

## Approaches of Impact Analysis Assessment and Classification towards Projects Changes

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*Change impact analysis has been defined as identifying the potential consequences of a change, or estimating what needs to be modified to accomplish a change. The term "impact analysis" is used with many meanings, it's used for characterizing and comparing diverse impact analysis approaches, it corresponds to how an approach is used to accomplish impact analysis and how an approach does impact analysis internally, and the effectiveness of the impact analysis approach. As the project management community recognize the growing need to identify consequences of changes, impact analysis is making its way into the software process and dependencies between project life cycle objects are becoming more numerous and complex as many IT projects grow beyond a large number of requirements. Therefore, this paper deals more on investigating further how software practitioners use and make use of impact analysis as part of the process of managing change and how impact analysis is applied during software changes. The improvement of primary data with project management practitioners will be identified.*

**Keywords:** Impact analysis approaches, change requirement, project management practitioners and change control.

### 1. Introduction

Almost no major corporations are free from the challenge of developing and implementing successful strategies for managing change. Indeed most recognize that strategic change is not a transient issue, but rather a continuous process Collofello (1999). Yet few project managers seem to be able to manage change effectively. A frequent problem with IT projects is that changes to ongoing system requirements, however small, may have unintended, expensive, or even disastrous effects (Lions, 2000). The most of the studies in impact analysis focus more on developing methods, algorithms, for helping the analysis. Base on our experience, there is a few studies about non-technical aspects of the subjects. Since, impact analysis is a part of change management process. In this paper, we present an exploratory scientific study of the views of impact analysis at project management practitioners in Malaysia. These practitioners used to develop all types of software systems. These systems are by nature both large and complex and are subject to rapid evolution. In the study, the change source in question was change requests and Impact analysis was seen in a broad sense: both with respect to the analysis of the change requests and to the analysis induced by the change. In exploring Issues of impact analysis at project management practitioners in Malaysia, we identified the fundamental factors of the issues to understand how issues associated with Impact Analysis are seen under the different perspectives in the organization; we interviewed 8 employees at the different

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organizations with different roles as industrial experts. The resulting list of the issues was consequently subjected to analyze and propose the appropriate solution and improvement for the issues. Our objective is to investigate whether people see impact analysis differently depending on their level and perspective and how the practitioners can be used in their daily work. The main outcome of the study is to present scientific data from different people of our focus group. It gives extensive analysis of the primary data that supports in presenting difficult issues. Finally, it proposes the appropriate approach of impact analysis process.

## 2. Literature Review

Numerous researchers highlighted on differences between project board and managers in the context of project management concept, for example, concerning about the views of software project quality Hall (1997), use of formal routines to transfer information and experience Conradi (2001), and how they rate factors affecting project goal Karlstro (2002). Although both project managers mostly have more information and knowledge than project board. Based on that, manager's priority for this specific work are more likely to align well with those of the organization. So that, differences between managers and engineers could be attributed to differences between the organizational alignments of their default perspectives Bohner (1995). Impact analysis relies on methods and strategies that date back a long time. It is however possible to determine a trend in impact analysis research over the years Karlstro (2002). Early impact analysis work focused on source code analysis, including program slicing and ripple effects for code Davis (2006). The maturation of software engineering among software organizations has led to a need to understand how changes affect other System Life Objects than source code. For example, Turver and Munro (1994) point out that source code is not the only product that has to be changed in order to develop a new release of the software product. In a document driven development approach, many documents are also affected by new and changed requirements Chung (2009). The user manual is an example of a document that has to be updated when new user functionalities have been provided Gdaer (1999).

In 1996, Bohner and Arnold published a collection of research articles entitled Software Change impact analysis (Bohner and Arnold, 1996). The objective of the collection was to present the current, somewhat scattered, material that was available on impact analysis at the time. When reading the collection today, nearly ten years later, it becomes apparent that it is still very relevant Michelle (2004). Papers published after 1996 seem to work with the same ideas and techniques. We do not mean to depreciate the work that has been done, but it indicates that the field is not in a state of flux. Rather, the focus remains on adapting existing techniques and strategies to new concepts and in new contexts. Impact Analysis on the architectural level is an example of this Conradi (2001).

