

Comparative Analysis of Project Management Frameworks and Proposition for Project Driven Organizations¹

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ABSTRACT

Risk and uncertainty are inherently associated with every novel developmental effort. Project Management integrates a variety of activities undertaken to successfully achieve project objectives. Various organizations across the globe have developed frameworks for guidance in these activities focused on different facet and elements in projects. In this paper based on open source literature review information about various project management frameworks is obtained, and a brief description of various frameworks for project management, their evolution, global utilization, their comparative analysis and tradeoff is presented. The mandate of Defence Research and Development Organization to indigenously develop defense technology and systems and become self-reliant is dependent on technological innovations and development which is managed using Procedures for Project Formulation and Management in DRDO (PPFM) guidelines. To attain the project objectives within time, budget and scope (QRs) constraints, over the years a systematic framework is devised. The intent of this research is to obtain best project management practices from available frameworks, assess their applicability and to enrich DRDO PPFM 2016 framework by augmenting it with the available best practices.

Keywords: Project Management, Global Project Management Frameworks, Comparative Analysis.

1. PREAMBLE

Technology development efforts are best managed by implementing project management strategies. The utilization of these strategies facilitates mitigation of risks and uncertainty associated with developmental efforts of a novel product or process. All projects are unique endeavors, and one size does *not* fit all ^[1]. A diamond shaped framework presented by *Shenhar & Dvir*[2] assists in demarcating projects based on 4 dimensions namely, Novelty addressing the uncertainty of goals, Technology describing the level of technological capability required,

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Complexity referring to system engineering approach of product complexity and Pace taking time as dimension stating urgency of project.

To attain project objectives within time and budget constraints, the framework encompassing project activities must adjust with the environment, the task, and the goal, rather than stick to one set of rules. Projects have existed, and have been managed, since medieval period; however project management, in its modern form, its language, tools, techniques and concepts, first appeared in the early 1960s. IPMA (formerly known as INTERNET) traces its history back to 1964^[3], and rests at present with development of GAPPS (Global Alliance for Project Performance Standard) in 2012. Applicability of various frameworks in varying degrees to meet the need projects is dependent on quality standards; customer satisfaction and benefit realization and hence no individual framework includes entire spectrum of knowledge required to successfully terminate a project. Various industries, global regions have their own preferences in choice of framework.

Defence Research & Development Organization (DRDO) Govt. of India has also developed its restricted framework called PPFM (Procedures for Project Formulation and Management) ^[4] which encompasses the timeframe from pre-project activity to the post-induction life cycle support. The general tenets of project management were brought out in PPFM 2006 and were updated in PPFM 2014 & 2016. PPFM 2016 has brought out a common and standardized management framework for planning, sanctioning, reviews and accomplishing projects for seven different technology clusters of DRDO ^[4]. DRDO being an organization undertaking projects across spectrum of readiness levels from ab-initio research to proven system for induction into service can provide a roadmap to undertake projects in Indian context, using a structured framework.

A framework by definition is a basic structure underlying a system, or concept. Various Project Management frameworks intend to increase the project success rate by putting emphasis on different prospective. The frameworks are classified into ^[5]:

- Standards - A standard is a document established by an authority, custom, or general consent as a model.
- Methodology - A methodology is a system of practices, techniques, procedures, used by those who work in a discipline.
- Guides - A Guide is a foundation upon which organizations can build methodologies, policies, procedures, rules, tools and techniques, and life cycle phases needed to practice a discipline (project management)
- Manuals - A manual is a book giving instructions or information to be adhered to.

2. DEVELOPMENT OF PROJECT MANAGEMENT FRAMEWORKS

The Project Management discipline that emerged in the 1960s majorly in Aerospace and Defence industry was largely technical, integrating project management, systems and engineering management. In United States, Project Management Institute (PMI) was founded in 1969 and has evolved over years to publish 6th edition of Project Management Body of Knowledge (PMBOK) Guide in 2017, with other baseline of charts and glossaries for the PMBOK.

