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Enhance PMBOK® by Comparing it with P2M, ICB, PRINCE2, APM and Scrum Project Management Standards

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1.0. **Abstract**

The objective of this project was to enhance and enrich “A Guide to the Project Management Body Of Knowledge” (PMBOK®), 4th edition of Project Management Institute (PMI) by comparing and contrasting it with the following standards:

1. International Project Management Association (IPMA) *International Competence Baseline* (ICB) version 3.0 and related articles.
2. *Association for Project Management (APM) Body of Knowledge (BOK)*, 5th edition, UK Professional Body for Project Professionals and related articles.
3. *Project Planning and Project Management (P2M)*, volume I, II, Booklet, 2003, Association of Japan (PMAJ) and related articles
4. *PRojects IN Controlled Environments (PRINCE2®)*, Office of Government Commerce (OGC) and related articles.
5. *Scrum Agile Standard*.

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Structure of Project Report: For each standard, the driving forces for its adoption, its content, synergies and differences with PMBOK® are noted at a high level. New competencies and keywords from each standard are identified that are not covered, or adequately illustrated in PMBOK®. These new competencies are used to enhance (1) a particular section of Body of Knowledge (BOK) of PMBOK® and/or (2) the Input, Tools and Technique, Output (I/TT/O) of one or more of the 42 processes of PMBOK®.

Appendix: Includes a brief comparison between PMBOK® and other global standards, mapping of each standard with the Knowledge Areas (KAs) and Process Groups (PGs) of PMBOK®, enhancement to PMBOK® in a table, the Project Plan, lessons learned, list of abbreviations, and references.

2.0. Introduction

2.1. Project Management History, Adoption and Influence

A project is a unique endeavor with a start and end date that delivers a specific result or service. Although a project is temporary, the results of a project can be long-lasting. Project Management is a discipline in itself. It helps meet project requirements by applying knowledge, skills, tools, techniques (pg. 6, PMBOK®) and human interactions. It also ensures that the project aligns with corporate strategy and objectives. Project Management started in the 1960s with engineering projects. Today, Project Management is a recognized discipline that is used in a variety of business domains for projects of all sizes. Many global standards on Project Management are now available along with certifications, education and training.

2.2. PMBOK® History and Adoption

PMI is a non-profit organization that was founded in 1969 by a group of 5 people in Atlanta. PMBOK® was first published by PMI as a white paper in 1987. The fourth and latest edition was released in 2008. Although PMBOK® is an American Standard National Institute (ANSI) standard, it was contributed to by members across the world. Over 2.8 million copies are in circulation and available in 10 languages. It is the most widely accepted guideline on Project Management. PMI has over 307,000 members in 180 countries with 10-20% annual growth. (Cable, 2011)

2.3. PMBOK® Concepts

PMBOK® provides “common vocabulary” (pg. 4, PMBOK®) that is understood across all the business disciplines. It identifies “generally recognized good practices” whose application will increase project success rates. PMBOK® is a guide, not a methodology. PMBOK® is a foundational reference, it is “neither complete nor all-inclusive.” It contains 9 Knowledge Areas (KAs) – Integration, Scope, Time, Cost, Quality, Human

Resource, Communication, Risk and Procurement and 5 Process Groups (PGs) – Initiating, Planning, Executing, Monitoring and Controlling and Closing. There are 42 processes that cross-cut into these 9 KAs and 5 PGs. Each process has inputs, tools and technique and outputs (I/TT/O). An output from a process can be used as an input to another process. PMBOK® recognizes that a project can apply these processes in varying degrees. These processes can be repeated in different phases of the project. Repetition of processes will reduce the learning curve and increase project success (PMBOK®, 2008).

2.4. Enhancing PMBOK® will Improve the Project Management Discipline

Even with the emergence of many Project Management standards and substantial advancements in the last 20 years, the discipline of Project Management is still in its infancy. To date, 28% of the projects fail. Further, IT projects have a poor success rate of 16% (Cable, 2011). Of all the standards, PMBOK® is the most accepted standard. Many projects still fail by using (or misusing) PMBOK® guidelines. Poor communication, ineffective planning and improper execution are the primary reasons of project failure. The Project Manager (PM) has limited authority in a functional organization and often does not have expert power. This project starts to address these issues. This project aims to enrich PMBOK®, which will in turn improve Project Management discipline.

2.5. Assumptions

American English and spellings are used in this project report. This project aims at identifying additional competencies that could be added to future editions of PMBOK®. Industry and implementation agnostic competencies are identified from other standards to enrich the generic guide of PMBOK®.

2.6. Other World-Wide Standards – See Appendix for Brief Comparison with PMBOK®

Other standards worth mentioning are (1) PMI Foundational Standards: Organizational Project Management Maturity Model (OPM3®), The Standard for Portfolio Management, The Standard for Program Management. (2) PMI Practice Standards and Frameworks: Risk, Configuration, Scheduling, PM Competency Development Framework, Earned Value, Work Breakdown Structures, Estimating. (3) PMI Standards Extensions: Construction, Government. (4) ISO 1006 for Quality Management. (5) P3M3, Portfolio, Program, and Project Management Maturity Model. (6) Australian Institute of Project Management (AIPM) National Competency Standards. (7) HERMES, Swiss Project Management method. (8) Information Technology Infrastructure Library (ITIL) of OGC provides standards for IT service delivery. In addition, several models are available namely CMM, SEI, Berkeley Maturity Model, V-Model, Waterfall.

