

IMPACT OF BEHAVIOURAL METRIC IN SOFTWARE DEVELOPMENT

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Abstract –New metrics are evolving and are aligning with the software industry trends. New metrics are created by understanding the customer needs and the changing industry. But nowhere the behavioral or cultural or geographical aspects are looked into which could impact the outcome of the development or enhancement projects. The evolution of the one of these aspects – behavioral, is analyzed over the changing software processes or the framework models from legacy system to the recent object oriented systems. The study is to understand and see how the team members’ behavior affects the outcome of the projects and to see if it can be measured and tag to the outcome. The modern software developments are driven by the need of agility thus giving way to agile modelling in the software industry. This model looks in for self-organizing teams, the agile manifesto shares that projects to be built around motivational individuals with trust and also value individual interactions over processes and tools, which is a behavioral aspect and is an unmeasured metric. This paper tires to understand the need of one behavioral aspects and its impacts the outcome of the projects.

Key words: Agile process, behavioral aspect, metrics trend, metric evolution, software evolution

I. INTRODUCTION

A metric is a quantitative measure of degree to which a system, component or process possesses a given attribute. Metrics are useful for cost and schedule future projects, to establish productivity trend over time, improve software quality, anticipate and reduce future maintenance needs.[1] These metrics are evolving to meet the Metrics are generally classified under Products, Processes and resources. Behavioral aspects are never considered or measured for success of a project delivery. The geographical and culture of Organization also serve as differentiator between successful ones and the laggards. In this paper, the focus is on the study and trend of behavioral aspects in the evolving software industry and the direction to meet the organizational welcoming the changing requirements, even in late development stage.

Software frameworks and processes are evolving to meet the industry demands. The recent ones like the incremental and iterative models delivery are under the same umbrella – “agility”.

II. CONVENTIONAL MODELS

Conventional software engineering processes are like Waterfall, incremental and evolutionary and specialized process models and others where the dawdler practices are not being used or are revised to meet the organizational demands and are disparaged. Hierarchical model of execution (till 2000) is the key feature in these models, with Delivery Manager, Project Manager, Technical Leads, Developers and Testers. In these models, the information flow is top down. These are *heavyweight* methods (which are heavily regulated, planned and micro-managed) are criticized and new lightweight methods emerged from mid

1990s. In the hierarchical model, clients will be sharing the knowledge and the requirements with the senior executives like Program Manager or Delivery Manager, which is later scrolled down in a hierarchical way to the development and testing teams. These are mostly a *closed paradigm* [2], which is a traditional hierarchy authority model. These teams can work in a pre-defined and familiarized environments mostly to reproduce the existing applications with not much of innovations. This structure is initially described by Becker[3] as a nucleus team composed with predefined and planned activities instructed to team for execution.

III. THE 4 P’S OF SOFTWARE MANAGEMENT

The first P, PEOPLE, is the key for any project manager or organization for a successful outcome of the business engagements with customer. The other Ps are product, process and project. If a manager pays less attention to product, then the project is into risk of building an elegant solution to a wrong problem. Without proper process, the manager is riking by developing tools into vacuum. Without proper project plan, the manager is endangering the success of the project itself.

Software industry authors have defined the team models based on the activities and processes that are governing the execution of a project development. These models as defined by Constantine [2] are

- *Closed Paradigm* – traditional hierarchy of authority with no innovation
- *Random Paradigm* – individual driven model

- *Open Paradigm* – collaborative working in complex models.
- *Synchronous Paradigm* – compartmentation of tasks with little active communication

Jackman [4] describes “team toxicity” in teams which demotivates the teams being productive. Human traits – extroverts and introverts, also impact the projects depending on the process frameworks they are working in. understanding the psychology of these traits and recognizing the human differences is the key step for creating a health project environment.

Towards the behavioral aspects and to continuously improve individual competencies, People Capability Maturity Model (P-CMM), Agile Teams have evolved. PCMM [5] is a maturity framework that focuses on continuously improving the management and development of the human assets of an organization. Though People CMM does not mention on the behavioral aspect of human but it indirectly works towards managing the workforce and establishing a culture of excellence within an organization.

Most of the business organizations are looking towards agility with the market demands. Agile Teams and process models are being evolved and are being adopted as a key success for delivery.

A. BEHAVIOURAL EVOLUTION

Most Legacy processes and conventional models are mostly nuclear focused and with centralized knowledge with only one or two specialist who drive the plan and execution. This resulted in demotivated teams with less or no innovation idea generation, leading to efforts and cost overrun and abrupt project closures.

Agile software development model has been proposed as an antidote to the many of the problems plagued in the software industry. This model directly kills closed paradigm and gives attention to the individual rights of “out of Box” thinking and collaborative working where everyone is recognized.

B. BEHAVIOURAL IMPACT

The dimension which was never quantified and a sensitive one, attitude aspect of behavior determines the success or failure of the projects. Neven has this topic has been explored to understand the impact of attitude on the impact of project success. Projects are run with process, tools, products and teams. A healthy environment in a team has a more probability of success than a “toxicity” team. The behavioral aspect of self-organizing and collective working is the key for current trend of process development models like agile. Imagine a situation where in the complete or majority of key information is with a single person and the a situation arises where-in (s)he is demotivated and does not turn up on the key day like go-

live or presenting to CEO. What happens! Whereas a positive attitude and distributed/sliced tasking and decentralized information will likely to handle such situations effectively and succeed.

Organizations are moving towards building a P-CMM alike models that inculcates a positive behavioral aspects with-in the employees and move towards a healthy working environment.