Trans- Atlantic in Europe INTERNET (**INTER**national **NET**work) was formed which later evolved to IPMA in 1965, oldest Project Management Association ^[6], along with some private industries like Simpart Systems who developed PROMPT (Project Resource Organization Management Planning Technique) in 1975. Today IPMA includes around 70 members associations in Europe, Egypt, India and China with combined worldwide members of more than 20,000 [6]. The Association for Project Management (APM) was founded in 1972 and was originally known as the United Kingdom Branch of the IPMA. In 1975, APM was formulated as independent body.

Project management was introduced in Japan first into the engineering and construction industry in 1960's for utilizing American process-based technologies to cater to the Japanese industry to attain post-World War II recovery. As the production technology was from the US, project management was imported in parallel. Japan witnessed full-scale research on project management in the latter half of the 1990s.

3. PRESENT DEVELOPMENTS IN PROJECT MANAGEMENT FRAMEWORKS

3.1. Project Management Body of Knowledge (PMBOK) ^[7]

PMI developed and published A Guide to the Project Management Body of Knowledge (PMBOK® Guide). This guide is based on The Standard for Project Management. The exhaustive subject of project management by PMBOK is divided into two major cross-linked tiers as

1. Project Management Framework
 - a) Project Management Context
 - b) Project Management Process

2. Project Management Knowledge Areas

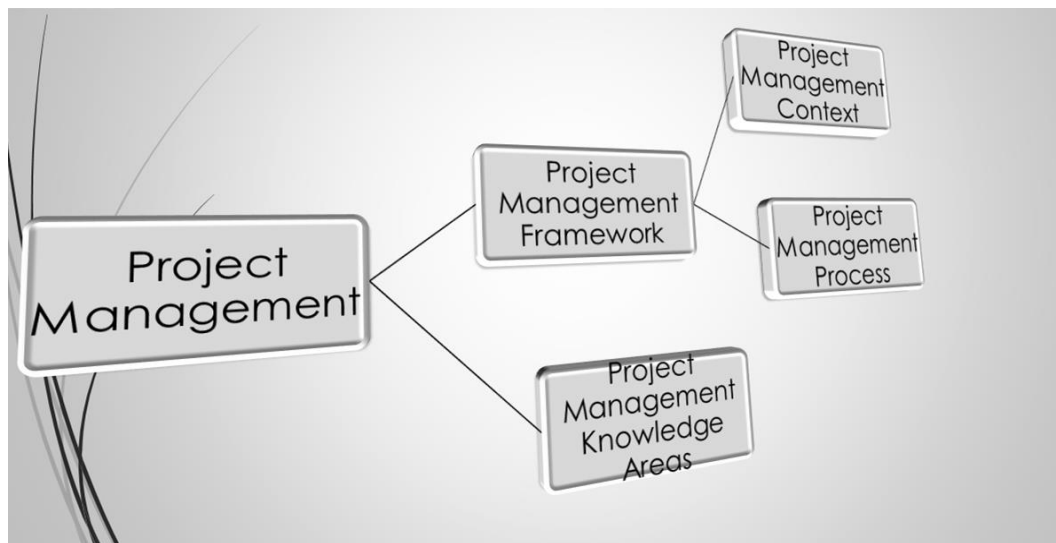


Figure 1 PMBOK Project Management Scope [7]

The context deals with the operating environment in which projects operate both within and outside organizational sphere of influence including organizational structure and influences socio-economic factors etc. The management process encompasses the 5 key activities of project spread across project life cycle, i.e., Initiating, Planning, Executing, Monitoring and controlling and Termination of project. The 10 Knowledge areas enveloping 47 activities provide the necessary set of tools and techniques and competences required to undertake project successfully.

The PMBOK Guide-Sixth Edition also presents 132 individual tools and techniques, grouped into data gathering, data analysis, data representation, decision making and interpersonal heads with some ungrouped techniques.

3.2. PRINCE 2 [8]

PRINCE2, PRojects IN Controlled Environments, was created in 1989 by CCTA (the Central Computer and Telecommunications Agency), since then called by OGC (the Office of Government Commerce). It is a project management methodology based on PROMPT, a project management method created by Simpart Systems Ltd in 1975 and adopted by CCTA in 1979 as standard to be used by all Government projects.

