

# Software Project Management Methodologies/Frameworks Dynamics “A Comparative Approach”

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## Abstract

*In order to manage a project and bring it to a successful completion, its project manager must have a complete understanding of the methods being used for the management of different parts of the project. Managers prefer specific project methodology/framework, while resist and face difficulties for an opportunity to manage another project with different methodology or a framework as they don't know how much commonality exists between the preferred and the new required methodology/framework.*

*The crux of this paper is to present an understanding for managers and their organizations which can really augment their overall performance by having an understanding of different dynamics of different project management methodologies/frameworks and then use this understanding intelligently either by combining different powerful features or simply by knowing the equivalency with competitors which are using other project management methodologies/frameworks. This paper can be a good resource for the project managers having difficulty in deciding which and why a particular project management methodology/framework should be opted.*

*To parameterize the scope of this paper, five important project management methodologies/frameworks were compared with PMBOK, which is a growing and established project management methodology. Finally a conclusion with a generic project management approach has been suggested.*

## 1. Introduction

All IT projects, regardless of their size, complexity or industry, require a set of defined rules and principles to be managed effectively and come to a

successful conclusion. This area of managing projects is called project management. This idea of project management has been around for a long time. Today, project management has emerged as its own field, supported by bodies of knowledge and researches across many discipline. Although still relatively new, the field of Software Engineering has its own bodies of Knowledge that include various methodologies, frameworks, tools and techniques supported by a continuous growing base of research.

Being an iterative process, project management can be considered as a lock-step sequence of activities with the application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed project stakeholder needs and expectations.

According to the Software Engineering Institute (SEI), a methodology must possess certain attributes in order to meet the requirements of being called a methodology. A methodology provides a strategic level plan for managing and controlling IT project. It is a combination of interrelated processes which tells us "what should be done?" but not how it has to be done? That why one has to adapt any methodology to work. It can be perceived as a template for initiating, planning and developing/implementing any project.

Where as a framework can be considered as a combination of processes and technologies used to solve complex project issues. Like a skeleton, various objects are integrated for a given solution. It provides a descriptive guideline rather than a proscriptive set of rules.

## 2. Overview

### 2.1. PMBOK

The “Project Management Body of Knowledge” (PMBOK) is a combination of 9 knowledge areas and 5 process groups with 44 key process areas (KPA) within the profession of project management. It

discusses the context in which the project is managed, such as project phases and life cycle, project stakeholders, organizational influences, general management skills needed by the project manager, and the various socioeconomic influences on the project.

*It's processes split into five high level process groups and can be considered as a five step life cycle which uses a variation of the Deming Cycle for continuous improvement. These numbers of phases and KPAs can vary based on the project scope and the application domain.*

At times it can also become very complex for small projects and does not prescribe any specific lifecycle for projects rather it specifies that the project lifecycle should be divided into phases making it a difficult decision process for project managers managing small projects.

## 2.2. PRINCE2

Projects In Controlled Environments (PRINCE2), the successor of PROMPTII is a project management methodology for effective project management for all types of projects. PRINCE2 is mostly used in UK based organization and has a structure comprised of 5 phases and 8 high level processes. Out of which 6 are considered as main processes and the rest of the two have the supporting roles.

*PRINCE2 offers benefits to the organizations like eliminating the need to reinvent a management method for each new project. It delivers a standard but flexible, project management framework for the organization.*

Like other Project Management Methodologies PRINCE2 does not promise to give results in short span of time. It requires a high degree of passions and support from the apex management to get the desired results. One of the main shortcomings of PRINCE2 is that it does not cover and provide any support for the contract and people management.

## 2.3. Rational Unified Programming – RUP

The Rational Unified Process (RUP) is a software engineering process delivered through a web-enabled, searchable knowledge base that describes who does what, when, and how in a software development and deployment project. The process enhances team productivity and delivers software best practices via guidelines, templates and tool mentors for all important software lifecycle activities. *The knowledge base allows development teams to gain the full benefits of the industry-standard Unified Modeling*

*Language (UML).* It also has the characteristics of being architecture-centric, risk-driven, and iterative.

The RUP activities for a project begin right from the start of the project. A project guided by RUP, functional requirements expressed in the form of use cases drive the realization of the application's executable architecture. Simultaneously, the process focuses team effort on building the important architecture that includes behavioral and structural elements, before building the less important architectural elements. Mitigation of the most important risk elements drives the scope definition of the early iterations of its lifecycle. Finally, RUP partitions the SDLC into iterations that produce incremental versions of the executable application. [13]

Disciplines included in the RUP defines software Project management as the art of balancing competing objectives, managing risk, and overcoming constraints to successfully deliver a product that meets the stakeholders needs and are clearly related to the 06 best SE practices and categories of 06 core and 03 supporting workflows. The need for more closely representing individual roles for members within the full development team is also thoroughly stressed.

