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Project Quality Management Approaches: A Comparative Evaluation of International Standards

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Abstract. Every project is usually surrounded by various stakeholders. Each stakeholder has requirements from the project and its product(s). The totality of these requirements is called quality requirements and the extent to which a project and its product(s) satisfy it is called quality level or fitness for purpose. Project management standards have been nationally and internationally developed to describe best practices in project quality management, prescribe methodologies to perform quality management in projects, and assess project quality management competence of an organisation or an individual. A thorough study of the most recent version of the standards has been carried out. This paper reports this study and compares the standards in terms of their target, focus, and structure. The findings show that most standards are descriptive in target and focus on a single project. Also their structure is subject-oriented rather than process- or a life-cycle-oriented.

Keywords: Project quality management, project management standards, comparative evaluation.

1. Introduction

Launching numerous construction projects per year characterise developing countries. These projects typically involve considerable investments, stake human lives, and are surrounded by various stakeholders i.e. owner, contractor(s), supplier(s), legislative bodies, environmental regulating offices, and affected neighbouring communities. Every stakeholder imposes its requirements in terms of total cost, timely delivery, technical specifications, safety and reliability (guarantee of maintenance) of the project's products. The totality of these requirements is called quality requirements and the extent to which project management and project products satisfy it is called quality level or fitness for purpose. A construction enterprise willing to survive competition should work out quality requirements early during pre-project phases (product development), manage uncertainties (risks and opportunities), reward quality-mindedness and punish irresponsibility. All these together with socio-economic conditions in developing countries motivate an effort to develop theories to push quality of construction projects through in these countries. A first step, which is the subject of this paper, is to investigate international project management standards and their approach to project quality management.

International project management standards describe best practices in project quality management, prescribe methodologies to perform quality management in projects, or provide a basis to assess project quality management competence of an organisation or an individual. This paper presents a comparative evaluation of the approach of several most widely adopted project management standards to project quality management, more specifically their target, focus and structure.

2. Project Management Standards and their approach to quality

A short description of project management standards and their general background, purpose, focus, and applicability are presented here. General approach of each standard to quality is discussed as well. A summary of the standards are shown in Table 1.

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Table 1 - General properties of project management standards

Title	Publisher	Last edition no.	Last edition year	Country
A Guide to the Project Management Body of Knowledge	PMI	4th	2008	USA
Construction Extension to the PMBOK Guide	PMI	2nd	2007	USA
Project Management Body of Knowledge	APM	5th	2006	UK
ISO 10006:2003	ISO	2nd	2003	Switzerland
AIPM Professional Competency Standards for Project Management	AIPM	1.0	2008	Australia
A Guidebook of Project & Programme Management for Enterprise Innovation	PMAJ	3rd	2005	Japan
Managing Successful Projects with PRINCE2	OGC	5th	2009	UK
IPMA Competence Baseline	IPMA	3.0	2006	Switzerland, Holland

2.1 PMI's PMBOK [1] and the Construction Extension [2]

US-based Project Management Institute (PMI) started in 1980s to collect, refine, organise, and publish those project management practices which were deemed to be mostly accepted as good. The result has been a comprehensive yet descriptive reference document baptised as Project Management Body Of Knowledge (PMBOK). This standard focuses on managing a single project and not only provides a common nomenclature for project management profession but also is a basis for project management certification.

PMBOK's 4th and latest edition appeared in 2008 enumerates 42 project management processes and places them in five process groups and nine knowledge areas. Process groups are initiating, planning, executing, monitoring and controlling, and closing. Knowledge areas are project integration, scope, time, cost, quality, human resources, communications, risk, and procurement management.

Construction Extension to PMBOK lastly published in 2007 incorporates four extra knowledge areas due to unique aspects of construction projects. They are project safety, environmental, financial, and claim management knowledge areas.

