about monitoring how changes flow into systems. Whenever these changes are updated, new features are subsequently released. Release management is generally not just a management effort. It often includes a great deal of collaboration and automated arrangement of complex computer systems. If you want to generate a new release, you might look at release candidates before, and perhaps an investigation of doubts before going full production.

Software release management is the process of ensuring releases that can be reliably planned, scheduled and successfully deployed to real environments. Figure 1 gives a clear overview of release management, during a release planning process. As shown in the figure, there are three main steps in release planning process.

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Figure 1. Overview of release planning process.

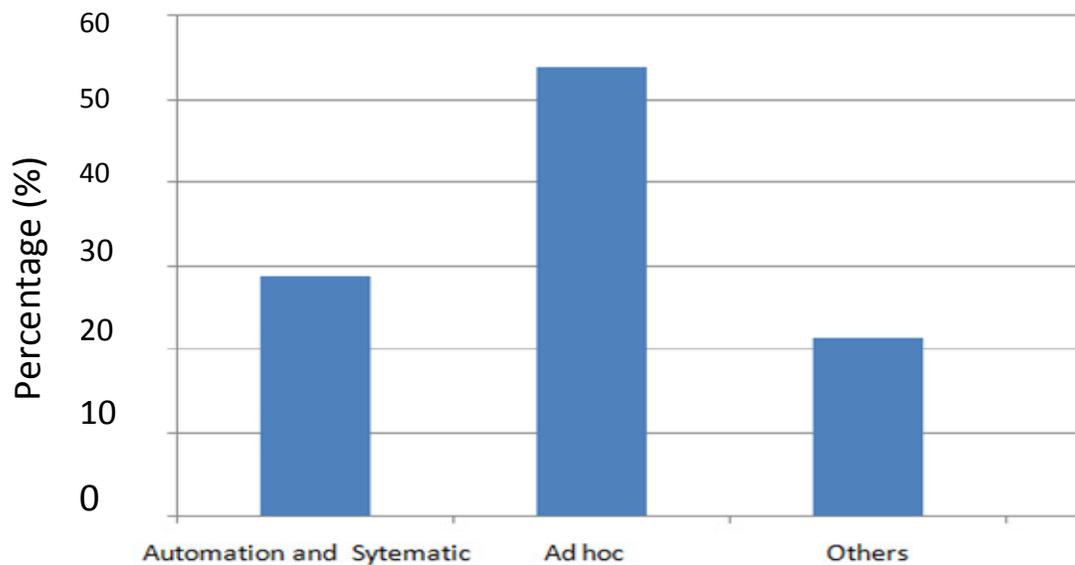


Figure 2. Respondents.

The first step is “release goals”, which includes: requirements, updates, patches, the main goal of releases, services and business policy organization or it can be say the targets of releases. Release management in fact plays a great role.

It includes standardization, control, approval for implementation of features and investigation of correctness of new changes for going to release. After changes and modifications are done, and features are implemented, it is time to execute the release in real environment in order to get feedback from customers. In fact release execution step is the behavior of new release. The main idea of Figure 2 is adapted from Drapeau and Oudi (2007).

This paper is in fact an exploratory study to find the challenges in release management in software industry among small software companies in Malaysia. For the purpose of this study, developers and release managers of different projects were interviewed individually to identify release management challenges that affect release planning.

## RELATED WORK

Once the basic release of software is delivered to the market, a number of new features and enhancements

can be identified. For investigation and evaluation of these new demands, release management is necessary. Although, release management is the main part of release planning process for improving the quality of a product, few surveys have been conducted in the area of release management, practices and challenges.

Michlmayr et al. (2007) finds problems and practices for release management in free software projects. An exploratory study was performed to get a better view of actual practices and problems associated with release management in free and open source software projects. In fact, the study explored release practices employed by volunteer free software projects and showed problems that occur.

van der Hoek et al. (1997) discussed and identified the issues encountered in software release management, and presented an initial set of requirements for a software release management tool. They described a prototype of such a tool that supports both developers and users in the software release management process.

On the other hand, van der Hoek and Wolf (2003) have proposed the problem of release management for component-based software and discussed SRM, a prototype software release management tool that was developed; it supported both developers and users during

**Table 1.** The responder's numbers.

Role of respondent	Number
Project managers	5
Release managers	4
Developers	17
Analysers	15

the software release management process.

Krishna (1994) with a business perspective introduced an economic model to capture the various tradeoffs involved in software release decisions and further discussed methods to obtain optimal software release time.

