



AN IMPROVED ESTIMATION MODEL FOR SOFTWARE SYSTEM PROJECTS

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Abstract-Estimation model is key factor to calculate the size of project and in turn estimate the efforts. Based on these efforts project commitment can be provided. However, there is no accurate model which can predict exact size and efforts in new generation projects which are based on agile development methodology.

In earlier days of project development methodology were of conventional types where requirements were almost freeze at the start and waterfall model was good to serve the purpose. But in today's scenarios market changes very fast and development needs are changed accordingly so the agile development is need of the era. The user story estimation approach is very much acquainted for agile development and serve the purpose. Estimations are fairly good with the user story approach, also phase delivery life cycle model leverage the advantages of phase wise estimation. To summarize the context, phase wise project lifecycle and phase wise estimation model provides and improved estimation model where the productivity is also based on the actual results of previous projects.

Keywords: Life cycle model, Estimation, Project Size, User Stories, Agile development method.

1. INTRODUCTION

Lifecycle models provide a structure of the sequence of activities carried out in the development program. These activities are organized into distinct phases and are arranged in the order in which those phases are executed. The key purpose of these life cycle model is to provide a standardized format for planning, organizing and executing the program.

There are various life cycle models available to provide guidance for manager. By selecting any model which is suitable for the project, project manager can make plan for the project.

Following lifecycle are available which can be selected to plan the project activities:

- Waterfall Model
- Overlapping Waterfall Model
- Staged Delivery Waterfall Model
- Incremental Development Model
- Iterative development
- Agile/Time boxed lifecycle
- DevOps Lifecycle phase

All the lifecycle have some strengths and weaknesses, for software system projects we have studied Iterative development, agile development and DevOps lifecycles as long duration software system project cannot be planned with waterfall type life cycle.

After studying different life cycle we found some of the issues with these life cycle which have generated the clues for the problem statement and objectives of my research.

These are:

- Establish a life cycle model which suites big system projects
- Establish an estimation model which can give better prediction
- Reduce project delays and variances with respect to commitments

As the objectives are difficult to achieve following changes needs to be addressed first.

- Identification of an effective estimation model which can give more accurate estimations so the customer can be provided
- Identification of project life cycle which can serve customer as per his requirements and also take care of the commitments. As the project delays can also impact the brand image of the company. It impacts on the trust and integrity of the organization. Once commitment is provided and not adhere is a panic situation for the organization as well as customer both.
- The standard life cycles which are used are not supporting the estimations for big and long duration projects research paper we have studied have different life cycle model but not suitable to achieve my objectives so we have merged some of the life cycles and define a new life cycle model with new estimation model for software system project.

In this paper we have explained the new model. The first part is introduction where the life cycle explanation, problem statements and challenges are mentioned. In second section what all we have searched and studied is mentioned. Then what new idea is and what are the results achieved by new model is mentioned. At the end

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conclusion of the work is mentioned.

2. LITERATURE REVIEW

There are various types of research done on how to do estimation. Many approaches and research relevant to life cycle and estimation have been suggested. Let us discuss some of the work already done in this field.

Manzoor Ahmad Rather, Mr. Vivek Bhatnagar author of “A Comparative Study of Software Development Life Cycle Models” has concentrated on comparative studies of the life cycle model which suggests the lifecycles for the system project development. It has conclusion that waterfall and spiral lifecycle can be used for the system development but both has its own disadvantages and are not suitable to me because my prime objective is to provide better estimations and focus on customer delivery both. Also Costing is a factor for the organization because the organization works for a profit and both life cycles are not very much effective for us.

Murad Ali, Zubair A Shaikh, Eaman Ali author of “Estimation of Project Size Using User Stories” which suggests the abstract as there is no model which can provide an estimation on project size in agile. These paper is giving much insight about the estimations for system development projects but again this is suitable for agile development whereas my projects are not of agile development nature , these are the ling system projects which have clarity what type of architecture is required for the system , although some requirements may come later on.

So again some work is required for establishing the estimation model but the user stories based estimation method will work in my project with some improvements.

Adam Trendowicz, Jürgen Münch, Ross Jeffery author of “State of the Practice in Software Effort Estimation: A Survey and Literature Review” is suggesting what all type of methods are used by various industries.

In the paper author concluded that with respect to industrial trend , there is need to include various supporting processes in effort estimation like project and process management , risk management , change management, project negotiation etc. and also many of the industries estimates based on expert judgement only where the skill is also judged by the experts.