A PRINCE 2 project is driven by the project's business case, which describes the organization's justification, commitment and rationale for the deliverables or outcome. The business case is regularly reviewed during the project to ensure the business objectives, which often change during the lifecycle of the project, are still being met. The role of project manager is of a facilitator for Project Board.

The PRINCE 2 method consists of 4 main parts and PRINCE2 has chosen the word Elements (also called Integrated Elements) to represent these 4 parts. These elements are Principles, Themes, Processes and Tailoring.

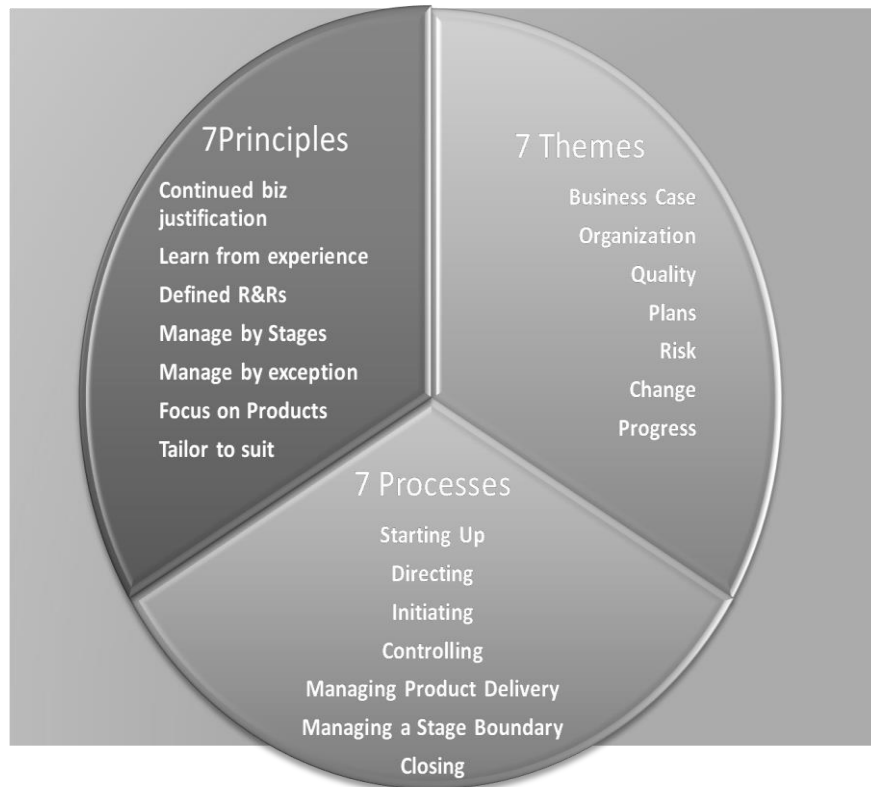


Figure 2 Elements of PRINCE 2 [8]

- Principles: PRINCE2 says that each project should consist of the 7 PRINCE2 principles (in other words, “best practices”). Presence of all principles is essential for project to be governed by PRINCE 2.
- Themes: Themes answer the question regarding what items must be continually addressed during each project, e.g., Business Case, Organization, Quality and Configuration Management.
- Processes: Processes answer the question regarding what activities are done during the project and by whom.
- Tailoring: Tailoring answers one of the most common questions from a Project Manager, “How do I best apply PRINCE2 to my project or my environment?”

3.3. APMBOK [9]

APMBOK covers its wider spectrum of topics with lower level of detail, assuming that detailed descriptions and methods can be found elsewhere. APM BoK defines Projects as unique, transient endeavors undertaken to achieve a desired outcome. Project Management according to APMBok is the process by which projects are defined, planned, monitored, controlled and

delivered such that agreed benefits are realized. Projects are change drivers and project management is recognized as the most efficient way of managing such changes. APM BoK defines 52 areas of knowledge in project management and the endeavor is convey knowledge required for managing the projects, rather than the process and practices of project management.