3.0. PMBOK® Versus ICB

3.1. History, Driving Force and Adoption of IPMA

IPMA was initiated in 1965, before the emergence of PMI. IPMA is the oldest project management association. It is also a non-profit organization. IPMA is a federation of independently established organizations based in different countries. About 50 countries have IPMA members with a pronounced presence in Europe. Although there are disagreements between IPMA and PMI, there are recent collaborations between them for promoting education (Cable, 2011).

3.2. ICB Concepts

IPMA introduced *ICB version 3 in 2006*. ICB is the most widely accepted standard after PMBOK®. PMBOK® and ICB have similarities and differences and serve different purposes. ICB is the basis for the 4 Level Certification (4-L-C) for project, program and portfolio manager. These 4 levels provide a career path at an entry level (D) to the higher levels of C, B to A. PMI has Project Management Professional (PMP). It recently introduced an entry level certificate CAPM and a certificate for program, portfolio manager PgMP. ICB lists 46 competences that are used by a Project Manager (PM) in a project. These competences are seen through the eye of a PM, known as *Eye of Competence*. Competence is a collection of knowledge, personal attitude, skills and experience. Competence = Knowledge + Experience + Behavior (Caupin, 2004).

Each competence has a (1) brief introduction, (2) process steps, (3) topics, (4) grade for certifications, (5) relationship to other competences. The 20 Technical Competences are fundamental to the matter of project management.

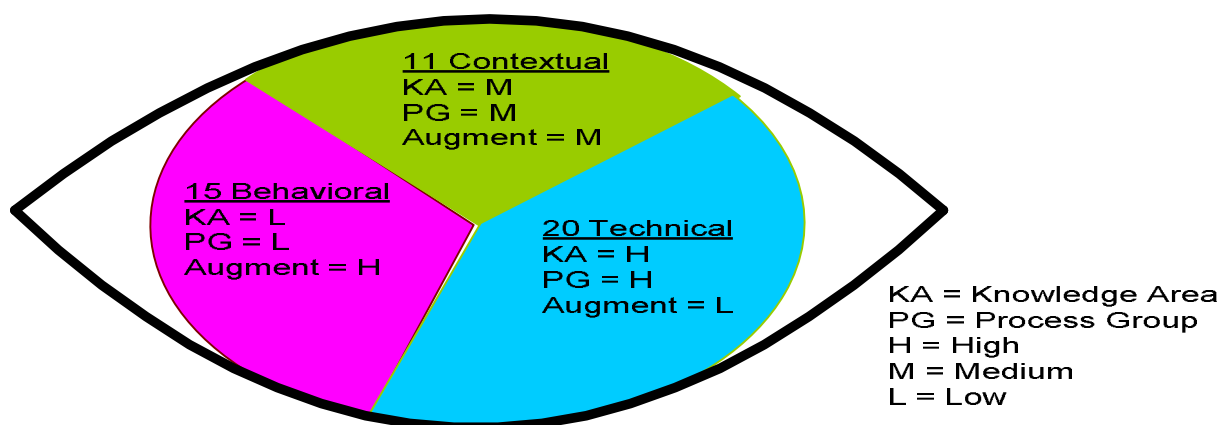


Fig. 3.1: Eye of Competence: Shows the Degree of Match of 3 Categories of ICB Competences with PMBOK® KA and PG and how they enhance KA and PG

3.3. High Level Synergies Between ICB and PMBOK®

1. Both are guides, they can be implemented differently to suit the specific need of the customer and industry. 46 ICB competences are used by a PM in a varied level in a given project. The 42 processes of PMBOK® are applied in varied degrees in a project.
2. ICB competences can be mapped to PMBOK® KAs and PGs.
3. ICB competences are related to each other, so are 42 processes of PMBOK. The output from one process in PMBOK can be used as an input into another process. Similarly, the information from one competence in ICB can contribute to a different competence.

3.4. High Level Differences Between of ICB and PMBOK

1. ICB focuses on the skill assessment and capability of the PM and project team while PMBOK addresses the processes in a project. ICB improves project success rates by applying the 46 competences of the PM and team. PMBOK does so by applying the 42 processes. Processes can be repeated in a project or phases, thus reducing learning rate through reuse.
2. ICB emphasizes behavioral competences which are the personal relationships in a team. PMBOK focuses on technical skills rather than interpersonal ones (Eberle, 2011). PMBOK does not address PM's personal skills, attitudes, portfolios or programs (Caupin, 2004).
3. The certification process of ICB is more rigorous than that of PMI and requires interviews.
4. When ICB is adopted by a national member, it becomes their National Competence Baseline (NCB). NCB allows adaptations and changes and flexibility to meet with local standards. When PMBOK is translated into other languages, it remains the same.
5. PMBOK defines project as a temporary effort to create a unique product or service (pg. 5). ICB defines project as a time and cost-constrained operation to realize quality deliverables (pg. 128). ICB emphasizes on quality and satisfaction.

3.5. High Level Gaps in ICB that are Covered in PMBOK

1. The ability to get the work done and being a “closer” is more important than the competences defined in ICB. PMBOK emphasizes project execution.
2. PMBOK prescribes detailed TT for 42 processes. An ICB practitioner has to get TT information from other sources. However, this also gives ICB a greater flexibility in the

selection of T&T. The “Topics Addressed” section of each competence in ICB is not adequately explained.

3. ICB provides more emphasis on people skills. PMBOK has more focus on process skills. Both skills are important in a project. The right balance between them is critical (Grisham, 2011).