### Motivation and objective

One of the biggest problems faced by software projects is that, although enough experts or skilful human resources, and sufficient budget and resources are available during a software development, there are still chances of having problems in a new release and this may return to the management desk for further decisions.

In this paper, the most probable challenges in software release management by interviewing developers, managers, and release managers were studied. The main goal of this study was to find challenges that are related to management of a new release in small software companies in Malaysia.

Every software company must face these challenges, findings, and understand these obstacles and try to improve them. They are effective during release planning process and consequently, the success of the release depends on them.

### RESEARCH METHODS

In this paper, we have presented an exploratory survey result on software projects to find release management challenges in small software companies in Malaysia. Definition of "small" businesses varies by industry (Fayad et al., 2000). However, as the focus is on small size of organization, we defined organization's size based on the number of employees. Organizations with less than 100 employees are small. Exploratory studies are used when the "research looks for patterns, ideas, or hypotheses rather than research that tries to test or confirm hypotheses" (Vogt, 1999).

The aim of this paper is to identify the challenges that can affect and improve release management process in practice. This research was conducted as semi-structured based interviews with eleven software organizations. In this study, we have interviewed 41 practitioners, including release managers, project managers, analyzers and developers of various projects. Although, the size of these companies are small but sensitive projects, such as web-based system, database systems and some tools for organizations something is missing.

As Table 1 shows, the participants are mainly project managers: 5 (12.2%), release managers: 4 (9.7%), software developers: 17(41.5%) and software analyzers: (36.6%). Duration of each interview that includes discussions about research question was 15

to 25 min.

### Research question

In addition to the interview, the study had discussions with some practitioners, for clarification. Recall that the intent of this research was to investigate the effective challenges that could affect release management. It thus, had a pertinent research question:

Q: what challenges, in your opinion, can improve or affect release management?

This question is dealing with the investigation of significant challenges of release management in small software companies. This question is operationalized by asking the participants of this study to find challenges.

### RESEARCH FINDINGS

After interview and observation with practitioners, we achieved some of the main point of their ideas that can be effective in release management of small software companies.

Although some of them were mentioned in the journal articles or past researches, there were some new helpful ones, which can improve release management to a great extent. Further discussion elaborates our findings based on data collection from small software companies in Malaysia. The main challenges are:

#### Types of releases

One of the most important challenges that was discussed in interviews and the practitioners tried to focus on, was, type of releases. It is clear and obvious that management of different types of releases is different. As in (Michlmayr et al., 2007) general term of release management is used to refer to three different types of releases: development release that is aimed at developers who are interested in working with cutting-edge technology. It means developers try to move towards latest technology in their release. A major release usually introduces new capabilities, functions or some new and significant changes, and minor releases incorporate a number of fixes for known problems into the baseline, updated to the existing current release. When we talked to members about release management, the first thing they told us was about the types of releases and they agreed that management for developing a new release, based on minor changes is easier.

Obviously, the type of release we are going to deliver is important. For instance, a release which is developed after one year and getting feedback from various customers is different from a release with some minor defects only. Obviously, the management of these releases cannot be the same. Sometimes, a release is planned for special features and it takes time and effort and sometimes it is only a different language, but mostly, projects

are based on the requests of the customers.

From forty-one participants coming from eleven companies, this study found that thirty-seven of them strongly agreed that the type of release plays a great role in release management, categorization of changes for a new release in order to identify types of release, which can be effective in release management. Therefore, one of the most important challenges that has value, and has always been discussed in release managements is type of releases.

### **Necessity of automation in release management**

Automation enables you to do tasks without dependencies to human resources, and standardization of the way of process ensures that your automation works well and the result are consistent. In this study, nine out of eleven companies liked to have a systematic approach for their release management, even one of the project managers said he preferred to have at least two new releases per year, because maintenance is easier and new demands does not accumulate.

In view of the participants, automation for release planning means having standard cycles for releases, they do not like to face unexpected events, although, it may occur. After several years of experience, release managers try to develop standard process for release delivery. Their goal is to have systematic rules for managing their releases.

One of the issues that were discussed with the practitioners was the ability of managing releases automatically in a standard cycle. However, it can be very hard for release managers to achieve this, and Carlshamre (2002) classified release planning as a "wicked problem", which means, it is not predictable. As shown in Figure 2, eleven out of forty-one respondents agreed to have automation process for release management, and twenty-two of them liked ad hoc approach for release management. Ad-hoc signifies a solution designed for a specific problem in release management. They think that release management problems are not foreseeable, and based on customers' demands, they used specific solutions. Nine of the participants told us their release management depends on release type.