PMBOK takes the ISO definition of quality: the degree to which a set of inherent characteristics fulfil requirements. Requirements of a project are determined by its stakeholders. In case of construction projects they are typically owner, contractor(s), supplier(s), legislative bodies, environmental regulating offices, and neighbouring communities. They take part in conducting the project and delivering its products, influence its performance or products, or are somehow affected by them. Similar to modern quality management, PMBOK recognises the importance of customer satisfaction, precedence of prevention over inspection, continuous improvement and management responsibility to provide resources necessary to succeed. Fulfilling stakeholders' requirements, or in other words project quality management is one of PMBOK's nine project management knowledge areas. It consists of three processes (as stated in verb-noun constructs): Plan Quality, Perform Quality Assurance, and Perform Quality Control. They fall under planning, executing, and monitoring and controlling process groups, respectively (Table 2).

Table 2 - Project quality management represented by PMBOK

PMBOK knowledge areas	Process Groups				
	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Project Quality Management	-	Plan Quality	Perform Quality Assurance	Perform Quality Control	-

Plan Quality process identifies requirements and documents how the project is to demonstrate compliance. Quality Assurance audits quality requirements and quality measurement results to ensure appropriate quality standards are used. Perform Quality Control process monitors and records the results of quality activities to assess performance and recommend necessary changes.

PMBOK explains in details the inputs to project quality management processes, their tools and techniques, and their outputs. Furthermore, it shows how project quality management processes interrelate with processes in other knowledge areas and process groups. The focus of this document, however, is on quality management of a single project in its lifecycle from initiation to closing. Therefore the document should be in practice supplemented by other concepts and tools which cover the following:

Pre-project considerations

Before a project is ever kicked off steps should be taken to ensure quality of its management and products. Product development, for instance, practiced in well-established construction companies in developed

countries enables them to conceptualise high quality products which are later during the project taken off-the-shelf as modules just in time. Project quality management procedures can also be prepared before initiating a project.

Another pre-project consideration is to provide justification for conducting the project in terms of financial benefit. Comprehensive feasibility study must be carried on and ways to reduce waste and maximise efficiency should be worked out to prevent money burning during the executing phase of the project.

Programme and portfolio management

Organisational structures available for project-based enterprises from pure functional to matrix organisations to fully project-oriented structures are summarised in PMBOK. Definitions for programme and portfolio are provided there as well. Nevertheless, strategic and organisational aspects of a project-based enterprise and how to manage programme as a group of related projects managed in coordination and portfolio as a collection of strategically related projects and programmes are not covered in the document.

PMI, however, has published Organisational Project Management Maturity Model (OPM3) to assess the maturity of project management practice in an organisation and other documents for programme and portfolio management.

Personal characteristics of a competent project manager

Project success, after all, is the result of project team efforts directed by a project manager. He or she should possess professional knowledge, general management skills, and certain behavioural characteristics. In a project-based enterprise there should be a concrete job description for a project manager as well as competence conditions for such a position. Since PMBOK does not focus on this aspect of project management it should be supplemented by other standards.

2.2 APM's PM BoK [3]

The approach of the UK-based Association for Project Management (APM) to publish its latest (5th) edition of Project Management Body of Knowledge (PM BoK) is fairly similar to that of PMI. The resulting document, which is much more concise, collects 52 project management topics under seven headers (Table 3). Project quality management falls in "planning the strategy" category.

Table 3 - Project management topics represented by APM's PM BoK

APM's PM BoK sections	Summary of topics covered be the respective section
Project management in context	General topics, e.g. project, programme, portfolio management, etc.
Planning the strategy	Overall framework for managing the project effectively and efficiently, e.g. stakeholder, value, risk, quality, health, safety, and environmental management, etc.
Executing the strategy	A broad view of what is meant by control, e.g. scope management, scheduling, resource, budgeting and cost, information management, change control, etc.
Techniques	e.g. development, requirements management, estimating, technology management, value engineering, modelling and testing, etc.
Business and commercial	Business case, marketing and sales, project financing and funding, procurement, and legal awareness.
Organisation and governance	Structural aspects of the way the organisation is configured as well as steps in a project lifecycle, e.g. organisation structure and roles, methods and procedures, concept, definition, implementation, hand-over and close out, etc.
People and the profession	Communications and soft skills in managing people, e.g. teamwork, leadership, conflict management, ethics, etc.

PM BoK is a descriptive collection of broadly yet briefly defined concepts related to project management ranging from organisational and strategic aspects, the project management tools and techniques, to the behavioural capabilities of a project manager.