3.6 Detailed Comparison of ICB with PMBOK – Enhancing PMBOK

3.6.1. Technical Competences Enhancing PMBOK

The technical competences of ICB are adequately covered in PMBOK. Initiation in PMBOK matches with start-up in ICB, Planning of PMBOK matches with requirement and scope, execution in PMBOK matches with problem resolution. Quality, teamwork, procurement, monitor and control, information distribution and closing are covered in both the standards. Technical competences of ICB align projects with corporate objective, help manage stakeholders, plan, monitor, close projects with a focus on cost, quality, risk and communication. Following are additional concepts from ICB that enhance PMBOK.

20 Technical Competences and Description	Enhancement of BOK and I/TT/O of PMBOK
1.01 Project Management Success: Set criteria upfront, agreed by key stakeholders.	1. <i>Failure criteria</i> is missing deadline, cost etc. Add it as output to Project Charter. 2. <i>Success criteria</i> is meeting milestone, budget etc. Add it as output to Close Project Phase.
1.02 Interested Parties: They are stakeholders, who are managed differently based on their interest and influence.	1. <i>Position of the project in the program</i> , portfolio and the organization of the business, Project Context adds to Organizational Influence. Although, PMBOK notes that projects are executed to meet corporate objective/portfolio (pg. 12).
1.03 Project Requirements & Objectives: The requirements (unidentified and identified) and goals are set in a project to satisfy stakeholders.	1. <i>Strategy</i> helps attain the future vision of an organization. It enhances EEFs. 2. <i>Balanced scorecard</i> added as TT for Collect Requirements. It helps align requirements to the vision of organization. 3. Project context, <i>context conditions</i> add to Organizational Influence to align project with portfolio.
1.04 Risk & Opportunity: Strength, Weakness, Opportunity, Threat (SWOT) is managed throughout project to mitigate risk and capitalize on opportunities.	1. <i>Risk and opportunity</i> is managed by PM in ICB. PMO manages it in PMBOK. 2. <i>Risk taking attitude</i> of corporation adds to EEFs and influences project selection. PMBOK briefly notes risk tolerance (pg. 276). 3. <i>Successive principle</i> adds to TT of Develop Project Plan. Dr. Lichtenberg proposed it to keep plan simple by looking at total project (Kahkonen, 1997).
1.05 Quality: Quality to maintain customer satisfaction, fitness for use.	1. <i>Computer aided design</i> adds to TT to Direct and Manage Project to prototype a product. 2. <i>Standard operating procedures</i> adds to OPAs for routine activities and risk response plan.
1.06 Project Organization: It	1. <i>Continuously seek to improve the project organization</i> adds

is the organizational structure and roles and responsibilities of stakeholders.	to EEFs. It matches with PDCA of Dr. Deming. 2. <i>Interface management</i> adds to TT of the processes in Communication KA to manage expectations of stakeholders.
1.07 Teamwork: A highly effective team is more productive, has higher job satisfaction through mutual accountability, more trust and complementary skills.	1. <i>Able to work in teams</i> and <i>Cooperation with management</i> adds to TT of Manage Project Team and Develop Project Team. Poor management can cause non-cooperation. PMBOK states cooperation in only in two places. 2. <i>Individual profile assessment</i> and <i>group dynamics</i> adds to TT in Manage Project Team. Myers-Briggs Type Indicator (<i>MBTI</i>) provides better understanding of the differences in behavior of team members.
1.08. Problem Resolution: Problems cost time and money. Risk response plans and contingencies proactively manage and reduce impact of problems.	1. <i>Involving interested parties</i> at appropriate steps can be added to expand Stakeholder Management. 2. <i>Moving through project forward and backward</i> can be added as TT of Develop Project Management Plan. Forward and backward pass ensure validity of problem resolution approach. 3. <i>Systems and Lateral Thinking</i> add to Group Creativity Techniques. Systems engineering uses multi-disciplinary approach. It is noted once in PMBOK in Product Analysis. Lateral thinking promotes indirect thinking.
1.09 Project Structures: The importance of a project in programs and portfolios is evaluated. Project is divided into phases and tasks.	1. <i>Information and Communication Technology</i> (Coding systems, Databases, data input and output) add to TT for processes in Time KA. PMBOK briefly notes coding program in Network Schedule Template (pg 141). 2. <i>Multi-dimensional, Hierarchical and non-hierarchical structures</i> of project organization adds to Organization Structure. 3. <i>Project structure is provided in higher detail for inexperienced PM and team</i> adds to Expert Judgment.
1.10 Scope & Deliverables: Identified, unidentified, additions and deletions of scope and deliverables.	1. <i>Interfaces</i> add as TT to Identify Stakeholder. PM interfaces with various stakeholders. 2. <i>Formally hand over the deliverables</i> to the interested parties adds as an output to Close Project or Phase and processes in Communication.
1.11 Time & Project Phases: Schedule, estimates, milestones	None, covered in Time Management KA.
1.12 Resources: Allocate tasks to project members.	None, covered in HR KA.
1.13 Cost & Finance: It is planning and monitoring of cost.	1. <i>Financial management</i> adds as an input to processes in Cost Management. PMBOK captures accounting information. PMBOK only notes financial control as a part of OPAs. Financial analysis will improve project analytics and decisions.
1.14 Procurement & Contract: Obtain best value of services and contracts. Contracts are a legally binding agreement.	1. <i>Penalty</i> adds as TT to Close Procurement. Penalty can be additional fees, or interest for late delivery. 2. <i>Strategic partnership</i> adds as TT for Conduct Procurement. Use partnership to buy from pre-qualified vendors, or sole source.
1.15 Changes: Changes to specifications, contracts etc.	1. <i>Change authority</i> enhances EEFs, which is an input to Integrated Change Control. PM or stakeholder authorizes

