A Survey Study of Various Software Cost Effort Estimation in Perspective of India

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*Abstract-*According to Current scenario of India cost estimation plays a vital role in the whole cycle of software development. Software development process involves various techniques and skills which help for accurate estimation, overall charges, early delivery date, required effort and assurance of project acceptance or denial. This paper presents current scenario of knowledge in the field of software development methodologies through conducting systematic survey of cost estimation in Agile Software Development, which will be useful to understand current trends in cost estimation in Agile Software Development stages. Stages are building blocks of any software development methodology which are presented graphically. Software development methodologies are compared by highlighting strengths and weaknesses from the stakeholder's point of view. This research is related to software cost and effort estimation in software development.

Keywords: Effort, Cost, Estimation, Software, Agile Technology, Survey, Analyze

I. INTRODUCTION

This research is related to software cost and effort estimation in agile software development. The research was done at Accenture, Honeywell Hyderabad, Tata Consultancy Services Banglore, EICE Noida, Macquarie Gudgaon, FIPL Vadodara, Orange cruves Jaipur. Research inspired from the bad estimation accuracy found in area of software development. The main motive of this research is to present current scenario and evaluation of cost-effort estimation in perspective of software, survey in team members working on various companies. According to literature review Machine Learning, Algorithmic Models and Expert estimation three kinds of techniques available for cost-effort estimation but all are inaccurate because Algorithmic and Machine learning technique require lot of research and data so company avoid these techniques and largely use expert estimation which based on past experiences and thoughts of experts. Current scenario of various company shows that team members believed on expert estimation method and reason is toughest task to collecting data and flexibility of user requirements. Current studies found by conducting questionnaire surveys. Questionnaire based on past literature studies.

Purpose:
The goal of my research is to reduce estimation inaccuracy and loopholes as well as improving suggestions on expert estimation. Research Topics:-
1. Analyzing various Software cost effort estimation in software development.
2. Current Indian scenario of Cost-effort estimation in Software companies.
3. How could improve the estimation method in various software companies?

II. EFFORT ESTIMATION PROCESS

The meaning of Software development effort estimation is the method of predicting most accurate amount of person working hour or required for software development.
The process of Effort estimation is step by step method to find out the estimates for any software. Absence of process the result must be inaccurate. [1]

Estimation= Duration of task completion + task completion Cost

Effort estimation is a way in which inputs which it takes and output which it produced. During this process some resources are adopted with estimation methods. Quantitative and expertise both data are used for estimation. Quantity and Quality of data are two major factors for estimation. [2]

Normally estimation done by previous or past projects but if quality data in perspective of current scenario is not available then estimators have to do new effort estimates instead of taking past historical data.

Effort Estimation Methods:

According to literature review three main effort estimation methods were found—

1) Algorithmic Estimation- These methods are based on mathematical models which produce function of a number of variables-

$$Effort = f(x1, x2 ..xn)$$

where $x1, x2, , xn$ denote the cost factors i.e. software metrics. [3]

Ex: COCOMO, Puntametc

2) Expertise Estimation- These Methods are used when there is complexity to collecting data and requirements. There is no accurate evidence but situations where we can expect expert estimates to be more accurate than other estimation models.

Ex: Delphi, Rule based etc

3) Learning Oriented- These methods are advance version of algorithmic and expertise estimation where conclusion obtained by previous projects, examples and current knowledge.

Ex: Neural and Analogy. [4]

4) Price to Win- Estimates according to budget of the software.

5) Bottom-up- Estimate and test each components of the system.

6) Top-Down- Estimate and test entire system

Table 1: Comparative Analysis of Estimation Methods:

Method	Type	Advantages	Disadvantages
Analogy	Non-algorithmic	• Require past Experiences. • No need of new resources	• Required large amount of data. • Sometimes similar problem pattern not available
Expert based	Non-Algorithmic	Due to expert experiences fast process	Chances of biased decisions
Bottom-Up	Non-Algorithmic	• Stable as the estimation errors in the various components might balance out.	• Time • Inaccurate data • Require lot of data
Top-Down	Non-Algorithmic	• Faster and Easier • Low level costs	• Justifies decisions are less • less stability
COCOMO	Algorithmic	• Repeatable results can be generated • Easily modifying input data • Easy filtered formula • Clear results	• Inaccurate cost estimate • Size uncertainty • Require huge data • Practically not good
Function Point	Algorithmic	• Estimation based on requirements designs • Specifications • Tool independent	Not considered good enough
Neural Network	Machine learning	• Superior cost estimate • Consistent estimate	• Training data required • No standard guidelines

In this research various estimation techniques Machine Learning, algorithmic models, Function Point, Top Down, Bottom up and Expert estimation are explored. Planning Poker, COCOMO and neural networks are widely using in present world.