The approach of this document to quality and its management is similar to that of PMBOK just as the whole document is similarly a project management body of knowledge. Project quality management in APM's document is the discipline applied to ensure that product(s) of a project as well as the process of delivering them meet stakeholders' requirements. Quality management covers quality planning, quality control, and quality assurance.

2.3 ISO 10006:2003 [4]

International Organisation for Standardisation (ISO), the world's largest developer of international standards, has its HQs in Geneva, Switzerland. ISO 10006:2003 is devoted to guidelines for quality management in projects and follows the general writing style of ISO documents but is heavily influenced by PMI's PMBOK.

ISO 10006:2003 has the general quality management system principles of 9000 series, for instance customer focus, management responsibility, involvement of people, process and system approach to quality management, and continuous improvement. As it is seen in Table 4 the project management processes fall in two broad categories: a) resource (including personnel) management, and b) product realisation processes. The latter basically consists of the same elements as those of PMBOK's knowledge areas (Table 4).

Table 4 - ISO 10006:2003 representation of project management processes (equivalent in PMI's PMBOK)

Resource management processes	Resource-related processes (Project Time Management)
	Personnel-related processes (Project Human Resource Management)
Product realisation processes	Interdependency-related (Project Integration Management)
	Scope-related (Project Scope Management)
	Time-related (Project Time Management)
	Cost-related (Project Cost Management)
	Communication-related (Project Communications Management)
	Risk-related (Project Risk Management)
	Purchasing-related (Project Procurement Management)

2.4 AIPM's Competency Standards for Project Management [5]

Australian Institute of Project Management (AIPM) is the equivalent of PMI and APM in Australia. Its Competency Standards for Project Management is in fact the content of PMI's PMBOK organised such that it suits a certification procedure for project management professionals.

The Australian publication of AIPM takes knowledge areas of PMBOK and calls them units of competence. It then builds on this basis an assessment and certification procedure for project management professionals in three levels: project practitioner, project manager, and project director. Units of competence for each level are divided into elements and for each element several performance criteria are introduced. Specific areas where elements are applied and necessary knowledge background of the assessed project professional are explained. Evidence of performance in the unit of competence comes at the end.

2.5 PMAJ's Guidebook of Project & Programme Management for Enterprise Innovation [6]

Project Management Association of Japan (PMAJ) published its latest edition of project management standard in two detailed volumes in 2005. This is a descriptive reference and a basis for accreditation of project management professionals. Quality management falls under "Project Objectives Management".

The Japanese publication is again in form of a descriptive project management body of knowledge. It puts quality management together with topics such as project time and cost management under the broader topic of project objectives management in its "tower" representation of project management. Quality in this document is the degree to which materialistic, sensual, humane, safety, timely and functional requirements are met not only by the final product(s) but also by the way it (they) is (are) delivered.

2.6 OGC's PRINCE2 [7]

Office of Government Commerce (OGC) is a British HM Treasury office promoting efficient spending by the government. Latest edition of its project management method called Projects IN Controlled Environment 2 (PRINCE2) appeared in 2009. Quite different from other standards briefed so far, PRINCE2 is a project management methodology rather than a pure collection of relevant knowledge. After explaining the principles based on which a project should be managed, it introduces seven aspects of PM that must be addressed continually and in parallel throughout the project. One of these so-called themes is quality. The processes come finally which describe a step-wise progression through the project lifecycle, from getting started to project closure.

According to this document, before a project can be called PRINCE2-compatible, several principles must be in place. A project must show continued business justification. Lessons learnt from the project should be documented and lessons learned from previous projects should be implemented where applicable. Roles and

responsibilities should be clearly defined. A project must be planned, delegated, monitored and controlled stage-by-stage. Defining distinct responsibilities of directing, managing and delivering a project and definition of tolerances for each project objective to establish limits of delegated authority are another PRINCE2 principle. Last but not least, a project should focus on definition and delivery of products, in particular their quality requirements.

Quality is defined in PRINCE2 as the totality of features and inherent or assigned characteristics of a product that meets expectations or satisfies stated needs, requirements or specifications. The set of coordinated activities to direct and manage an organisation with regard to quality is quality management and should be comprised of quality planning, control, and assurance.