because of unanticipated events.	change. Changes in later parts of the project are more expensive. 2. <i>Product re-design</i> enhances Expert Judgment for Integrated Change Control by seeking expertise.
1.16 Control & Reports: Monitors project progress, takes corrective actions and forecasts.	None, covered in Monitor and Control PG.
1.17 Information & Documentation: It is the management of project data.	1. Add to the OPAs “ <i>care must be taken in deciding who gets what information.</i> ” CEO likes high level, while Product Manager wants detailed data. 2. <i>Regulation, security and semantics</i> of documents enhance TT of Communication KA.
1.18 Communication: Poor communication is main cause of project failure. 75% of the tasks of a PM are related to communication (Cable, 2011).	1. Definition of communication (pg. 245) can be augmented by <i>adding graphic, static or dynamic, volunteered or requested</i> form of communication. 2. <i>Confidentiality</i> can be added to OPAs and to Communications Requirements Analysis. Certain stakeholders are privy to certain information.
1.19 Start-up: Start-up workshop, requirements walk-through unveils unidentified requirements.	1. <i>Obtain information that is not yet available and ill-defined requirements</i> can be added as an input to Collect Requirements. 2. <i>Manage unrealistic expectations</i> : irrational optimism of stakeholder can fail a project. Add it to TT of Identify Stakeholders.
1.20 Close-out: Completion of a project, phase, or program.	1. Penalty, Financial transactions, Hand-over documents are already noted to enhance PMBOK.

3.6.2. Behavioral Competences Enhancing PMBOK

Behavioral competences found in ICB are not adequately covered in PMBOK. Some of the key concepts are leadership, self-control, emotional intelligence, values appreciation and engagement. Disengaged employees cost 10% of US economy (Davis, 2010).

15 Behavioral Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
2.01 Leadership: PM with leadership qualities will provide motivation, vision and make emotional connection with team members.	1. <i>Delegation, motivation, leadership styles, natural authority, power, tenacity, vision</i> enhance interpersonal and management skills could enhance PMBOK. PMBOK differentiates between manager and leader, notes differences between formal, expert (preferred, not mandatory), referent (association), coercive (not preferred) powers and authority of a PM in functional, matrix and projectized structure. PMBOK does not note leadership styles.
2.02 Engage & Motivate: Involve stakeholders, improve motivation by autonomy and mastery (Davis, 2010).	1. <i>Accountability, delegation, empowerment, enthusiasm, positive attitude, verbalization</i> and <i>visualization</i> of objectives can be added to TT of the processes in HR KA and to interpersonal skills.
2.03 Self-control: It helps in coping with stress,	1. <i>Work-Life balance, mental models, self and time management, and working under stress</i> are not covered in

rejuvenation and having work-life fit.	PMBOK. Add them to interpersonal skills and TT to many of the HR KAs.
2.04 Assertiveness: PM persuades his point of view.	1. <i>Diplomacy, assertiveness, personal conviction, self-belief and self-control</i> can be added as TT to HR KA and interpersonal skills. Persuasion is based on facts, not emotion and agenda.
2.05 Relaxation: Active leisure (Loehr, 2003), working in small sprints and taking time to recover will energize team.	1. <i>Family, leisure and personal contacts</i> can enhance HR KAs and Organization Structure. 2. <i>De-escalation</i> is tension reduction. Add it as TT to Communication KA. 3. <i>Awareness, humor, imagination and re-energizing</i> can enrich interpersonal skills.
2.06 Openness: Accepting opinion of other team members will bring additional, diverse expertise.	1. <i>Accessibility and transparency</i> can add to Communication Method and Communication Requirements Analysis. It improves trust and clarity. 2. <i>Flexibility, openness to age, gender, sex, religion, cultural, and disabilities</i> can add to Organizational Influence
2.07 Creativity: The ability to think and act in imaginative way is helpful for problem solving and break-through type and R&D projects.	1. <i>Emotional intelligence</i> adds to interpersonal skills. It is the ability to assess and control the emotion of oneself and others. Emotional Intelligence is more important than IQ for a PM (Davis, 2011). 2. <i>Creativity techniques, intuition, holistic thinking, new combination and optimism</i> add to corporate knowledge base for project selection (pg. 33), and as TT for Plan Risk Management to find optimal solutions, Direct and Manage Project Execution. Holistic thinking enables thinking of the whole project, not just sub-components. Optimism must be realistic.
2.08 Results Orientation: It helps meet results and objectives by focusing on the project, customer and people, not only the sub-problem.	1. <i>Delegation for resource leveling</i> can add as TT of Manage Project Team. 2. <i>Entrepreneurship</i> for opportunities can add to EEFs. 3. <i>Efficiency</i> enhances Team Performance Assessment of Develop Project Team. 4. <i>Integration of social, technical and environmental aspects</i> add to Business Case.
2.09 Efficiency: Increased by proper planning and continual improvement.	1. <i>Energy efficiency</i> enhances Team Performance Assessment of Develop Project Team. 2. <i>Compromise</i> adds to Change Request (input) of Integrated Change Control.
2.10 Consultation: Bringing in different opinions through mutual acceptance of decisions.	1. <i>Consultation methods</i> add to Expert Judgment TT. PMBOK notes consultants but does not describe techniques. 2. <i>Structured thinking and Systems Engineering</i> add to Product Analysis TT for problem solving by taking inter-disciplinary approach.
2.11 Negotiation: Resolve disagreements using win-win.	None, covered in Communications KAs.
2.12 Conflict & Crisis: Conflict is difference in opinion. Crisis is uncertainty.	None. However, conflict management in PMBOK can be enhanced by stating that PM knows how to resolve conflicts. They can be resolved by risk planning.
2.13 Reliability: It is the ability to deliver the expected result.	1. <i>Control cycles</i> enhance continuous improvement (Plan-Do-Check-Act) of PMBOK. 2. <i>Tolerate mistakes</i> can enrich interpersonal skills and reduces fear of making mistakes.