Finkelstein and Sommerville discuss perspective in relation to viewpoints (1996). A viewpoint consists of an agent (i.e., actor) and a perspective. Due to its complication, large-scale software development project requires multiple opinions and, therefore, multiple perspectives. With respect to Finkelstein and Sommerville, differences in perspectives stem from the agents' different responsibilities and roles and, thus, variations in their goals and opinions. Furthermore, they argued that multiple perspectives need to be integrated if there is a common or shared goal (1996). In software projects, the common objective is to construct a successful enhancement

program that handles the organization's software processes (see, for example, Zahran (1996). This motivates the relevance of looking at multiple perspectives when prioritizing Impact Analysis issues. Thus, a need for Impact analysis strategies that utilize requirements and their relationships to other System Life Objects has formulated. Still, dependency webs for large software projects can be so complex that it is important to visualize them in novel ways. Kilpinen (2008) discussed the practical applicability of impact analysis methods in her PhD thesis. She determined a gap between approaches proposed for impact analysis and their application in practice. However, most authors neglect this fact and thereby limiting the applicability of their method. In contrast, experiments and case studies conducted within the scope of her thesis have found a sharp decrease in needed design work when marginally improving the integration of impact analysis into the development process.

### 3. Methodology

An empirical study using an interview was applied in this research. In order to understand how issues associated with impact analysis are seen at the different levels and under the different perspectives, we interviewed 8 entrepreneurs as preliminary data collection at different company in their roles as industrial experts. Our goal is to investigate whether people see Impact analysis differently depending on their level and perspective and enhance impact analysis process in appropriate manner. The overarching goal of this study is to explore the role of Impact analysis in the project development, in order to be able to improve ways of working with Impact Analysis. In addition to that, qualitative analysis was conducted during the analysis of the collected data. When the data collected in qualitative purpose, the intent was to first explore the problem under study and then follow up on this exploration with qualitative method that are amenable to studying a large sample so that results might inferred to a population. Alternatively, when quantitative data proceed, the intent is to explore with a large sample first to test variables and then explore in depth with a few cases during the qualitative phase. In concurrently gathering both forms of data at the same time, the researcher seeks to compare both forms of data to search for congruent finding.

Based on the literature and preliminary data analysis, we determined some issues of Impact Analysis from literature and Interview data. In order to improve Impact analysis process in a software project developers and organizational level we need to identify all factors that involve impact analysis decision. As mentioned above, to have a decision on the impact of the change to the system involves all participants of the project with their different perspective and views. On the other hand, Impact analysis on technical part has done a lot of work but still there are a lot of difficulties, due to the software complexity and technology change. During this paper, it will focus more on how software practitioners use and make use of impact analysis as part of the process of managing change. This perspective provides how research communities can create impact analysis method and tools that work in practice.

In addition to that, an interview sessions where conducted with entrepreneurs. A sample of population of Project management practitioners has been considered in gathering the information. The main target was project directors, Project managers and developers. The total interview questions was 15 including demographic questions, all questions were direct. More specifically, the main objective of the interview sessions was to compare the problem formulation based on secondary data which is the literature review with primary data to support strongly the problem

formulation. The interview data analyzed by using qualitative method and the result of the analysis will be explained in detail in the following paragraphs.

#### 4. Results

Based on Table 1 below shows that the, eight important issues as perceived by respondents of this study. Besides that, the interview data shows that, the difficult issue of projects management practitioner nowadays is change. In addition to that, Most of the respondents confirm that project management enterprises in Malaysia today used their own approach of change impact analysis; there is no standard method or approach of change management for their daily work. All participants have different perspective with different view based on change impact analysis performance. Therefore, the mapping of participants to the organizational levels resulted in eight participants at the operative, tactical and strategic level. However, analyzed data shows that the most difficult issues in project management practitioner platform today are change impact analysis performance. Base on that, a number of issues extracted from the interview data and past works. These issues are varying in closeness to impact analysis. Further, some issues concern change requests, some concern the actual analysis activity, some concern process details, and others concern the analysis results.

