

Impact of Requirement Gathering Techniques on Software Development

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Abstract
Requirement of any software project plays an important role throughout the development life cycle. It affects the system cost, effort, time estimation, system development, software quality measures and ultimate software performance. There are many requirement gathering techniques deployed for this purpose. Some of these techniques are if good in one picture, at the same time these techniques do not provide better results in another one. In the small size software industries in underdeveloped countries, these techniques varies for the same environment. This research analyses the five common requirements gathering techniques that include interviews, questionnaires, joint application development, request for proposals and prototyping. This paper statistically analyse that the impact of these on software development.
Keywords: Requirement gathering, Software performance, Software quality, Requirement analysis.

1-Introduction

Involvement of client is an important part in the development and deployment of software system. The parameter for success metrics of a software system is the degree which it fulfilled the customer's need. The goals of a software system requirement gathering techniques are to identify the stakeholders, their needs, documentation and successful subsequent implementation. The requirement engineering focuses on collecting the actual functional and non-functional requirements. For this purpose, various techniques are deployed. Change in requirements will affect the design, code and implementation [1].Requirement Engineering is a fundamental approach in software projects [2].Requirement is a very important point in a system as it is a set of statements that identify the capability characteristic and quality of a software system. Requirement gathering is very beneficial in developing a new system. Requirement gathering depends on communication between Client and RE team and Project cost [3, 4].Literature shows that the user involvement is very important in Requirement gathering and it is important for project success [5]. Requirement gathering for a software system is a basic aim of its developer [7]. Occasionally, development fails due to wrong gathering approaches. Existing requirement gathering techniques are useful when software develops from scratch. Requirement gathering takes time [8].Engineering requirement gathering in requirement engineering is supposed to be the key to successful completion of any project. Requirement gathering and requirement managing in a proper way is key to success in software project [9].System design without the clear requirement will fail to meet the customer expectations from a system. Some sources of software requirement gathering are:

a) Current System
b) Customers Need
c) Company Standards
d) Government Laws
e) Domain Knowledge

The four main categories of requirement gathering techniques are as follows.

a) Classical Techniques
b) Intellectual Techniques
c) Batch Methods
d) Present-day Techniques

In many requirements engineering processes the requirements engineering team uses traditional requirement gathering techniques. The famous and most commonly traditional techniques are interviews, questionnaires, JAD, RFP, prototyping. This research paper is based on quantitative analysis of five basic techniques and their impact on software development based on quantitative analysis of these five techniques. On this quantitative analysis impact of requirement gathering techniques is compared.

2-Material and Method

$H_{0=}$ $\mu_{Q=}$ $\mu_{I=}$ $\mu_{J=}$ $\mu_{R=}$ μ_{P} *A-Research Questions*

The Literature review shows that there exist controversial views regarding the impact of requirement gathering techniques. One of the key controversies is that the requirement gathering techniques have the same impact and other point shows that impact of requirement gathering techniques is different. From the given discussion, a

question rises here,
Is requirement gathering techniques have same impact on software development, software performance and quality?
B-Data Set
We apply a quantitative survey on software developers of different companies who have worked on at least two software projects recently and currently working on software projects. In questionnaires it has been asked to the developers that which requirement gathering technique provides a better set of requirements that helps during development life cycle. The data was collected on five different techniques. The data is based on one independent variable and other is dependent variable. The independent variable is requirement gathering technique and dependent variable is type of techniques that are used. The values vary from 1-10. After collecting data we calculate the mean value of each different technique. The figure 2.1 shows the data set.

Questionnaire	Interview	JAD	RFP	Prototype
10	8	5	7	3
9	7	4	8	4
8	7	3	9	5
7	8	4	10	8
7	9	5	4	7
8	6	4	5	6
7	7	3	6	4
56	52	28	49	37

Figure 2.1 data Set

$Mean_{\mathrm{Q}} = 8\,, Mean_{\mathrm{I}} = 7.42, Mean_{\mathrm{J}} = 4\,, Mean_{\mathrm{R}} = 7, Mean_{\mathrm{P}} = 5.28$

3-ANOVA Test
From the research question,
We have assumed hypotheses that all techniques have the same impact.
ANOVA test is used to analy\se the data that is gathering on the base of hypothesis. Applying the ANOVA test on the data set to prove the given hypothesis. First mean values of each technique are calculated. After those degrees of freedom between the group and within the group is calculated, and with the help of $df_{Between}$ and df_{Within} grand mean of all values is calculated. From the values it has been taken the value of $F_{Critical}$ from the F table which is equal 2.69 below show the calculations of df_{Between} and df_{Within} and F_{Critical}.
$df_{\mathrm{Between}} = \mathrm{k} - 1(1)$
Where k= Total number of Requirement gathering Techniques.
So,$df_{\mathrm{Between}} = 4$.Now calculated$df_{\mathrm{Within}}$
$df_{\mathrm{Within}} = \mathrm{N} - \mathrm{k}(2)$
Where N= Total number of values.
So, $df_{\mathrm{Within}} = 30$
Now calculate grand mean using below formula.
$Mean_{\mathrm{Grand}} = G/N(3)$
After calculating grand mean we have

$$Mean_{\mathrm{Grand}} = 6.3$$

After grand mean $SS_{\mathrm{Total}}, SS_{\mathrm{Within}}$ and $\mathrm{SS}_{Between}$ is calculate using below formulas.

$$SS_{\mathrm{Total}} = \sum\ (X - Mean_{Grand})^{\ 2} \quad (4)$$

$$SS_{\mathrm{Within}} = \sum\ \left(X_{Q\_}Mean_{Q}\right)^{2} + (X_{I\_}Mean_{I})^{2} + \left(X_{J\_}Mean_{J}\right)^{2} + (X_{R\_}Mean_{R})^{2} + (X_{P\_}Mean_{P})^{2} \quad (5)$$

$$\mathrm{SS}_{Between} = \mathrm{SS}_{Total} - \mathrm{SS}_{Within} \quad (6)$$

After putting the values in above equations we have $\mathrm{SS}_{Total} = 141.89$, $\mathrm{SS}_{Between} = 76.74and\mathrm{SS}_{Within} = 65.15$.
After sum of square calculation, Mean Square calculated below is the formula of calculating $MS_{Between}$ and MS_{Within}
$MS_{Between} = SS_{Between/}df_{Between}(7)$
$MS_{Within} = SS_{Within/}df_{Within}(8)$
After putting values in the formula we have values 19.185 for $MS_{Between}$ and 2.16forMS_{Within}.
For calculating the value of F from our data set we put the values of $MS_{Between}$ and MS_{Within} in F formula.
$F = MS_{Between}/MS_{Within}(9)$
So the calculated value of F is 8.8796.
F>2.69

4-Result

The calculated value from ANOVA test is 8.8796 which are less then Critical value of F that is 2.69.
F>F_{Critical}

5-Discussion

From the results of One-Way ANOVA Test, the value of One Way ANOVA test is F=8.8796 and the value of F for the critical reign from F table is 2.69. This shows that our result for H_0 is not in critical region so the null hypotheses, that "the impact of all requirement gathering techniques are equal" is rejected, because we calculated F value is greater than F Table value.

6-Conclusion

From the above results in the requirement gathering techniques, analysis different techniques have different impact while software development life cycle, software performance and quality. In future this research expands more than five techniques and use on large scale projects to measure the impact of the requirement gathering techniques. Reasons of different impact on small level industries, and comparison of technique's productivity will might be the area of interest.

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