<p>2.14 Values Appreciation: Values in Action (VIA) recognizes 24 strengths to help PM know himself, others and appreciate differences.</p>	<p>1. <i>Concern for impact, Liaison between permanent organization and project team, Maintenance of contacts, Personal interests and goals, Personal presentation, Political sensitivity, Pressure groups, Social sensitivity and Takes responsibility for own actions</i> can be added to interpersonal and management skills of PM.</p>
<p>2.15 Ethics: Ethics is morally accepted conduct. It varies among societies and cultures.</p>	<p>1. <i>Solidarity</i> is not covered. It is a common responsibility that applies to ethics and Develop Project Team. <i>Aspirational and mandatory conduct</i> are noted in a separate reference of PMI.</p>

3.6.3. Contextual Competences Enhancing PMBOK

Contextual competences found in ICB are moderately covered in PMBOK. However, ICB has a higher emphasis on programs and portfolios than PMBOK. More coverage on these are found in PMI’s Foundational standards of OPM3, Standard for Portfolio and Standard for Program Management.

11 Contextual Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
3.01 Project Orientation: Project meets corporate goal.	None, covered in PMO and Organizational Influence.
3.02 Program Orientation: Set of projects managed as a Program for efficiency and better alignment with portfolio.	None, covered in PMO and Organizational Influence and PMI’s other foundational standards namely OPM3, The Standard for Portfolio Management, The Standard for Program Management.
3.03 Portfolio Orientation: Portfolio contains projects and/or programs that are managed together to better meet corporate objectives.	1. <i>Priority setting committee</i> is made up of the head of PMO, key PMs and functional managers. This committee helps with project selection, priority setting etc. 2. <i>Key Performance Indicator (KPI)</i> adds to TT to Monitor and Control Project Work, Close Project or Phase. KPI measures success criteria.
3.04 Project, Program & Portfolio (PPP Program)	None, PMBOK notes it briefly and covers more in PMI’s other standards.
3.05 Permanent Organization: Permanent (PMO, EEFs) influence temporary projects.	None, covered in PMO and EEF.
3.06 Business: Project aligns with business need.	1. <i>Strategic</i> (high level objective), <i>operational</i> (procedures, plans) and <i>tactical</i> (daily activities) decisions can add to EEF.
3.07 Systems, Products & Technology: Product development and technology selection are carried out as a project.	1. <i>Facility management</i> can add as output to processes of Cost KA. 2. <i>Systems development</i> and <i>Systems theory</i> requires multi-disciplinary approach to solve a problem. It adds to TT of Direct and Manage Project Execution, Collect Requirements, Integration, Time, Cost, Quality and Risk KAs.
3.08 Personnel Management: Talent acquisition, development and retention are top problems for corporations (Zeitoun, 2011).	1. <i>Assessment techniques</i> can add as TT to Develop Project Team. 2. <i>360 degree review</i> (feedback from different tiers) and <i>Team role models</i> can add to Organizational Process Assets. 3. <i>Benefits for the project personnel</i> and <i>Career development</i> can add as an output of Develop HR Plan.

3.09 Health, Security, Safety & Environment: Projects should ensure safety and health.	1. <i>Environmental Impact Plan</i> covers issues related to environment changes e.g. clean air act. It can add to EEF. PMBOK only briefly notes business environment factors.
3.10 Finance: It makes the money available for executing the project in a timely fashion.	1. <i>Financial markets, Financing models and Treasury</i> can be added to EEF and as an input to the processes in Cost KA. 2. <i>General accounting</i> can be added as TT to Determine Budget.
3.11 Legal: Existing laws and changes can impact project.	None, PMBOK covers it in Strategic Plan (section 1.4.3), Stakeholder (section 2.3), Business Needs and Settlements.

4.0. PRINCE2 Versus PMBOK

4.1. History, Driving Force and Adoption of PRINCE2

PRojects IN Controlled Environments (PRINCE) was originally based on PROMPT, a project management method created by Simfact Systems Ltd in 1975. PRINCE was established in 1989 by Central Computer and Telecommunications Agency (CCTA), which was renamed as Office of Government Commerce (OGC). Since its inception, it has superseded PROMPT. It has undergone 7 revisions since 1989. PRINCE2 was published in 1996. It was contributed to by a consortium of 150 European organizations. The newest edition of PRINCE2 was released in 2009. The driving force for the emergence of PRINCE2 was to establish a standard for IT projects in the United Kingdom (UK). It is one of the first standards that was developed with IT projects in mind. It is the de facto standard for the government agencies in the UK. It is widely recognized and used in private sectors in the UK and internationally. The concepts of PRINCE2 can also be applied to non-IT projects.

4.2. PRINCE2 Concepts

PRINCE2 stands for PRojects IN Controlled Environments. It is a structured but flexible, process-based project management standard to improve the effectiveness of project management. The structure of PRINCE2 is made up of 4 elements which are 7 Principles, 7 Themes, 7 Processes and Tailoring to suit the specific need of the project. The 7 Processes are broken into 40 Activities. Control in PRINCE2 is achieved in the following three ways: (1) Dividing the project into manageable, controllable stages (2) Managing milestones (3) Defining organization structure of the project team. Product based planning in PRINCE2 gives a focus on the product of the project. It also emphasizes change control and quality control techniques.