### **Appropriate tools**

Surprisingly, the release management is lacking from comprehensive tools that would help automate the process. Using a proper tool for release management in a software company means an acceptable approach for release management. So, it can be said that the right tool to some extent is related to automation of release management. Despite the importance of release management for delivering a good quality software release, responders were still asking themselves how to

find new proper tool(s) for new release. Therefore, one of the major challenges that practitioners were talking about was having a suitable tool for release managers for new release and this is very hard, as each release has different situation and problems. For example, one release may need minor changes, but in another release, functions may also have to change. Therefore, the need for a suitable tool that can satisfy all conditions is felt.

Among investigated companies, only one company used specific tools for release management. This is because they have a systematic approach for new release. The rest, to some extent, depended on release managers but they are trying to have suitable tool, and they admit that it is very hard.

### **Foreseeing a new release before real execution**

Release managers have the duty to predict the proper execution of new release in the real world, and one of their worries is to predict it correctly. It happens that new releases have lower qualities than the previous releases. Therefore, it is the responsibility of release managers to determine whether or not the new release will outperform the previous releases. They must be able to predict the future of the release, before it gets to the market.

Participants in this survey agreed that testing their product, at least once, before releasing it to the market, is very important for predicting the quality of their products. They emphasized that this prediction is necessary for software companies to determine the future of their products. So, all of the investigated companies try to have solutions for their products in real environment, and sometimes, they try to predict level of satisfaction before sending it to the market with some tools.

### **Release manager's role**

The role of the release manager is diverse and demanding because, they have to interact with different people, understand technical issues, and also, know how to plan and coordinate (Michlmayr et al., 2007).

In a small project, a release manager usually has an administrative role, which involves the preparation of the release in different formats that can be distributed. He/she is also responsible for creating release notes and actual distribution of the software (Michlmayr et al., 2007). One of the most important issues that play a great role in both release planning process and release management is having qualified release managers. Michlmayr et al. (2007) states that having different skills such as community building, strong vision, discipline, judgement, good communication, and management skills, are very important.

Participants in the survey acknowledged that having good project managers, plays an important role in the quality of the products. It is desirable for managers to say

something once and everyone understands it, but in reality, this does not happen. The role of the release manager is diverse and demanding, because they have to interact with large numbers of different people, understands technical issues, but also know how to plan and coordinate (Michlmayr et al., 2007). In small projects that the study targeted on, some properties of release managers was also discussed. For example, they must have discipline, and need a lot of experience in development of software; they sometimes have to know details and the responsible of them are transferring new demands to developers and team managers and in new resale they must adjust new resale and requires that are request. Based on data collection from practitioners, 65% of respondents agree that the most important factor in delivering a successful release is the release manager.

### **Proper understating of RFC**

Request for changes (RFCs) is a change request that captures the detail of a change that is needed to be made for existing releases based of customer demands. The reason for creation of a new release is implementing a series of these changes and modifying the behavior of a release due to normal business value because there are some problems in current release. In these companies, one of the important challenges that they are worried and they want to improve, was understanding proper changes and in release management this is very sensitive and must be done carefully because misunderstanding of new requirements may lead to low quality and less satisfaction.

### **Release policy**

Release policies are high-level statements of how releases are to be managed, organized, and performed in your environment. Policies include management goals, objectives, beliefs, and responsibilities. These topics are used to learn more about release policies and to learn how to view, create and edit the policies of International Business Machines (IBM). One of the main topics that were discussed with practitioners is about release policies and although these policies are different in each company and depends on many factors but recognizing and understating these policy can help companies to have better release management, for example, in some companies that are related to government, the government policy like specific goal or rule for the software release.

Based on interviews, although each company obeys some polices and these policies are important to release planning process but sometime these polices lead into limitations and restrictions for release management. In eleven investigated companies, there are only 4 developing software for some governments' organizations that accept government's policies and 7 of them follow their

managers' policies.

### **THREATS TO VALIDITY**

Validity of the result needs to be planned by gauging proper counter measures. We have followed the recommendations by Yin (2003) who chose four possible ways for the validation. The first one is referred to as construct validity, that is, a test or a measurement tool that is established by demonstrating its ability to identify or measure the variables or constructs that it proposes to identify or measure. For this research, we have used two main researchers for interviews in order to reduce misunderstanding of the information gained from the interviewees. One of the researchers is the first author and the second one is a master student.