3.4. International Project Management Association (IPMA) International Competence Baseline (ICB) ^[10]

IPMA is a federation of independently established organizations based in different countries and the oldest non-profit project management association. IPMA introduced ICB version 3, guide in 2006. ICB is the second most widely accepted standard, lists 46 competences that are used by a Project Manager (PM) in a project. The IPMA Competence Baseline (ICB) offers access to the technical, behavioral and contextual competence elements of project management. The eye of competence symbol for the ICB, represents eye of project managers and other team players represents integrated elements of project management as visualized by the project managers while evaluating a specific situation. The eye represents clarity and vision. The ICB enlists forty-six competence elements, complemented by the key relations between them and described in three ranges grouping 20 technical, 15 behavioral and 11 contextual competences.

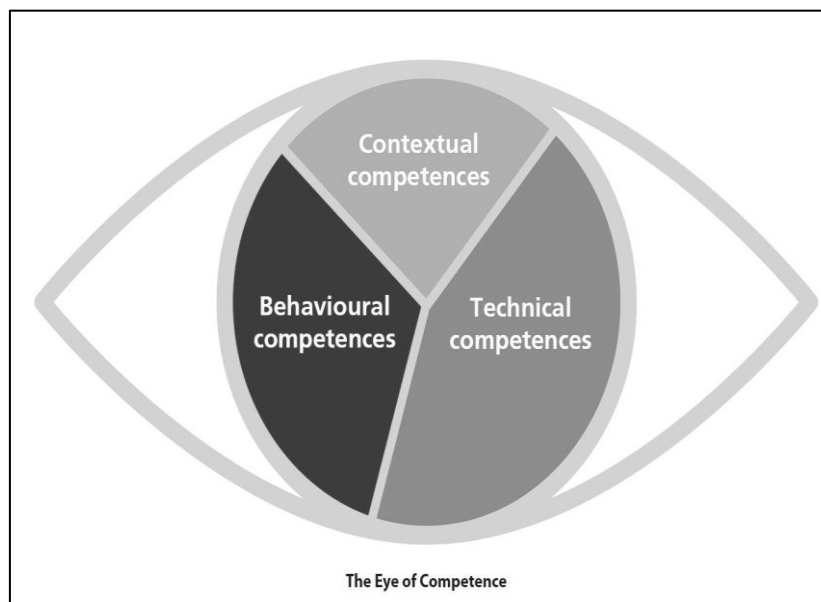


Figure 3 Eye of Competence [10]



Figure 4. Iris of Eye of Competence enlisting Competences [10]

3.5. Project Planning and Project Management (P2M), volume I, II, Booklet, 2003, Association of Japan (PMAJ) [11]

The non-profit organization PMAJ was created with the collaborative efforts of the Japan Project Management Forum (JPMF) and the Project Management Professionals Certification Centre for Japan’s unique economy. It publishes *Guidebook of Project & Program Management of Enterprise Innovation (P2M)* with objective to facilitate innovation in Japan’s industrial community. P2M aims at building the competency of project professionals to undertake multi-disciplinary and challenging assignments. P2M puts higher emphasis on the society and the environment that affects projects and programs, especially the ones with long durations.

3.6. ISO 21500:2012 Guidance on Project Management [12]

ISO 21500 is the first in a planned family of project management standards [11]. The development is an integrated framework of knowledge from reputable representatives in the project management profession from all over the world, like PMI and IPMA and provides generic guidance on concepts and project management processes. ISO 21500 describes an approach towards project management, which is applicable to most projects, most of the time. There are five process groups defined as Initiating; Planning; Implementing; Controlling and Closing with their basis on Deming’s PDCA cycle scoping to 39 processes spanning over 10 subject groups.

ISO 21500 mentions both competence of project personnel categorized into three areas as Technical competences (20), Behavioural competences (15), and Contextual competences (11).