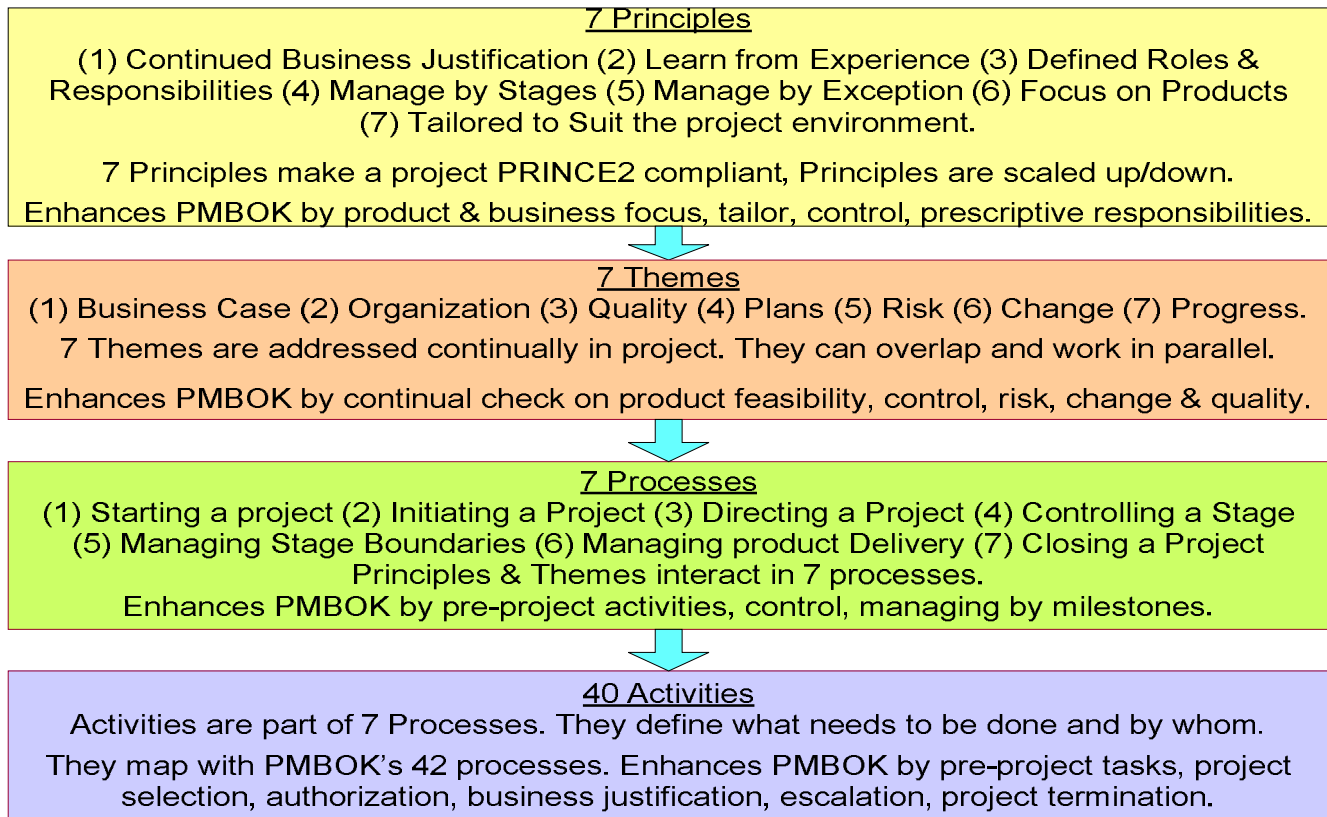


Fig. 4.1: PRINCE2 Enhancing PMBOK

4.3. High Level Differences Between PRINCE2 and PMBOK

1. PRINCE2 focuses on key risks: PRINCE2 emphasizes key risks in a project. PMBOK is more comprehensive (Siegelaub, 2004). PRINCE2 identifies why projects fail and it aims to reduce the failure rate by removing the reasons for failure through management, control and proper use of tools and techniques. PMBOK also aims to increase project success rate by applying processes, tools and techniques. While neither can guarantee success, they improve chances of success. PRINCE2 revolves around improving success rates.
2. Product based: PRINCE2 emphasizes on product planning to produce a quality product. Product Breakdown Structure (PBS), Product Description and the Product Flow Diagram are key to product based planning (Wideman, 2011). PMBOK does not have similar emphasis.
3. Control in PRINCE2: Control is exercised by authorizing and by dividing the project into manageable stages and milestones. PMBOK does not cover it.

4. Management and Technical stages in PRINCE2: Technical stages are overcoming technical tasks and challenges while management stages are commitments to stakeholders. PMBOK does not make this distinction. Stages and phases are used interchangeably in PRINCE2.
5. Business Case in PRINCE2: Business case drives a PRINCE2 project while the customer requirements drive projects in PMBOK (Siegelaub, 2004).
6. Defining Stakeholder: PMBOK defines a stakeholder as a person or organization that is actively involved in the project, or whose interests may be positively or negatively affected by execution or completion of the project. PRINCE2 goes a step further and puts a stakeholder into 3 categories: business sponsor, user, and supplier. Business sponsors are those who make sure the project delivers for money. Users are the people who will use the product once it is finished. Suppliers provide the expertise and the resources to the project and ultimately produce the products.
7. PRINCE2 is prescriptive but adaptable: The Process structure needs to be followed in PRINCE2. It can be scaled according to the size of the project. PMBOK prescribes tools and techniques at a high level, but mostly serves as performance based standard.

