

CMMI, PRINCE2 AND PMBOK – THE BIG THREE

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Abstract — Project management’s PRINCE2 is a widely used methodology. It is flexible and offers set of procedures to implement and manage a project. PMBOK provides principles and tools that can be used by project managers for successful handling of projects. This paper presents a study of project management’s methodology PRINCE2, CMMI and a guide to project management PMBOK. Research was done to identify their weaknesses and issues and areas where they can complement each other were highlighted. This way they can be used in a more efficient way to fulfill the needs of any industry.

Keywords—CMMI, PRINCE2, PMBoK.

I. Introduction

Project Management is a rapidly expanding field and Project Management Methodologies (PMM) is used by various small and large organizations to implement their projects. A project that is undertaken whether it is hardware or software requires a methodology to be followed. What is a methodology? According to Charvat [1], “A methodology is a set of guidelines or principles that can be tailored and applied to a specific situation.” Organizations either use already available methodology or they implement their own. In either case, principles of methodology have to be followed. PMBOK (Project Management Body of Knowledge) provides guidelines that can be adopted to undergo a successful handling of a project.

Many of today’s projects fail because of unrealistic, too tight optimistic timescales. Time is decided prior to the project start and is not changeable afterwards. Another reason of failure is the poor communication. Lack of proper communication among the project team members and with the customers leads to the improper requirements selection and implementation. Yet another reason is the insufficient budget. Projects, often, are not provided with all the resources required to meet the requirements resulting in poor projects and their outputs. Project management when properly used result in many advantages including better use of financial, human and physical resources, improved customer relations, shorter development times, lower costs, improved productivity and more.

Different countries across the world use different project management frameworks. For example, PRINCE2 is mostly used in UK and other countries like Australia, France, Italy, Poland and South Africa [2]. CMMI is used by US, China, Germany, India, Chile, Turkey, Egypt, and Russia. According to PMI [3], “a project management is the application of knowledge, skills and techniques to execute projects effectively and efficiently. It’s a strategic competence for organizations, enabling them to tie project results to business goals – and thus, better compete in their markets.” Hence, project management not only tells what and how to the project

managers but also performs other tasks vital to a project’s success.

This paper presents their study, their strengths and weaknesses and how they can benefit each other. Literature review is presented in the next section while the following sections describe the methodologies, their issues, how they can complement each other and conclusion.

II. Literature Review

According to PMI [3], “A project is a temporary group activity designed to produce a unique product, service or a result.” It is temporary because it has a definite beginning and an end along with specified allocated resources. It is unique because it is a set of activities that are not carried out on a daily basis and by the same people. It often involves people from different backgrounds, knowledge areas or even different countries. Construction of a bridge, a relief operation after a disaster, making of new software for a business solution is all projects. The making of these projects requires management. According to [4], “a management in all organizational and business activities is the act of coordinating the efforts of people to accomplish desired goals and objectives using available resources efficiently and effectively.” This leads to the concept of project management which is related to managing a project consisting of a small team to a project consisting of expanding a business to a geographical level. According to Kerzner [5], “The growth and acceptance of project management has significantly changed over the past forty years, and these changes are expected to continue well into the twenty-first century, especially in the area of multinational project management.” So it is evident how this field is growing over the years. According to Baars [6], the six phase’s of initiation, definition, design, development, implementation and follow-up form the basis of all the methods. Dividing a project into small phases allows for easy management, division of workload among the teams and to lead a project to a right direction. Thus management plays an important role in the making and handling of a project.

The framework of CMMI is complicated and the cost required for implementation makes it impossible to be used by small and medium sized organizations. Research has been done to tailor its framework so as to make it applicable for such organizations [7]. Also, it has been studied along with PMI’s rules and ITIL (Information Technology Infrastructure Library) to make it applicable to IT industry [8]. Work has also been done to combine it with Scrum so that it can be used as a starting method by small teams and without defined processes [9] [10]. Prince2 method is comparatively flexible. According to Charvat [1], it is independent of any project type or complexity and it can be changed according to the requirements and can be applied to non-IT projects as well. It tells “how” part of the process. PMBOK, unlike CMMI and

PRINCE2, is not a methodology rather a guide that tells the project managers “what” they have to adopt to implement a project. It provides many project management activities and processes that need to be performed for success of a project [11].