## 2.4. Agile Development Methods

Agile methods are not a single approach to software development but a family of development methods and processes. They are modern project management set of lightweight activities used to manage the development or acquisition of software.

Seven important Agile methods are gaining popularity in the software development industry and gains are being reported with increased business satisfaction from the systems developed using these methods.

Agile software development is based on common software project processes for undertaking software projects. These are based on a minimal set of activities needed to reach the end goal a working software system.

The scope of agile method goes beyond development team activities and changes the way sponsors, users and other stakeholders are engaged. *The primary focus of these agile development methods is on coding, testing, and software artifact delivery however some of these methods do address the management aspects of software projects people, processes, and technology.*

Mechanistic processes, premature decomposition

and one way task communications that contradict the volatile nature of software development are swapped for more humanistic, goal directed approaches that utilize people's ability to manage complexity. Agile methods have some common underlying values which are used as a foundation for the principles of Agile Project Management which creates the foundation for managing IT projects in an Agile manner. [13]

Most of the problems faced by majority software companies can be addressed by these Agile methods, but not all companies are ready for the radical ideas needed to become an Agile organization. *Agility is still an emerging topic and is at the stage where it is not possible to buy an off the shelf solution that has been shown to behave in the same manner as heavier weight processes.* [12] Therefore the introduction of an Agile process should only be undertaken by organizations that are risk aware if not risk adverse. Organizations who need answers and concepts that are fully developed and results in a solution that can be implemented with little risk should stay clear of the Agile Processes.

## 2.5. Microsoft Solution Framework – (MSF)

Microsoft combined number of principles, models and best established practices and named it Microsoft Solutions Framework (MSF) that helps IT project teams directly address the most common causes of project failure.

*MSF provides guidance for successful application development and infrastructure deployment projects by answering “how to” category questions.* These answers emphasize the people and process elements of the project in addition to the technology elements.

MSF provides a solution that allows development team to develop what the team considers can be beneficial for its environment.

Having the features of a framework, MSF has three core disciplines that are expressed as concepts, guidelines and best practices that can be tailored to the unique needs of each project. These three disciplines, which are expressed as models work in a complementary fashion, each targeted at a specific area of project management. With the combination of these models, they provide a compelling and powerful framework for successful IT project management.

## 2.6. Information Technology Infrastructure Library

The growing IT dependency leads to growing needs for quality IT services, that is matched to business

needs and user requirements. For the last 20 years experts involve in ITIL development have tried to introduce “Engineering” think and practices into the IT world which defines the organizational structure and skill requirements of an IT organization and a set of standard operational management procedures to allow the organization to manage an IT operation and associated IT infrastructure.

*It is the new industry buzzword, the new certification, the new conference, and the new idea that the IT world feels it needs. ITIL describes a framework of processes for the management of IT.* [7]

The IT Infrastructure Library is a set of eight books with good practice processes on how to manage IT services delivery. Part of ITIL is the constant improvement of each of the 10 ITIL processes and the inter process communication. One of the main goal of this constant improvement is to provide IT services in a more cost-effective manner and to better match those services to the present and future needs of the business.

Implementation of ITIL may not be easy or short and can be a costly effort. Because it is a framework, ITIL does not describe in great detail how any particular process should be implemented. ITIL adoption requirement must come from the very top of the IT organization otherwise the probability of success rate will be very low.

Many organizations' present technology may not be able to support the processes or interposes communication required by ITIL. This framework can only work efficiently when an organization have the right tools to support both the processes and the interposes data exchange.

## 3. Comparison

Methodologies/Frameworks discussed in the paper have commonalities in their features and ultimate goal. Where as some commonalities and differences are evident, in the areas of their main focuses, strategies, tools and procedures which they use to have a successful project. They perform tasks with the common goal but the approach is different which is based on the authors/practitioners effective proven preference and working style. They also provide a robust easy-to-follow methodology, processes, tools and techniques for running most IT related projects.

In the case of the PMBOK and PRINCE2 the documentation needs tailoring to suit the occasion. Often they are not intended to tell people how to do

any of the techniques or use any of the tools described. They only lay out the processes, how they link together and the tools and techniques that can be invoked. Somewhat similarly, the application of these methodologies and frameworks must be scaled for the size and needs of the project.

Methodologies and framework like PRINCE2, MSF and ITIL do not include and provide information related to some of the management knowledge areas and treat them as a separate project.