4.4. High Level Synergies Between PRINCE2 and PMBOK

1. Defining a project: PRINCE2 defines a project as a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case. PMBOK defines a project as a temporary endeavor undertaken to create a unique product, service or result.
2. Defining the role of PM: PRINCE2 defines the role of the PM is to achieve project objectives within the targets set for time, cost, quality, scope, benefits and risk. PMBOK says the PM's role is to work closely with the portfolio or program manager to achieve the project objectives and to ensure the project plan aligns with the overlaying program plan.
3. Six project variables/performance constraints: These are defined in PRINCE2 as time, costs, quality, scope, benefits, and risk. The same variables are referred to as project constraints in PMBOK.
4. Themes and knowledge areas: The themes of PRINCE2 are very comparable to the knowledge areas of PMBOK. The only PMBOK knowledge area that is not covered or explained in detail in PRINCE2 is procurement.
5. Process Groups: The process groups of PMBOK and PRINCE2 are very comparable as well. The only difference is in PRINCE2 the process 'Starting Up a Project' is not contained in PMBOK.

6. Activities versus processes: PRINCE2 has 40 activities that are demonstrated throughout the project in the different processes. This compares to the 42 processes in PMBOK.

4.5. Gaps in PRINCE2 covered in PMBOK

1. PMBOK covers the Procurement KA: PMBOK states that procurement includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team. PRINCE2 makes no mention of procurement throughout the entire manual.

2. Detailed techniques: PMBOK has detailed information that can be used for each competency that it addresses. For every competency that is addressed in PMBOK, there is a tools and technique section that gives detailed information for that technique. PRINCE2 just states that the best suitable techniques should be chosen for a project and does not give any detailed information on them.

3. Human Resources: PRINCE2 does not give any information dealing with human resources or human resource management. PMBOK dedicates an entire knowledge area to human resources management for a project. It involves developing a human resources plan, acquiring the project team, developing the project team, and managing the project team.

4. Leadership capability/soft skills: PRINCE2 just mentions that the best training programs should be used for the specific environment. PMBOK has higher details on the use of soft skills for reducing conflicts and increasing cooperation in a team. PMBOK also references the importance of leadership skills for the success of a project.

4.6. Detailed Comparison of PRINCE2 with PMBOK – Enhancing PMBOK

4.6.1. PRINCE2 Principles Enhancing PMBOK

7 Principles	Maps to PMBOK	Enhancement of BOK and I/TT/O of PMBOK
Continued Business Justification	Initiation PG	Enhances Monitor and Control Project Work by ongoing health check of project feasibility.
Lessons Learned	OPAs	Lessons learned is part of OPAs in PMBOK. In PRINCE2, lessons are learned as the project continued, as opposed to doing lessons learned in PMBOK at the end of a project or phase.
Roles and responsibilities	HR KA	Enhances input to HR Plan by clearly defining roles and responsibilities in more descriptive fashion.
Managing by Milestone	Plan and Execution PG	Enhances input to Develop Management Plan by managing in key deliverables/milestones.

Managing by Exception	Execution PG	Enhances TT of Direct and Manage Project Execution by addressing situations where actual differs from planned result and it exceeds certain tolerance. It also helps in issue escalation.
Product focus	Plan, Execution PG	Enhances input to Define Scope and Develop Project Management Plan by clearly defining the product. This gives the team the same idea on what is being worked on and the end product.
Tailoring to the Project Environment	Plan, Execution PG	Enhances input to Define Scope by scaling up or down project scope for large and small projects.

4.6.2. PRINCE2 Themes Enhancing PMBOK

7 PRINCE2 Theme	Maps to PMBOK	Enhancement of BOK and I/TT/O of PMBOK
Business Case	Scope, Time, Cost KA	Enhances input to Project Charter by defining the business reason for the project and its validity.
Organization	HR KA	Enhances input to HR Plan and RACI by clearly stating roles and responsibilities. Gets input from Project Board & senior managers.
Quality	Quality KA	Enhances processes in Quality KA by providing clear guidance for achieving quality objectives and checking fitness for use of the product.
Plan	Planning KA	Enhances PMBOK by managing project in controllable stages.
Risk	Risk KA	Enhances input to processes in Risk KA by identifying causes of failure. It uses 5 steps of risk management using Identify, Assess, Plan, Implement and Communicate (Turley, 2000) with PRINCE2 focuses on risk areas more than PMBOK.
Change	Integration KA	Enhances Integrated Change Control and Configuration management by defining how to make those changes and using what tools.
Progress	Monitor & Control PG	Enhances TT of Monitor and Control Project Work by comparing actual with baseline. This also helps prevent unexpected deviations,

4.6.3. PRINCE2 Processes Enhancing PMBOK

7 PRINCE2 Processes	Maps to PMBOK	Enhancement of BOK and I/TT/O of PMBOK
Starting Up Project	Initiation PG	Enhances input to Project Charter and Identify Stakeholder processes of PMBOK by identifying pre-project activities including project selection

		and its business justification.
Initiating Project	Initiation PG	Enhances output to Project Charter by defining the description of product. PMBOK does not have enough focus on the product of the project. The Project Initiation Document (PID) can enhance the output to Project Charter.
Directing Project	Execution PG	Enhances Direct and Manage Project Execution by managing in controllable stages. Project Board is responsible for directing the project. PM does the day-to-day management of the project and makes sure that the project produces the required products that meets time, cost, quality, scope, risk and benefits (Siegelaub, 2004).
Controlling Stage	Monitor & Control PG	Enhances TT of Monitor and Control Work as most of the project review is done in this stage.
Managing Stage Boundaries	Planning & Executing PG	Enhances Direct and Manage Project Execution by defining phases and stages.
Managing Product Delivery	Planning, Executing PG	Enhances processes in Planning by breaking product plan. Execution is more efficient when managed using Product Plan and PBS.
Closing Project	Closing PG	Enhances output to Close Project or Phase. Creates Benefits Review Plan to measure success.