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iii. The Methodologies

A. CMMI

According to SEI [12], “CMMI helps integrate traditionally separate organizational functions, set process improvement goals and priorities, provide guidance for quality processes and provides a point of reference for appraising current processes.” CMMI is a process improvement approach that allows organizations to improve their performance. It can be used for the entire organization, a project or even a division. It provides organizations with essential elements on how to improve their processes [13]. Not only it provides the process improvement approach but it can be used to measure the maturity of an organization as well. According to Charvat [1], companies want to know where they are with respect to the company’s performance and where would they like to be. CMMI has two basic representations: Staged and Continuous. In staged representation of the model there are five maturity levels defining the improvement path. It basically is for the improvement of the organization as a whole not only a process. For a particular process improvement Continuous representation is used. Continuous representation uses capability levels for process improvement in each process area while staged representation uses maturity levels to guide process improvement across the organization [7].

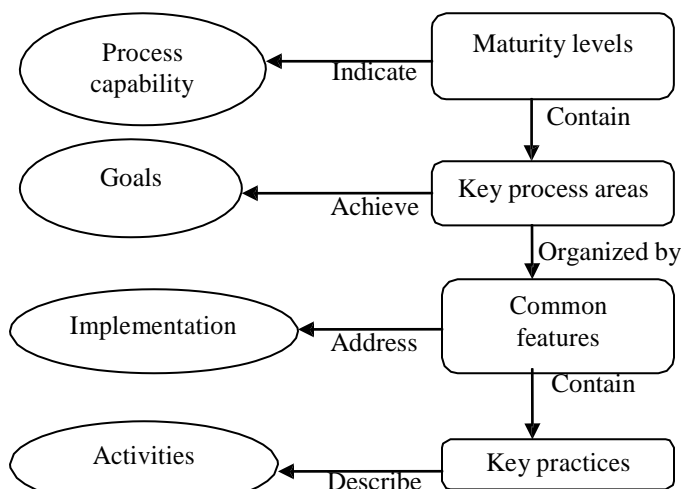


Figure1. CMMI Structure

Fig.1 describes the structure of CMMI. Each maturity level comprises of key process areas that are relevant to that level.

According to Mark *et al.* [14], these key process areas may be considered main requirements for their respective levels. To achieve a certain level, all the key process areas for that level must be satisfied. CMMI has 22 key process areas all of which are common to both the representations [15]. These process areas have their advantages and shortcomings as well. By aligning them with PRINCE2 and PMBOK processes they can be enhanced to be applicable to even larger number of organizations including medium and small sized as well.

B. PRINCE2

PRINCE2 is a process-based method for project management. It is used extensively both in public and private sectors worldwide [16]. It is described as a structured method for effective project management for all types of projects including the non-IT projects. According to Charvat [1], more and more companies are now moving towards using this approach as their standard methodology. Because of its focus on products rather than the activities it is the most widely used project management methodology. Its Product-based approach is very useful since it focuses on the product itself, helps in defining scope and refining it as the deliverable is near.

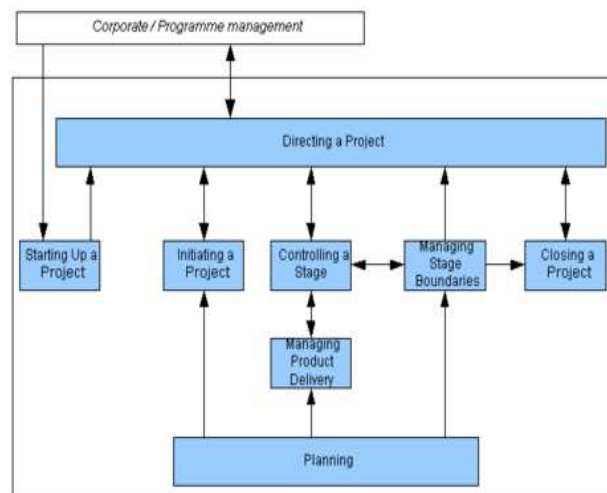


Figure2. PRINCE2 framework

Fig.2 shows framework of PRINCE2. It has total of eight processes. Out of these, directing and planning occur during the entire project.

C. PMBOK

PMBOK is a project management guide from PMI (Project Management Institute). It is used by project managers as assistance in making a project providing numerous tools, techniques, skills and knowledge applicable to a project. Project Management Body of Knowledge has nine knowledge areas and 44 processes. These areas provide industry best practices for managing products [8]. It addresses the project management without addressing the type of project or a large organization. Hence, the practices it offers can be applied to any organization. It defines more the “what” part of the project since it provides the principles and techniques that can be

followed. It is only a guideline not providing any particular methodology hence, project managers can use as many tools, skills they want for a project. PMBOK guide is short yet descriptive collection of the project management tools and techniques [17].