Expert Judgment Method:
In this method opinions, experiences, consult with software cost-effort estimation experts. If opinions are different then wideband Delphi and planning poker techniques are use.[5]

III. FACTORS FOR CHOOSING ESTIMATION TECHNIQUES:

Conclusion of literature review is that there is no single method available which estimates accurate than others. Each method affects different factors--
1) Is model having understandable structure and Process?
2) Is method is less expensive, easier to use and clear?
3) Does the model keeping missing or past data?
4) Does model considering uncertainty?
5) How model consider uncertainty?
6) Is estimation result is accurate or not?
7) Is method using agile methods or not?
8) Is method is dynamic or not?
9) Is method produce accurate output if requirement changes during development?
10) Is model less time consuming?
11) Is model fits in current situation?
12) Is model produces trustworthy results?

Estimation principles:
According to Jorgenson it is not enough to select estimation method and using start. He presented twelve expert estimation principles based on empirical evidence, which are presented in table 2.

Table 2 Expert estimation principles as reported by Jørgensen (2004) [6]

1. Evaluate estimation accuracy, but avoid high evaluation pressure

2. Avoid conflicting estimation goals

3. Ask estimators to justify and criticize their estimates

4. Avoid irrelevant and unreliable estimation information

5. Use documented data from previous development tasks

6. Find estimation experts with relevant domain background and good estimation records

7. Estimate top-down and bottom-up, independently of each other

8. Use estimation checklists. Combine estimates from different experts and estimation strategies

9. Assess the uncertainty of the estimate

10. Provide feedback on estimation accuracy and task relations

11. Provide estimation training opportunities

IV. PILOT TESTING OF QUESTIONNAIRE

Creation of Questionnaire ➙ Pilot testing ➙ Finding errors ➙ Sort out issues/errors ➙ Make ready for answering
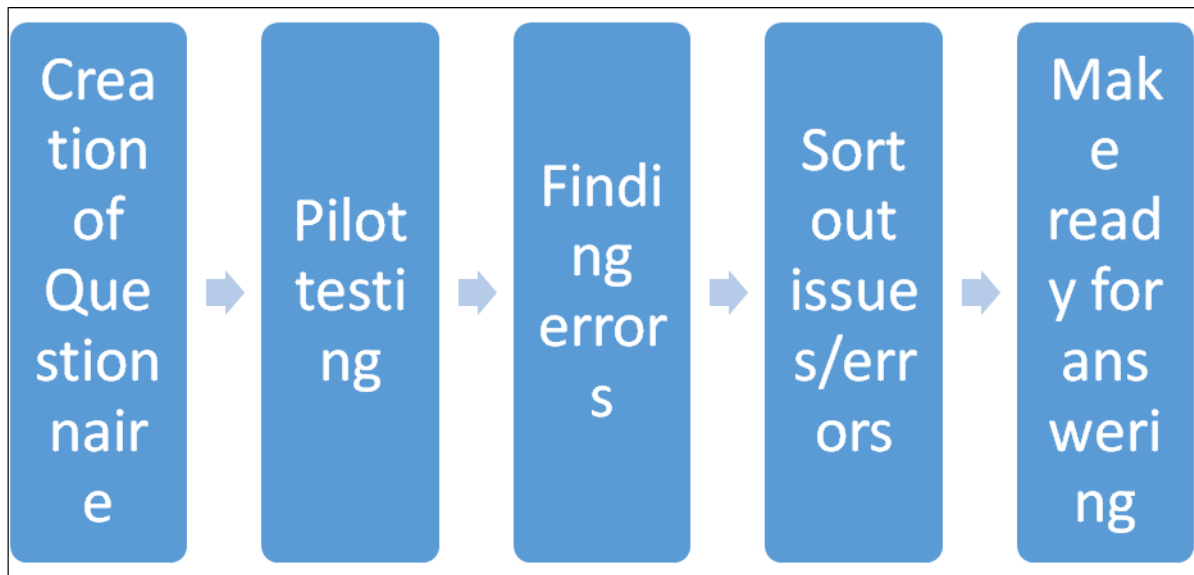
Figure 6- Pilot Testing Process

A pilot study is a small scale pre study to find issues and errors related to study and   improve the study design prior to performance of a full-scale research project. [7]

Analyzing questionnaire

After conducting the survey collection of questionnaire process become start. All different question frequencies are calculated by SPSS Software. T-test was used to compare Likert scale answers to previous studies that did not report the exact answers they had received, but instead reported the means and standard deviation of their answers. Coding used for labeling answers.If P-value is greater than 0.05 then concluded that there is no difference between mean and statistically considered.