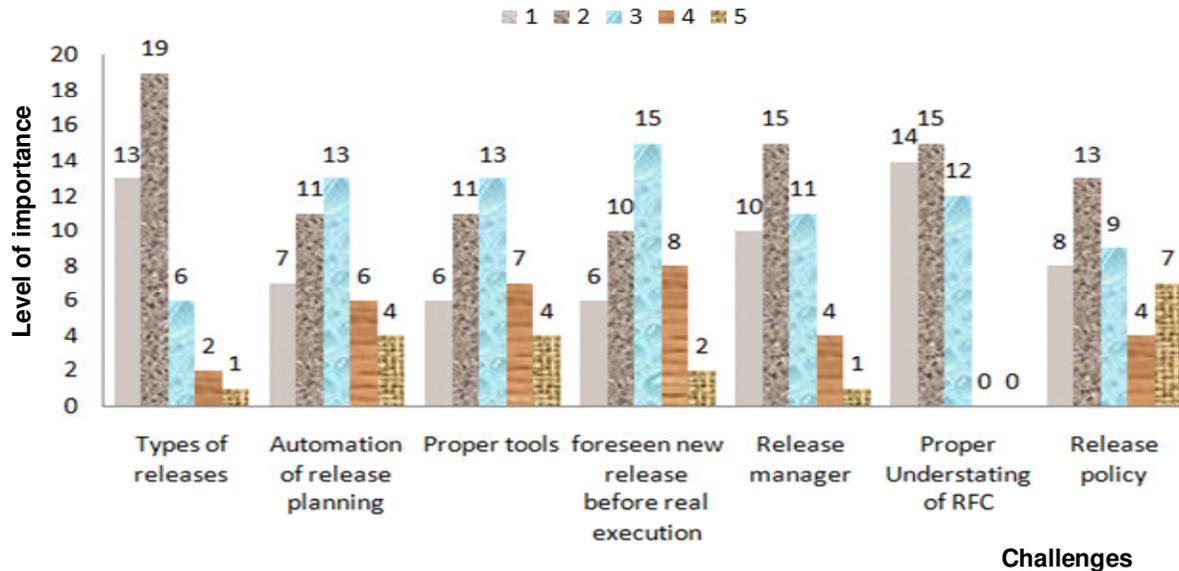
The second important measurement was trying to demonstrate the internal validity of the study. Internal validity conducts the "true" causes of the outcomes that one extracts in his/her research. After investigation and findings, the challenges in release management, for proving and know the level of impotence, the study send the findings to the same participant (41 people) in those companies to prove and know the level of impotency. The third validity measure is to show the reliability of this study. To increase reliability of the study, all collected data, and derivations are stored in a database, accessible only to the researchers in the study to reach the findings.

The last validity measure is external validity, which is related to generalization. As mentioned earlier, the findings extract based on small software companies in Malaysia and it can be used in other medium and large companies but maybe some more points have to be considered. The study thinks some of the main points of the findings are general, and can be valuable for all size of software companies.

After investigation and findings of the challenges as mentioned earlier, for proving and knowing the level of impotence, the study sends the findings to the same participant (41 people) in those companies to prove and know the level of impotency. This study used questionnaires presented in Appendix A (Table 1) to identify managers' ideas about the findings.

In this step, the study have sent the questionnaires to the participants by e-mail and asked them to fill the forms and send back. However, after sending, they were also reminded through telephone to fill these forms. And they send back filled forms. The main goal of this step is to internally validate the result and know the level of importance of the findings.

After analyzing the data that were collected from the same practitioners as illustrated in Figure 3, the level of importance of the challenges, type of releases and understating RFC becomes the most important challenges, and the investigation of these challenges is necessary for release management process. Based on Figure 3, some



**Figure 3.** Level of importance in release management.

1 = extremely important, 2 = very important, 3 = moderately important, 4 = not that important, 5 = unsure.

of the challenges that are important have less importance in release management.

## Conclusion

Release management plays a great role for delivering a successful release. There are several issues and challenges in release managements, that knowing and improving on them can affect management of a new release. The study found some possible challenges that can affect the management in software release projects. This study was an exploration of small software projects in Malaysia and was conducted in order to understand effective challenges in release management. These challenges were indentified by key role players in release management in software domain. It was found that some important challenges that are important in release management, their improvement and investigation can be of great value in release management. Consequently, success depends on them. The findings of this study can offer a framework for future analysis. Future research will be extended to the number of participants and investigation medium, and large size companies, to find a general framework for release management process.

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**APPENDIX A****Table 1.** A questioner sample.

<b>Challenge</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Types of releases					
Automation of release management					
Proper tools					
Foreseen new release before real execution					
Release manager					
Proper understating of RFC					
Release policy					
Comments:					

1 = extremely important, 2 = very important, 3 = moderately important, 4 = not that important, 5 = unsure.