There should be some quantitative method to estimate like some size should be there and based on the productivity the calculations can be done.

Ritesh Tamrakar & Magne Jørgensen author of “Does the Use of Fibonacci Numbers in Planning Poker Affect Effort Estimates?” This paper has suggested that the author was not much confident to use Fibonacci series as he mentioned some limitations in the paper like the task they have considered were small in size , also the experienced person who were part of project were not much equipped with planning poker method , so the conclusion is it is good to use Fibonacci series but developers need to be careful while they are applying any non-linear scales Fibonacci series usage can speed up process of estimation and achieve the precision over the linear scales, a Fibonacci series may also be bias when there is too low effort values

3. NEW APPROACH

In this new approach some of the points need to be taken care.

- All the broad level requirements should be compiled at starting of the project that is requirement analysis phase
- An architecture of the project should be finalized
- There should be an opportunity to take care the requirements analysis in between so customer feedbacks can be incorporated
- All the requirements are not much clear at the start so there should be mechanism to improve estimates within the project
- There should be some customer deliverable at some specified duration to ensure that customer is engaged with us and not in waiting mode till long duration.

The flow diagram of the life cycle is represented here

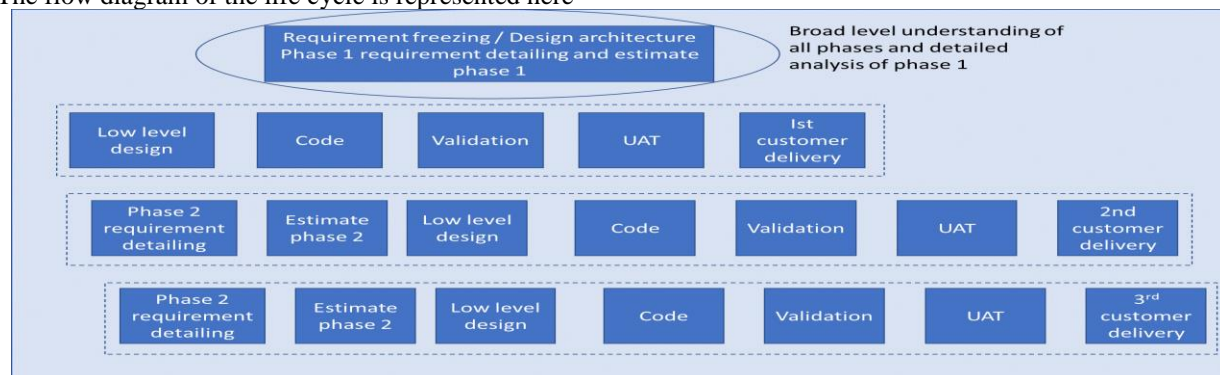


Fig. 3.1 Phase Wise Delivery Model



Above life cycle provide following benefits over other life cycles

- Requirement analysis is done at broad level, and for phase 1 detail estimation has been completed.
- Plan is prepared for the complete project.
- Decide and take agreement how many phases will there in the project
- According to the phases, estimations are done
- These estimations and customer deliveries are finalized as per plan
- Which features are to be provided in all phases are finalized

This life cycle is mixed of overlap waterfall, incremental delivery and agile methodology. This life cycle provides better estimation model where estimations can be done phase wise. Team will identify user story points as per complexity of the project and estimate the size as per the productivity. User story points will be assigned based on Fibonacci series and maximum points assignment will be 8, if story points are more than 8 points then these user stories need to be divided further.

Also user stories which are of 8 user stories point should not be exceeded so average productivity can be considered for all the user stories.

Method of estimation is

- Identify all user stories.
- Assign phases to all user stories
- Assign user story points as per Fibonacci series.
- Calculate the size and identify the efforts based on the organization productivity.
- This estimation will be done phase wise so for phase 1 firm estimation can be provided and for rest of phases broad level estimations will be done.

4. RESULTS

By this new approach following results have been achieved which further analyzed by Mini tab.

It is visible that we have achieved improvement in our estimations. The long duration projects were divided in phases and the commitments are done for the phases so the difference between planned Vs actual gets reduced. To check this we have captured the project data of same type of duration for the Year 2019 and Year 2020

Below table is available for the data for year 2019 and 2020.