3.7. GAPPS ^[13]

Global Alliance for Project Performance Standards (GAPPS) provides an independent benchmark and a basis for transportability and mutual recognition of project management standards and qualifications. In October 1995, 29 countries were represented at a Global Project Management Forum with aim to assess the possibility of achieving globally recognised project management standards and certification. The standard was formally released in March 2006 following formation of a GAPPS entity for holding the IP rights and to ensure free distribution of the standard. This voluntary initiative provides a platform for global collaboration in advancing project management. Global Alliance for Project Performance Standards (GAPPS), researches the coverage of existing project management standards and using recognized standards, development and review processes, produces performance-based standards.

3.8. PPFM 2016 ^[4]

To cater the vast spectrum of projects being undertaken, DRDO brought out structured guidelines on procedures to be adopted for Project Formulation and Management in 2006 with the objective of creating a Body of Knowledge (BoK) within the organization in area of project formulation and management. Subsequent updating and revisions were carried out and PPFM 2016 guidelines are presently utilized.

The manual covers the complete life cycle of the product development from selection to transfer of technology to production partner. Although the processes undertaken in PPFM match with that of processes of PRINCE 2, but absence of principle of business justification from PPFM 2016, makes it a novel framework when compared to PRINCE 2.

The manual by nature is the framework dealing with:

- I. Project selection and pre-project groundwork which includes Concept design, readiness analysis and review, Cost estimation, Procurement plan and Risk management plan.
- II. Project sanction process which covers Examination of proposal, Submission and routing with timelines and project sanction.
- III. Project execution which covers Preparation of project execution plan, Review mechanisms and Guidelines on design, manufacturing, testing.
- IV. Project Closure including Probable Date of Completion /Cost extension, Administrative and technical closure and Way forward

The annual selection of projects at the lab level is based on a comparative analysis on a figure of merit based on selective attributes such as alignment with Lab vision/mission/objective, core competence of Lab, alignment with LTIPP/LTTPP, S&T merit/potential for Transfer of Technology (ToT) or production, and need for additional HR followed by two step sanction based on detailed feasibility report, preliminary design analysis and cost benefit analysis and

self-assessment tool of technology readiness called PEARL. Following the Phase Gate model endorsed by NASA, prior to forwarding the case for project sanction Preliminary Design Reviews are performed include system requirement review as well as review of the concept design of the project followed by sanction from Competent Financial Authority. Once the sanction is obtained Project execution is carried out as per the approved project management plan and periodic reviews are performed in accordance with Phase reviews method at PMRC & EB meetings. Once the prototype is built and test bed testing is performed, testing and user validation to evaluate coherence between performance and requirements and in service suitability is done. This is followed by closure of projects and transfer of technology to the production agency.

4. COMPARATIVE ANALYSIS

The comparative analysis is performed amongst:

1. Project Management Body of Knowledge (PMBOK) 6th Edition and related articles.
2. Projects IN Controlled Environments (PRINCE2), Office of Government Commerce (OGC) and related articles.
3. Association for Project Management (APM) Body of Knowledge (BOK), 5th edition, UK Professional Body for Project Professionals.
4. International Project Management Association (IPMA) International Competence Baseline (ICB) version 3.0 and related articles.
5. Project Planning and Project Management (P2M), volume I, II, Booklet, 2003, Association of Japan (PMAJ).
6. ISO 21500
7. PPFM 2016 DRDO

A comparative table of the frameworks with emphasis on various aspects as highlighted is given below ^[14, 15]. Various facets are colour coded and grouped as: Yellow – Technical, Green – Contextual and Pink- Behavioural.

Emphasis On:	PMBOK	ICB	PRINCE2	P2M	APM	ISO 21500
Frameworks Type	Guide & Standard Both	Guide	Methodology	Guide	Guide	Standard
Project Life Cycle	*		*	*		*
Process Management and Execution	*			*	*	*
Customer Collaboration					*	*
Technology Management					*	
Project Tools and Techniques	*					
Innovation and Value Engineering		*		*	*	
Post Project evaluation	*			*	*	*
Early Risk Identification	*		*			*
Failure Criteria						
SWOT Analysis	*					
Project Handover Document	*					
Program & Portfolio		*		*	*	
Product Management			*			
Society and Environment		*		*	*	*
Marketing and Sales		*			*	*
Health, Safety and Legal aspects		*		*	*	
Business Case			*		*	
Transparency in communications	*					*
Competence of Project Manager	*	*			*	*
High Performance Teams						*
Leadership	*	*			*	*