**Table 1.1:** Impact analysis Issues

No.	Issues
1	It is difficulty to find resources for performing change impact analysis
2	There is not enough time to perform impact analysis
3	Responsibility and product/project balance are difficult to handle for analyses that span several systems
4	There is not standard Impact Analysis process strategy for the complexity of software projects nowadays.
5	Participants don't like to perform impact analysis
6	Different change request have different levels of complexity, and there is no appropriate method for handling all levels.
7	Analyses and change implementation evoke stress.
8	It is difficult to see trends and statistics for collective impact
9	Analyzed data result indicates that the most difficult issues in project management practitioner platform today is change control, the process improvement of Impact analysis in lightweight manner is more significant

During the analysis, a number of possible improvements to address the issues at hand were argued. These improvements are presented in this section 5. It is desirable to select those enhancements that can express as many issues as possible at the same time, to a reasonable cost. As many of the issues are relevant in one way or another, improvements are likely to have multi-issue impact. However, a multi-issue improvement may be very costly, in which case other, possibly narrower; the improvements have to be considered instead.

#### 5. Process Improvement

It's very important to improve the process of impact analysis for a large software projects. Further, to apply the approach of impact analysis in the project change

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management, it's necessary to consider first, it is important to limit the number of exceptional change requests at any time and use a selection process for having in change requests. Second, introduce various methods of dealing with different types of change requests (For example, use various change request "tracks"). Third, It is Important to Involve the design organization more in the requirements specification work to stay away from change requests associated to requirements issues. Fourth, plan earlier, for the reality that there will be several change requests in the project and introduce a database for keeping old impact analysis outcomes to be utilized as a practical knowledge base for upcoming analyses. Fifth, Prepare meetings where several development groups and sub-projects talk about joint impact analysis work. Finally, involve the assistance organization more in the impact analysis effort to make sure concentrate on post-delivery aspects.

As mentioned earlier, to control and manage changes in a large software projects, it is necessary detailed impact analysis process to be emplaced before starting any other activities of the project. Furthermore, Impact analysis is considered as an important activity which helps making decision. Sensitivity analysis is to identify tie factors which contribute in the proposed change and those design areas which are sensitive to change. Based on the analyzed data, proposes strong cohesive steps of change impact analysis process. These steps include:

1. Identify the factors which are the causes of change.
2. Identify those requirements which are highly affected by the change (this information is acquired by previous history of requirements or intuition).
3. Identify the consequences of those changes -Impact analysis
4. Perform change analysis on other requirements, design, cost, schedule, safety, performance, reliability, maintainability, adoptability, size and human factors.
5. Decide the change using change strategy which already emplaced.
6. Implement and verify the change to suit the project requirement.

These steps defined above are designed for a large software projects. Further, the CCB is referred for the approval of the change, but it does not elaborate on the bases used to evaluate different alternative and how does the CCB decide and approve the change. However, Integration of change impact analysis concept with project change evaluation may result having strong decision of the change, the decisions to analyze and the decisions to proceed with changes will be made by the change control board chairman and the project manager, if they do not impact scope, budget or schedule. When the change impacted to the scope, budge or time will be escalated to the project board based on the emplaced change strategy.

## 7. Conclusion

In this paper, we have presented results from a study where Impact Analysis issues were improved by software practitioners at three different organizational levels (operative, tactical, and strategic) and under two different perspectives (organizational and self). Furthermore, exploring issues from several perspectives and levels is rewarding and requires certain advantages from a process enhancement point of view. The most important issues related fundamental aspects of impact analysis and its execution. This underlines that impact analysis requires to be addressed as essential activity in the change management process. More specifically, it is imperative to

realize that processes require to not only impose the existence of appropriate impact analysis but also to prescribe how impact analysis should be carried out in order to achieve satisfactory and timely results. Therefore, it's important for change control board chairman to focus and evaluate the level of change impacted to the business in terms of quality, time, cost and effort. Based on that, change impact analysis approach may support having appropriate decision for the change implementation.

### Acknowledgement

The authors would like to thanks Universiti Teknologi Malaysia (UTM) and Ministry of Higher Education for FRGS Vot No. 78434 that has supported this research

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