Over 70% of the major software programs are still run on the legacy systems and are maintained with the same old metrics. Even the enhancements or changes to the existing legacy system are measured in the legacy metrics only. As the team members changes there a change in the metrics, which indicates reduced productivity. The positive outcome of these projects which follow the conventional methods are still measured using the existing metrics only. In the initial survey on these non-agile projects, the attitude/behavior of the team is measured and predicted the outcome. In most cases the results are positive.

As part of the primitive survey, the questions are based on the three aspects of attitude – Affective, Cognitive and Behavior are conducted with managers with sample size (50 – 25 for Waterfall Model and 25 for Agile Model). The results are promising showing the positive impact towards positive behavioral aspects and results are shown in the graph Fig 3.2 and Fig 3.3.

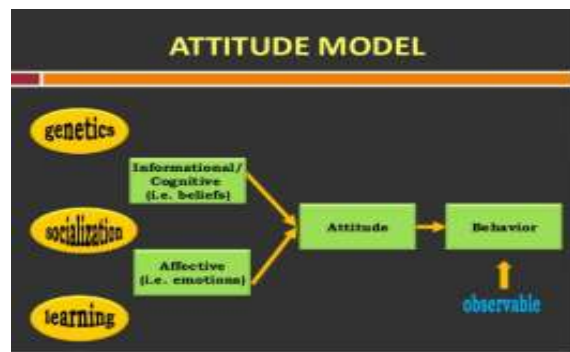


Fig. 3.1 Attitude Model

In few cases in Agile model, Fig 3.2 (group 4) where the PM predicted success percentage to be less than 100 considering the complexity of the requirements, the teams attitude/behavioral index was high to achieve success on time.

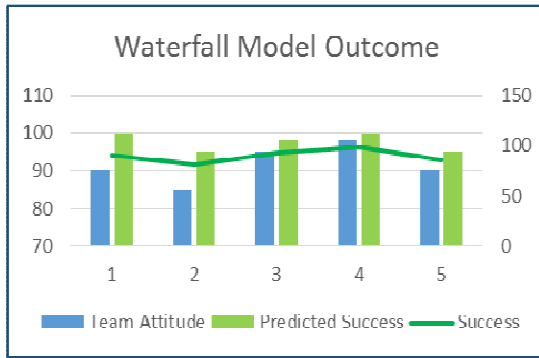


Fig 3.2 Waterfall model – predicted vs actual success

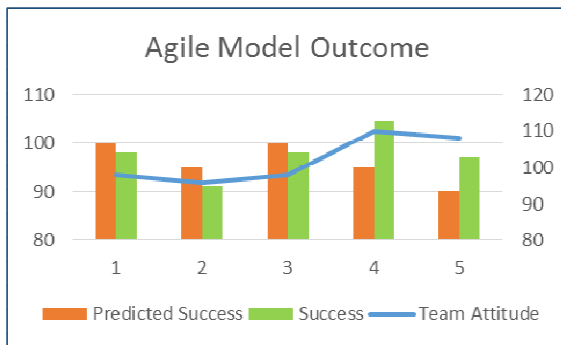


Fig 3.3 Agile model – predicted vs actual success

IV. TEAM BEHAVIOURAL METRICS

New process models (PSP, TSP) [6] evolved to improve the quality of products by considering software engineer’s into focus. These process models focus on team development and recognizes the importance of team collaborations to have successful outcome in projects.

PSP – Personal Software process, suggests methods, measures and templates towards right track of quality (in order to change the ineffective personal process). Later the lessons learnt in PSP are introduced in TSP – Team Software Process. TSP being self-directed teams to direct and plan the assigned tasks effectively. In PSP, the templates are used to measure the efficiently of self individually and improve on error reductions. Metrics are defined by individual or team based on the model chosen to track the quality and software development progress.

The Standish Group publications in 2012 [7], Fig 3.4 shows that agile has more success rate compared with waterfall model. And in 2015 published that agile models are 6 times successful and the recent findings from the Standish Group confirm the astonishing success and cost savings of agile approaches over waterfall [8].

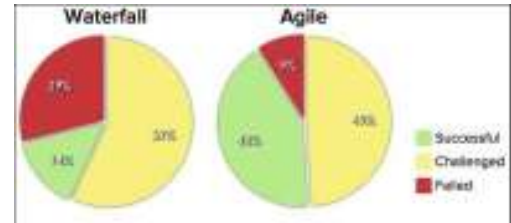


Fig 3.4 Waterfall model Vs Agile model - Success

V. CONCLUSION

From the legacy system with hieratical model where the success is less than 20% to the recent need of continuous delivery and early view of product being delivery, the trend set is to move from a closed paradigm to a synchronized paradigm. This synchronized paradigm is driven with collective team with sliced ownerships and collective outcome. The way team members looks at work plays a major role in the outcome of the project success.

Modern Software development is driven by the need of agility. This evolution is moving towards new trends in metrics and models. The basic move towards agility is driven with an approach to show early results to marketers and customers on how the look and feel is rather than the conventional models where the model will be ready for demo or testing almost after 80% of the schedule is completed. Behavioral aspect is considered as a key element to success and most of the organizations are organizing workshops and trainings to their employees to develop positive thinking indirectly a positive attitude towards their roles and responsibilities. One of the critical success factor is the team member – culture, values and behavioral competencies assessed. A predictive derived parameter using the behavioral aspect can help manager to plan for risk mitigation and contingency plan and have a positive outcome for the projects.

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