Software methods especially like RUP offers a comprehensive detail approach for standardizing software engineering best practices in the context of software development and deployment projects where as general project management methodologies and frameworks offer a descriptive approach for project management standardization best practices. They divide activities into structural groups and temporal groups. The PMBOK has structural groups of processes called knowledge areas and temporal groups of processes called process groups. The RUP has structural groups of activities called disciplines and temporal groups of activities called workflows. In some of the approaches deliverables are categorized as artifacts or outputs.

Methodologies and frameworks like PMBOK, Agile, MSF differ in their preferred approaches like command-and-control. Dictatorship is obvious in PMBOK approach whereas the Agile has an image of self-organizing teams.

PMBOK best practices aren't really that different from other methodologies and frameworks. In the case of methods having focus on agility, simply use few tasks more often than other, iteratively and incrementally with the attention to detail that's appropriate for the particular timeframe.

The differences in IT project characteristics have created a belief that a different set of skills are needed to address the nuances of IT projects, and that the "old" skills embodied in the methodologies like PMBOK no longer apply. While it is true that these differences create a need for new execution of project management skills, the need for the skills remains and there is also a need for some additional skills outside the domain of the PMBOK. In these areas frameworks like MSF incorporates the proven foundation of known project practices as found in the PMBOK and adds the dimensions necessary to address the differences and unique characteristics of IT projects.

All of the mentioned methodologies and frameworks stress that risk management, quality assurance and process improvement are dynamic processes where opportunities and risks can occur that must be employed throughout the entire project life

cycle. In addition, all the risks should be categorized and prioritized so that they are manageable and do not overwhelm the project team, as well as help in provision of useful and practical tools to be used to support the risk management, quality management processes.

## 4. Conclusion

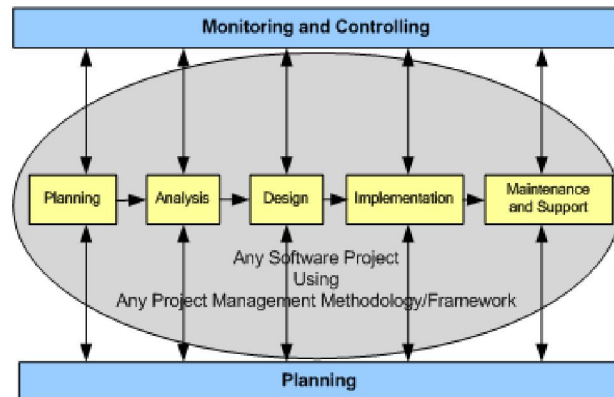
Selecting a Project Management methodology/framework can be one of the most difficult parts and can have real impact on fate of the project. Normally the *Project Managers' criterion for choosing a framework or a methodology for any software or any other projects is mainly based on an expert opinion, past working experience, government rules and regulations, organization/senior management/stake holders preferences and client location*. All of these can have positive or negative impact on the underdevelopment projects. But all of the above mentioned criterion have inbuilt quality of rigidity. None of these provide any opportunity to analyze the nature of project and then decide the future course of action related to the selection of project management methodology/framework. Decisions in which a methodology/framework is chosen or used based on a single criteria can have serious negative impacts on the project especially if the project manager/development teams don't have the knowledge or the pros and cons of the selected methodology/framework.

*No project management methodology or a framework is meant to be taken verbatim*. It must be customized in the context in which it is being applied in order to increase the rate of adoption and the opportunity for success.

It has been observed and evident from the above text, that all the methodologies/frameworks discussed have some common tools and procedure. There are points where one methodology/framework has some powerful tool and procedure than the others. In that case and in order to make the most of these established methodologies and frameworks, a combine/mix approach is required to get the best possible results.

For that reason a generic software project management model is being proposed using Figure-1. It suggests that any software related project managed by using any specific methodology/framework needs two high level areas of "Planning" and "Monitoring and Controlling". These two high level areas will be functioning at the top level during the entire project life cycle. The function of these two components starts from initiation and ends after the closure of the project. "Monitoring and Controlling" part checks the overall

performance of the project and suggests a change. “Planning” part then evaluate different tools and procedure on the basis of previously established results and efficiency of that particular tool or procedure. After evaluation the proposed tool or technique is recommended to inject in the project management/development procedure with a constant involvement of “Monitoring and Controlling”.



**Figure 1. Proposed Generic Software Project Management Model**

This model proposes a mixed approach with the advantages like choice of better project management techniques, more refined products, less dependency on a single project management methodology/framework, more trained/skilled project managers, data availability for the project improvement.

Like any other proposed model it also needs critical attention in some of areas like where it can be a time consuming exercise, need more training for people involved in “Planning” and “Monitoring and Controlling”, less effective for short term projects, prone to resistance, chances of failure (if decisions are biased).

It is also suggested that in order to integrate most of the models and develop a composite approach, the project managers need to know the similarities and dissimilarities between management methodologies/frameworks as well as nature or type of the project.

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