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FTR and OTIF Through Customized Adaptive Project Framework (APF) in Research & Development of New Projects

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Abstract - Research and development projects are highly unpredictable due to innovation in nature and associated and uncertain aspects. Despite careful planning, and initiating the projects with set timelines with anticipations and available resources, these will projects often face unexpected delays. To address this, the Agile Project Management approach, especially the Adaptive Project Framework (APF), is recommended. APF allows for flexibility in project management, accommodating changes in organizational needs, properties, and resources. By maximizing Experience in project management and automated tools, enhances the delivery of the projects by full-filling FTR and OTIF of TQM.

Key Words: OTIF, FTR, Agile, Adaptive Project Framework, Project Management, Research and Development

1.INTRODUCTION

Useful innovative products will always have better commercial value. It is always important to come up with innovative and cost-effective technologies to manufacture those products in order to be competitive and self-sustain. Research and Development and cost-improvement of these technologies is a continuous process. It requires and involves multiple functions and disciplines for successful development and timely execution, such as strategic team, purchase, logistics, R&D, quality analysis, development quality assurance, manufacturing, regulatory affairs, etc. This requires huge coordination, monitoring, facilitation, review, and escalation for the timely & complete delivery [1]. Project Management connects all the above departments and fulfills all the above coordination roles as shown in Fig-1.

Fig -1: Pictorial illustration of Project Management tasks

2. Body of Paper

In order to ensure the perfect timely development and delivery from multiple departments, it is highly challenging to monitor in a simple format, or through day-to-day notes. Hence, the project management team uses various tools such as Excel sheets, Gantt charts, stage gates, and milestones for monitoring. Though this approach is reasonably systematic, it is not on par with the current industry pace to generate dashboards, alerts, pop-ups, and automatic communication mechanisms of project health cards on a day-to-day basis. Hence many software companies developed products to help project management Microsoft Project Management software product, Project Managers, etc. Many well-established organizations are developing and using their customized project management software for their internal use [2] [3].

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Project manager's acts as catalysts, translating strategies into actionable plans, guiding teams, and ensuring every effort contributes meaningfully to the organization's vision. This can be only achieved by optimizing resource utilization efficiently [4] [5].

Advanced analytical tools such as automation integration and artificial intelligence (AI) are also entering project management, which will further strengthen in the near future. Certainly, these advances a play major role in navigating complications, addressing challenges, and leveraging advances in project management practices.

Significance of FTR & OTIF:

On the other hand, First Time Right (FTR) and On Time In Full (OTIF) are current industry concepts for quick and cost-effective deliveries. Research and Development should develop a technology that ensures the manufacturing of the product without any defects, this is termed as First Time Right (FTR). All the necessary technology packages should always consist of critical operation parameters (CPPs), specifications, vendor details, qualification documents, safety guidelines, and supporting documents for timely and systematic manufacturing. This is referred to as On Time In Full (OTIF) in Research and Development.

Timely development, execution, and delivery of the projects will be the goal of any research & development department of any innovation-based organization. Delay and partial delivery of any project failing to FTR & OTIF will adversely impact the organization, and lead to financial loss. Hence, to achieve the deliveries with FTR & OTIF, the Project Management (PM) function will be empowered to coordinate, monitor, facilitate, and escalate between multiple departments/functions of the organization.

Table -1: Fixed timelines as per waterfall methodology

POC			Development			Optimization			Validations		
Step-1	Step-2	Step-3	Step-1	Step-2	Step-3	Step-1	Step-2	Step-3	Step-1	Step-2	Step-3
M-1	M-2	M-3	M-2	M-3	M-4	M-3	M-4	M-5	M-6	M-7	M-8

Project Management not only improves the FTR & OTF, it also improves the operational excellence, and cost of the organization. This helps the organization to achieve the vision with great customer satisfaction [6] [7] [8].

The Adaptive Project Framework (APF) methodology, when customized for New Product Introduction (NPI), can significantly enhance First Time Right (FTR) and On-Time In-Full (OTIF) delivery metrics by incorporating principles of adaptability, stakeholder collaboration, and iterative learning. The Project Definition phase is crucial in NPI, as it sets ambitious yet feasible objectives that align with market demands [9]

Methodology

This study adopts the Adaptive Project Framework (APF), a flexible project management approach ideal for dynamic and uncertain settings typical of research and development projects. This section details how the APF has been tailored to suit our organization's unique requirements, crucial for effectively managing the complexities associated with projects in the manufacturing industry.