Other themes presented by PRINCE2 are business case (answers why a project should ever start or be continued), organisation (answers who directs, manages and delivers a project), plans (answers how, how much, and when), risk (answers what if), change (answers what the impact is), and progress (answers where we are now and where we are going).

PRINCE2 divides a project lifecycle into four major phases: pre-project, initiation stage, subsequent delivery stages, and final delivery stage. In pre-project phase, process of "Starting Up a Project" is conducted which basically verifies whether the project is viable and worthwhile. Initiation stage starts with process of "Initiating a Project". It provides detailed planning, project managements strategies and controls, and means of reviewing benefits. Near the end of each stage, a detailed plan of next stage is prepared by the process of "Managing a Stage Boundary". In subsequent delivery stages, processes of "Controlling a Stage", "Managing Product Delivery" and "Managing a Stage Boundary" are conducted. In final delivery stage the process of "Closing a Project" is performed.

2.7 IPMA's ICB [8]

International Project Management Association (IPMA) is an international non-profit organisation with an aim to promote project management internationally through its worldwide representative organisations. It is Swiss registered but has its secretariat in Holland. International Competence Baseline (ICB) edition 3.0 appeared in 2006 is mainly a basis to assess the competence of project managers in three categories: technical, behavioural, and contextual. ICB defines competence as the demonstrated ability to apply knowledge and/or skills, and, where relevant, demonstrated personal attributes.

Technical competence elements including quality are comparable to PMBOK's knowledge areas. They are needed to initiate and start, to manage the execution of, and to close a project. Quality together with time, cost, resources and many more falls in this group. Again here quality is the degree to which a set of inherent characteristics fulfils the project requirements and its management is carried out mainly through quality planning, control and assurance. Behavioural competence elements focus on personal capabilities of project managers e.g. efficiency, creativity, openness, etc. Contextual competence elements deal with organisational aspects such as financial, legal, and portfolio management.

3. Comparative evaluation of the standards and their approach to quality

Comparison criteria and its results are explained in this section and a summary is represented in Table 5. Three main comparison directions are target, focus, and structure of documents. Main target of a document can either be to provide a descriptive project management body of knowledge, to form a base for accreditation, or to present a project management methodology. The main focus can be on a relatively isolated single project, on organisational aspects of projects, or on personal attributes of a project manager. Finally a standard can be structured either to have process approach to project management, to follow project lifecycle, or to simply categorise project management knowledge by subject. A combination within the elements of each main comparison direction is possible but there is always at least a major target, focus, and structure for each document which is represented by darker shadows in Table 5. Lighter shadows represent secondary targets, focuses, and structures.

Table 5 - Summary of comparative analysis of project management standards

Title	Target	Focus	Structure

	Body of knowledge	Base for accreditation	Project management methodology	A single project	Organisational aspects	Personal attributes	Process approach	Project lifecycle approach	Subject categorisation
PMI's PMBOK	■	▒		■	▒		■	■	▒
Construction Extension to PMI's PMBOK	■			■			■	■	▒
APM's PM BoK	■			■	■	■			■
ISO 10006:2003	■			■	▒		■		▒
AIPM Professional Competency Standards for Project Management		■		■	▒	▒			■
A Guidebook of Project & Programme Management for Enterprise Innovation	■	▒		▒	■				■
Managing Successful Projects with PRINCE2	▒		■	■	▒		■	■	▒
IPMA Competence Baseline	▒	■		■	■	■			■

3.1 Target

Every project management standard accomplishes certain missions. While APM's PM BoK, ISO 10006:2003, and Construction Extension to PMI's PMBOK are descriptive bodies of knowledge or guidelines, AIPM publication is merely a base for accreditation of project management professionals. PMI's PMBOK and PMAJ's publication are mainly bodies of knowledge but as a secondary mission form a base for accreditation. IPMA Competence Baseline is mainly a base for assessment and certification of project managers but at the same time serves as a body of knowledge.

PRINCE2 is quite different as it is mainly a prescriptive project management methodology. It provides, however, a collection of knowledge as well.