V. CURRENT SCENARIO OF COST-EFFORT ESTIMATION IN INDIA

Pilot Study result:
1) No data are provided for urgent and unplanned tasks
2) No effort data is provided for tasks such as calls, meetings, and e-mail traffic
3) Employees are less knowledge about this topic.
4) Employees provide effort data about tasks expected from them, as well as ones they already perform.

Comparison Studies

Respondents of the survey reported six different roles, of which software developer was the most common. Only four respondents reported working in testing. These testers work on higher level testing, as unit testing and acceptance tests are done by the developers working on a feature. Seven of the respondents were Scrum masters. Scrum masters also work in normal development tasks in their teams.

Methods	JuhoLeinonen (2016)	Anooja (2018)
Planning Poker	22	81
Expert judgment	25	77
Analogy (analogy- and case-based reasoning e.g., analogy with different projects)	8	2
Work breakdown (WBS-based and other activity decomposition-based methods)	3	16
Function Point (methods based on function points, feature points, or use case points)	2	12

Guessing	2	7
None	1	2
Neural Network (methods based on artificial neural networks)	1	--
Regression (regression based methods, including most algorithmic models e.g., COCOMO)	2	--
Bayesian (Bayesian or Markov-based estimation models)	--	--
Informal discussion within team Simulation (simulation-based/derived models e.g., Monte Carlo Simulation)	1	14
Theory (theory derived models e.g., SLIM)	--	--
Top Down	--	--
Bottom Up	--	--
Price to win	--	1

Expert Judgment and Planning Poker methods widely used in Indian companies like other countries.

Information Type	Juholeinonen (2016)	Anooja (2018)
Previous development experiences	7	17
Feature analysis	6	56
Feature specifications	6	12
Codebase	5	11
Existing tests and need for new tests	4	23
Discussion with specification makers	3	11
General knowledge about the system	3	12
Resources available	--	10
Base product/source code	--	05
History data	3	16
All kinds	1	03
Deadlines	1	02
Experience of the person designated for the task	1	03
Individual estimates from team members	1	01
Inheriting Ability	--	01
Team velocity	1	09
Life Expires	--	10

Feature analysis and existing tests type information widely using in India.

VI. SUGGESTIONS AND IMPROVEMENTS

In this Paper suggestions and improvements will be described. These suggestions are result of literature review and survey conducted for this research.
Suggestions:
[1]. **Make Risk under control-**
      a)   Earlier find out and predict errors or failures may occur in future.
      b)   Week to week feedback taken by team.
[2]. **Reality-**
      a)   Be sure requirements given by customer is practically possible to complete.
      b)   Do you have experts staff and technologies to reach final goal.
[3]. **Training**-
      a)   Train your team very well to take challenges as well as sort out the issues.
      b)   Train your team with latest technologies.
[4]. **Scheduling-**

    a)   Before starting a project team manager have to plan and decide a rough schedule of working on project.
    b)   Decide rough estimates of each step. Calculate rough date to completion of small tasks.

[5]. Don't pressurize team members-
    a)   Don't pressurize but keep eye on their work because they aware you are watching them.
    b)   Be strict on goals.

VII. CONCLUSION

This research explores an overview of effort estimation in software development as well as the current scenario of effort estimation in Software companies of India. According to literature three categories of effort estimation techniques—expert estimation methods, algorithmic models and machine learning.
The survey is conducted to find previous survey studies. For pilot testing questionnaire distributed to 10 persons for primary testing. After successful completion of pilot testing the questionnaire are distributed to Software companies of India.

According to need of Indian perspective some questions were added by me 132 people participated in survey out of 146 peoples. Planning poker and expert judgment most common method used by almost companies for estimation. In previous research survey performed in a single company and only 61 people participated out of 100 which may be biased and may not be widely explained.

Accurate estimation is toughest task in presence of inaccurate information, Different time period, user behavior etc. Survey conducted on 132 peoples working in these companies and output shows that members believed in Expert Estimation. After Analyzing survey and literature review some improvements and suggestions were found. Main findings of survey—
    1. Remove irrelevant information otherwise expert judgment estimation affect the estimates.
    2. To reduce inconsistency in expert judgment estimation training is important.
    3. Clients plays vital role in the estimation process.
    4. Estimation terminologies are not well defined.
    5. Late delivery is major weak point of software development.
Hence to reduce the problem arised in cost effort estimation researchers required to implement methods from various research disciplines.

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