Table 1 Comparison of Project Management Frameworks

Emphasis On:	PMBOK	ICB	PRINCE2	P2M	APM	ISO 21500	PPFM 2016
Frameworks Type	Guide & Standard Both	Guide	Methodology	Guide	Guide	Standard	Manual
Project Life Cycle	*		*	*		*	*
Process Management and Execution	*			*	*	*	*
Customer Collaboration					*	*	*
Technology Management					*		
Project Tools and Techniques	*						
Innovation and Value Engineering		*		*	*		
Post Project evaluation	*			*	*	*	
Early Risk Identification	*		*			*	
Failure Criteria							
SWOT Analysis	*						
Pre mature Closure							*
Project Handover Document	*						*
Program & Portfolio		*		*	*		
Product Management			*				
Society and Environment		*		*	*	*	
Marketing and Sales		*			*	*	
Health, Safety and Legal aspects		*		*	*		
Business Case			*		*		
Transparency in communications	*					*	
Competence of Project Manager	*	*			*	*	
High Performance Teams						*	
Leadership	*	*			*	*	

Table 2 Comparison of Project Management Frameworks with DRDO PPFM

Analysis of Comparative Tables

Project implementation is a very complicated task, and effective project management skills are essential to ensure the success of the project. There exists unity among various frameworks and all intend to increase the project success rate by emphasizing different contexts. PMBOK deals with individual projects and majorly focused on its execution with 132 tools and techniques for 47 project activities but neglects contextual facets completely and assumes projects to be mutually exclusive. ICB guide excludes technical facets completely and focuses on competence of teams and contextual influences. The philosophy of PRINCE 2 methodology is focused on its 7 principles across project life cycle but disregards technical aspects of framework required. Japanese P2M philosophy and APM are more generalised in application. ISO 21500 informative organizational standard, maps to PMBOK and ICB frameworks and is of hybrid nature covering better artefacts of both.

DRDO PPFM 2016, a manual by nature deals with giving working standards to DRDO labs, however excludes critical success factors along project life cycle, leaving it on best human

judgement and skill of Project managers/ directors. No description of tools /techniques that can be utilised is mentioned, disregard of innovation, failure and descriptive success criteria and competence of project teams and leader and quality of project management makes projects vulnerable to time and cost overrun.

5. LEARNING FOR PROJECT DRIVEN ORGANIZATIONS

The strategies and methodologies of various frameworks are practiced and have proven to be effective and successful. The present scenario is creating Hybrid and Adaptive Project Management frameworks which can cater unique novelty and complexity of projects.

A hybrid model of all frameworks includes:

- Industry specific tools / techniques for project activities also catering the affect of individual projects on various programmes and portfolio of organization is recommended. The list of tools and techniques provide in PMBOK Standard can be utilized for reference purpose.
- The competence of the human resource plays a significant role is successfully achieving project objectives and therefore competence baselines in accordance to ICB can be devised taking into account the unique challenges and cultural diversity of organization.
- Aspects of technology management and the critical factors of success as adopted by most successful companies in world in their project execution shall be encompassed.
- The Continued business justification theme as stated in PRINCE 2 framework shall be benchmark for all projects.
- Effective decision making by utilization of Artificial Intelligence based algorithms during multi criteria decision making activities.
- Addressing various aspects of emotional intelligence to problems associated with a constellation of people with various cultural diversities working together.
- Utilization of technologies like Internet of Things (IoT) for accelerating information sharing, monitoring and controlling.

Since international organizations have now published standards for Project Management, coherent development and reformation of PPFM to complement them is required based on unique organizational aspects. Owing to the diversity of the projects undertaken by the DRDO, a revised, updated and adaptive framework can be used by various labs engaged in purpose of technology development for national interests and hence providing a National Project Management Body of Knowledge and roadmap for projects.

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