Table-4.1 Data Year 2019

Year of the project	Duration in years	Delay in days
2019	2	180
2019	2.2	225
2019	2.1	190
2019	2.5	120
2019	1.9	160
2019	2	180
2019	2.2	200

Table-4.2 Data Year 2020

Year of the project	Duration in years	Delay in days
2020	2.1	154
2020	2	142
2020	2.3	130
2020	2.5	125
2020	2.1	152
2020	1.8	138

This data was analysed by Mini tab which is a statistical analysis tool and software product which supports us to analyze the data. Following results are stating that there is significant improvement in average of both years delay days.

The two-sample t-test is performed to check the improvement, this is a method used to test whether the unknown population means of two groups are equal or not. It is also known as the independent samples t-test.

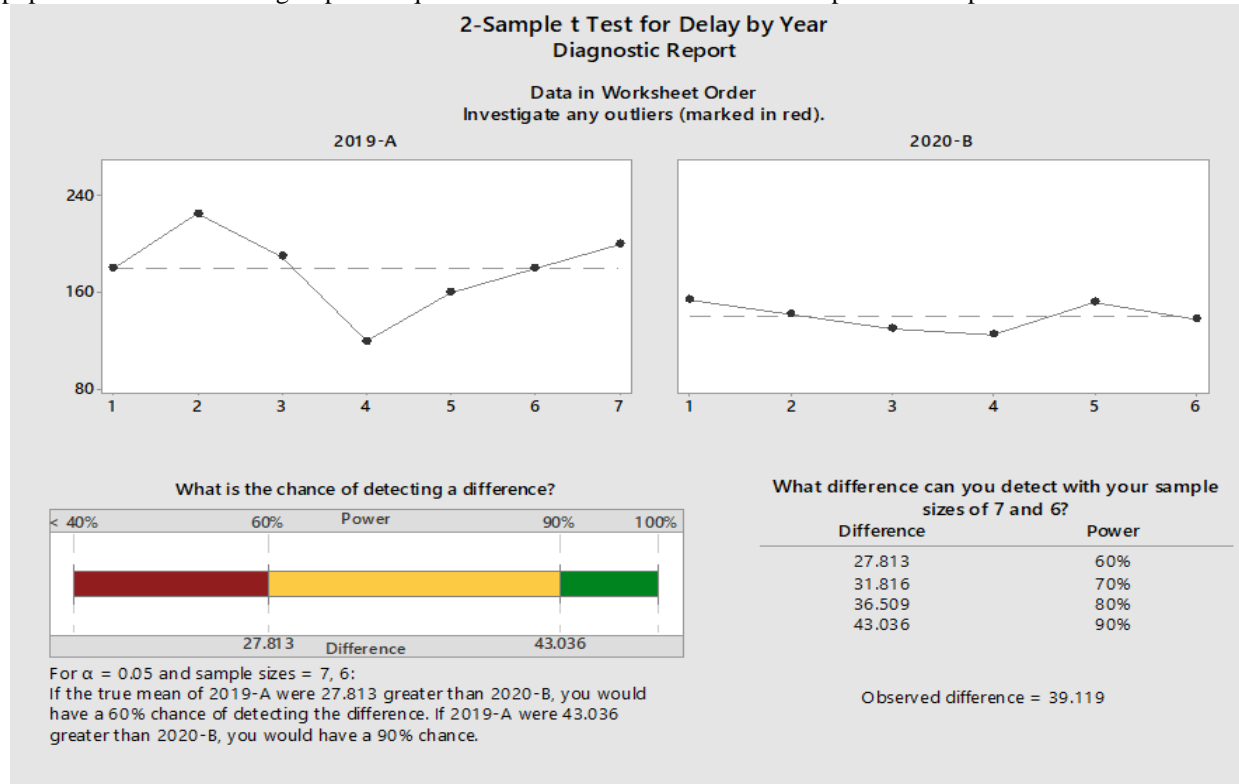


Fig. 4.1 Mini Tab Results

CONCLUSION

Selection of life cycle and estimation model is key factor for any project to be successful and to adhere the commitments.

- As per the project results it is concluded that any project planning and estimations need :
- Clear scope and requirements
- Customer expectations
- Functional requirements as well as nonfunctional requirements
- Skill and resource knowledge about the subject
- Understanding of the estimation model by team
- Understanding of the requirements by team
- Selection of the project life cycle
- Understanding of risk management
- How to take care of changes

So to reduce the delay and adhere the commitments it is very much required to do good estimation at starting of the project and fine tune it with the time.

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