FTR & OTIF through Customized Adaptive Project Framework (APF):

Adaptive project framework (APF) is an agile project management methodology that helps in achieving goals in dynamic and unclear conditions. In research and development, changes are inevitable and uncertain. Hence it requires the researchers to identify the risks and prepare for the unexpected. They also need to reevaluate the results by running the models multiple times to ensure consistency. Any undesired results at this stage lead to quick modification. Such modifications can only be accommodated by following APF methodology. APF methodology can be customized by tailoring the project management process to the specific needs of the organization. This can involve identifying and prioritizing tasks, managing resources, allocating budgets, and monitoring progress towards achieving goals and objectives. In addition to focusing on FTR and OTIF, there are several other factors that need to be considered to achieve the project's objectives. Some of these factors include Risk Management, Resource Management, Communication, Quality Assurance, Project Evaluation, etc. [9-12].

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First Time Right (FTR) emphasizes the importance of getting things right the first time, reducing errors, defects, or rework in the manufacturing or production process. On Time In Full (OTIF) focuses on delivering products to customers precisely as promised, meeting both the delivery timeline and quantity requirements [6-8].

Project management stands as a foundational discipline that transcends industries and businesses, offering a structured approach to planning, executing, and delivering successful outcomes. It embodies a comprehensive framework that empowers organizations to navigate complex endeavors, manage resources judiciously, and accomplish objectives efficiently.

Table 1 depicts the timelines for the stage gates of an R&D project from initiation to completion with OTIF by covering all the required components for FTR. In every stage gate, there will be different tasks, which need to be fulfilled by various departments. The timelines of these tasks and stage gates will be mapped as a 'waterfall methodology' for proper understanding and monitoring. In this, each task will have a fixed and interdependent set of timelines.

However, if any task in a research-based project is delayed, it will hit the other tasks and entire timelines. In such circumstances, a quick alternative action plan is required. This needs to be a parallel and faster approach. This alternative approach also needs to be incorporated with modification of the project plan with the new version. For this newly added action plan, additional resources and raw materials need to be facilitated. This agile approach is called the adaptive project framework (APF) methodology [11].

Every adaptive project framework must be customized based on the industry and organization.

In the current study, 8 months fixed timelines have been set for the project to be completed from proof of concept (POC) to technology development, followed by optimization, and final validations. This project consists of three steps in every stage gate, which means step-1 product must be taken to step-2, and finally to step-3. In every step, the intermediate product must meet the desired quality and quantity to ensure cost-effectiveness without any hidden risks involved. Ultimately end-product step-3 quality and quantity should be according to the desired specifications, which is the ultimate project goal. All the stage gates will have an inter-dependent subset of milestones to achieve on time. Delay in one aspect will certainly hamper the progress/execution of the next, which ultimately ends up in delayed timelines.

When there is a delay in any aspect, such as raw-material procurement, supply, analysis, quality assurance, etc.; the approach will be changed to agile methodology. The best approach in agile project management methodology is 'adaptive project framework (APF) methodology [12-16].

In this approach, some aspects will be executed in parallel manner, instead of all linear/sequential work. Based on target timelines and the availability of materials, the sequence of activities will be modified to bridge the gaps that cover the backlogs. This modified program ensures the completion of the project by fulfilling all the aspects in a fast-track manner of the affected stage gates. This is a hybrid model, which also requires continuous monitoring, checking, reviews, modifications, and re-alignments.

Table 2: Agile Planning-Adaptive Project Framework

Original Plan	POC			Development			Optimization			Validations			
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step2		Step 3
	M-1	M-2	M-3	M-2	M-3	M-4	M-3	M-4	M-5	M-6	M-7		M-8
Modified Plan	POC			Development			Optimization			Validations			
	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2	Step 3	Step 1	Step 2		Step 3
	M-1	M-2	M-3	M-2	M-3	M-5	M-3	M-4/5	M-6/7	M-6	M-7		M-8

Case-1: In Table 2, when the development activity of step 3 got delayed due to technical challenges, it missed the stage gate timelines of step 3 development. This will certainly cascade the entire project. To do the troubleshooting activity, as part of rework on the timelines, parallel activities has been planned in optimization stage gate.

In addition to the above problem, when optimization of step 2 spilled over to the next month due to the quality attributes, it also pushed the project into critical path. The agile adaptive

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project planning ensured to plan and work in parallel to continue the project.

When there is a delay in the project's health, the further strategy can be customized in this adaptive project framework to meet the goal date of the project, considering the resources and pooling. This approach it ensured to achievement of the overall project within the goal date of the project.

3. CONCLUSIONS

First Time Right (FTR) and On time in Full (OTIF) are concepts of Total Quality Management (TQM), which are intended to ensure the delivery of complete package of the entire project without giving scope for any sort of rework.

Agile project management concept: The customized Adaptive Project Framework (APF) approach ensures the alignment of strategies and execution on time. This approach also fosters innovation, and adaptability, and enhances stakeholders' collaboration. Adaptive project framework also pays path for learning and continuous improvement of overall project planning, coordination, monitoring, and execution.

All the R&D projects are bound to have risks and uncertainties. The experience of project managers plays a major role in proactively anticipating, planning alternative approaches, and risk mitigations, and driving efficiently and promptly to achieve OTIF and FTR.

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