IV. The Big Three and Issues

In general, CMMI and PMBOK are consistent because both have initiating, planning, executing, monitoring and controlling and closing phases [11]. CMMI call these as process capabilities that are clustered in maturity levels. As shown in Fig.1, the maturity levels have key process areas which are grouped by the commonalities among them and according to support for a particular level. PMBOK describes the “what” for a project so project managers can pick the required tool, skill that they want to apply [2] [11]. These process areas are grouped according to the support for the level but they lack some basic techniques that can be used from the book of knowledge. However, to achieve a particular level, an organization has to satisfy all the process areas and their associated goals. PRINCE2 is prescriptive approach for project management complete with templates, roles and responsibilities of multiple stakeholders [17].

According to [18], there are general misconceptions about CMMI that it is very large and heavy and difficult to carry on. It encourages heavyweight processes that are for large organizations only. It is overly prescriptive asking people what they should do instead of giving suggestions what is to be done. Moreover, it doesn't encourage innovation thus staying to an idea or approach not incorporating any new approach. It states only “what” by defining its requirements leaving the “how” part to the team [11]. Of the basic life cycle phases, it focuses more on Planning and Monitoring and Control phases and is used mostly by large organizations with mostly software engineering projects.

Some of the issues raised about PRINCE2 are around its design. According to Kirit [2], it provides no explicit treatment of requirements analysis which leads to projects being adopted falsely and hence failing. The methodology identifies dependencies among the activities but not the products thus creating problems for large projects where there are many products not defining the impact of change from the concerned to the linked products. Moreover, it talks of the implementation in a product life span instead of a complete life cycle hence it is more of an implementation methodology rather than a project management method [19] and therefore, a number of organizations suffer from PINO (PRINCE In Name Only) carelessly picking the method and failing to follow it completely and its principles [2]. It also doesn't offer many needs of modern project management because of its inflexibility [20]. According to Wideman [19], it has set of documents in its series of processes making it difficult to understand. So it is also very heavy in documentation.

PMBOK is just a guide for project managers to apply knowledge, tools while doing the project. It is not a methodology rather a management guide [2] [20]. But it is complex for small projects. Moreover, it has to be adapted to

application area industry where it has to be applied. Also, it has to accommodate the underlying project's time and budget, size and scope and quality constraints [20].

v. How They Complement each other

The tables below describe how the big three can complement each other. CMMI lacks some basic details and they are provided by PMBOK as shown in TABLE I. TABLE II shows how PMBOK is complemented by CMMI.

TABLE I. CMMI complemented by PMBOK

CMMI by PMBOK	
1	More guidance and details on project charter and initiation
2	More guidance and details on planning (additional planning documents)
3	More guidance and details on management and control
4	Human resource management guidance
5	Quality assurance, risk and control
6	Details on risk and procurement management

TABLE II. PMBOK complemented by CMMI

PMBOK by CMMI	
1	Engineering best practices (requirements elicitation, verification, validation, interface management, product integration)
2	Organizational process management
3	Data management (planning and monitoring data management)
4	Decision analysis and resolution (on how to structure the design processes)

PRINCE2 is enhanced by using some basic tools and techniques from PMBOK that help in handling the projects more efficiently. PMBOK does not specify any framework and PRINCE2 provides that besides providing details on risk and quality (TABLE III.).

TABLE III. PRINCE2 and PMBOK

PRINCE2 and PMBOK	
1	Prince2 lacks tools and techniques which are provided by PMBOK
2	Prince2 is just a framework while PMBOK is a complete guide on how to use the framework
3	PMBOK also provides more guidance to Prince2 regarding project charter and initiation
4	More guidance on human resource management

5	More guidance on planning
6	Prince2 provides PMBOK with available framework for doing a project
7	Prince2 also provides additional details on risk and quality management

TABLE IV. shows how PRINCE2 can use some of the best engineering rules and practices from CMMI. PRINCE2 itself can provide CMMI with guidance on basic management principles.

TABLE IV. PRINCE2 and CMMI

PRINCE2 and CMMI	
1	CMMI provides engineering best practices on using Prince2 including verification and validation
2	It also guides on decision analysis, casual analysis, measurement and analysis, requirements management, supplier agreement management
3	More details on organizational process focus, management and training
4	Data management details
5	Prince2 provides CMMI with more guidance on monitoring and control
6	More details on planning, initiation
7	Configuration management well explained

VI. Conclusion

This paper presented a study of project management's well known methodology PRINCE2 along with CMMI and PMBOK. While Prince2 is most widely used method for doing a project, PMBOK provides skills, tools, techniques and knowledge required to carry out a project. They have their own strengths and weaknesses and can complement each other.

Further research on this topic can include combining the three to make a framework comprising of their strengths and that can be used to handle any size, type of project for any type of industry including the IT industry.

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