3.2 Focus

Project management standards usually try to cover a broad range of project management topics. Nevertheless, each of them has its focus on a certain aspect of projects. The broader the topics covered are, the less detail is expected from the document.

IPMA Competence Baseline and APM's PM BoK have the broadest range of topics and predictably provide the least detail. These two documents cover organisational aspects of projects, personal attributes of a project manager, and aspects related to managing a single project. PMAJ's publication is more focused on organisational aspects. Other standards deal mainly with subjects related to management of a single project.

3.3 Structure

PMI's publications and PRINCE2 both present project management topics in form of processes with specific inputs, outputs, and tools and techniques to transform former to latter. Moreover, they offer this representation stepwise in order of project lifecycle phases from its initiation all the way to its closure. Publications of APM, AIPM, PMAJ, and IPMA, on the other end of the spectrum, structure their content based merely on subject categorisation.

3.4 Approach to quality

Interestingly, definitions for quality and quality management are almost the same in the standards studied in this paper. Quality is the degree to which inherent or assigned characteristics of project management and its product(s) fulfil stakeholders' requirements, needs, and specifications. Quality management is defined as the activities in order to direct and manage a project with regard to quality. There seems to be an agreement about the elements of quality management to be quality planning, quality control, and quality assurance. Differences seem to result from various targets, focuses, and structures of standards. Table 6 shows a summary of the approach of project management standards to project quality management.

Table 6 - Approaches of project management standards to project quality management

Title	Approach to project quality management
PMI's PMBOK	Project quality management is one of nine knowledge areas with three processes of Plan Quality (Planning process group), Perform Quality Assurance (Executing process group) and Perform Quality Control (Controlling and monitoring process group)
Construction Extension to the PMBOK	Similar to PMI's PMBOK
APM's PM BoK	A topic under section Planning the Strategy
ISO 10006:2003	The whole document provides guidelines for quality in management of projects; does not have a separate section on project quality management
AIPM's publication	Project quality management is a unit of competence with its respective elements, performance criteria, needed background knowledge, and evidence of demonstrated competence
PMAJ's publication	Quality management is a section under project objectives (or goals) management which is itself under heading segment management in project management "tower".
PRINCE2	One of seven PRINCE2 principles is product-orientation that necessitates definition of quality requirements of project's products. Quality is also one of PRINCE2's seven themes which must be addressed continually throughout the project. It consists of quality planning, control and assurance.
IPMA Competence Baseline	Quality is a competence element among technical competence elements.

4. Conclusions and further studies

Quality of project management and its products is critical in developing countries where annually a significant number of investment-intensive construction projects are launched. Various stakeholders with different requirements surrounding construction projects necessitate consideration of quality early in designing and planning phase and through product development even before a project is ever initiated. Quality responsibilities of involved personnel must be clearly defined and rewarding quality-mindedness and irresponsibility punishing mechanisms should be in place. All these together with socio-economic environment in developing countries make push-through of quality in construction projects a particularly challenging task.

A first step to develop theories to do this task is to go through existing most widely adopted project management standards and their approach to quality in projects. This is the subject of the present paper.

Eight project management standards are studied, their respective general backgrounds as well as approaches to quality are reviewed, and a comparative evaluation is provided.

The present study can be a base to develop theories on how the project quality management in general and construction project quality management in particular can be fostered in developing countries.

5. References

[1] PMI, PMBOK® Guide, Fourth Edition, 2008

[2] PMI, Construction Extension to the PMBOK® Guide Third Edition, Second Edition, 2007

[3] APM, Project Management Body of Knowledge, Fourth and Fifth editions, 2000 and 2006

[4] ISO, ISO 10006:2003 Quality Management Systems – Guidelines for Quality Management in Projects, 2003

[5] AIPM, AIPM Professional Competency Standards for Project Management, Parts A to D, Ver. 1.0, 2008

[6] PMAJ, A Guidebook of Project and Program Management for Enterprise Innovation, Volumes I and II, Revs. 3 and 1, 2005

[7] OGC, Managing Successful Projects with PRINCE2™, Fifth Edition, 2009

[8] IPMA, International Competence Baseline, Version 3.0, 2006