4.6.4. PRINCE2 Activities Enhancing PMBOK

PRINCE2 is made up of 40 activities that are mostly covered in PMBOK. However, there are some activities that can successfully enhance PMBOK to make it an even better standard for project management. Since PRINCE2 is comprised of activities, most of them will enhance PMBOK as an output and in some cases they will be inputs.

Activity and Description	Enhancement of BOK and I/TT/O of PMBOK
13.8 Selecting Project Approach & Assembling Project Brief: How to best approach the project, updating and confirming the project objectives.	It compares to Chapter 3 of PMBOK. However, it can be enhanced as an input to the initiation process.
13.9 Plan the Initiation Stage: Produces the stage plan, defines reporting, and controls arrangements for the initiation stage. Also, request authorization to initiate the project.	It can be enhanced as an input for a new competency in PMBOK. The output of the new competency would be the initiation stage.
15.3.1 Authorize Initiation: Review project brief, project description and stage plan. Also, approve these items and inform stakeholders that the project will continue. Finally, authorize next stage.	It can enhance the beginning since it refers to authorizing the initiation stage. This would be the output of the initiation stage competency described above.

15.3.3 Authorize a Stage or Exception Plan: Checks performance, lessons learned, and risk summary. Lastly, reviews and approves the next stage.	It can enhance the Executing PG. This would be an output for each of the processes because it allows an authorization of the next process in PMBOK.
15.3.4 Give Ad-Hoc Direction: PM seeks advice from the project board.	This can enhance the tools and techniques of the Communication KA.
16.4.5 Report Highlights: PM updates the Project Board with the project's current progress.	Enhances as an output to Distribute Information by providing timely information.
17.3.1 Accept a Work Package: PM and Team Manager agree on what needs to be delivered.	This can be an output in the Executing PG and the Project Integration KA.
17.3.4 Execute a Work Package: Involves the Team Manager managing the products that have been agreed upon with the PM.	This can be an output in the Executing PG and the Project Integration KA.
17.3.5 Deliver a Work Package: Delivering a work package involves the PM receiving a list of work and checking it for quality.	This can be enhanced as an output in the Executing PG and the Quality KA.
18.4.2 Update the Project Plan: Includes the progress reports for the project and can also include forecasting for the project.	This can be enhanced as an input in the Planning PG and the Project Integration KA.
18.4.3 Update the Business Case: Allows PM to verify project feasibility and if it should continue.	It can be enhanced in the Planning PG and the Project Integration KA.
18.4.5 Produce an Exception Plan: Only occurs when the current stage is out of tolerance. It creates an exception report.	It can be enhanced as an output in the Monitoring and Controlling PG and Communication KA.
19.4.2 Prepare Premature Closure: Occurs when the Project Board instructs the PM to close the project before its scheduled time.	It can be enhanced as an input in the Closing PG and Time KA.
19.4.5 Recommend Project Closure: Occurs when the PM has completed closing duties and confirms the project can be closed.	It can be enhanced as an output in the Closing PG and Communications KA.

4.7. Application of PRINCE2 in Small Projects and Non-IT Projects

PRINCE2 is criticized as being an appropriate selection of project standard for small projects. OGC claims that PRINCE2 can be scaled-down. This is possible because of the flexible and tailor-made nature of PRINCE2. PRINCE2 standard can be applied to non-IT projects to manage and control product delivery, improve success rate and realize business value

5.0. PMBOK Versus P2M

5.1. History, Driving Force and Adoption of P2M/PMAJ – Comparison with PMI

The PMAJ is a non-profit organization like PMI. It was created through the collaboration of the Japan Project Management Forum (JPMF) and the Project Management Professionals Certification Center. P2M was developed for Japan's unique economy. It published revision three of *A Guidebook of Project & Program Management of Enterprise Innovation (P2M)* in October 2005. The driving force for it was to facilitate innovation in Japan's industrial community. P2M was developed as a response to the problems Japan's economy has experienced. It aims to develop project professionals that are capable of handling complex project challenges and lead Japan to the world-leading economy it once was. P2M is intended to complement ICB and other international standards, not to replace them. There are 2,500 professionals certified in P2M with pronounced presence in Japan. It has rigorous certification process using four-level qualification system like ICB. The certification is obtained through a combination of experience, examination and a face-to-face interview. JPMF is the primary supporter of P2M. The key lessons from P2M are equally applicable to projects around the world across industries.

5.2. P2M Concepts

P2M divides a complex problem into many projects and then combines them as a whole. It aims to build the competency of project professionals who can take multi-disciplinary and challenging assignments. It aligns the project with the corporation and society using a systems approach. P2M is a practical guide, it is a "hybrid product of professional practice and practically applied science, incorporating recommended practices based on management science, systems science, information science, and human science." (Ohara, 2005). It requires the project professional to apply systematic knowledge, practical experience and attitude/qualities including professional ethics. As PMP professionals are required to earn PDU for maintaining credentials, P2M aims to enhance competency through learning and using "Capability Building baseline (CBB)." It uses a Tower Structure which is aligned to business management of the project, rather than just the project itself; similar to OPM3.

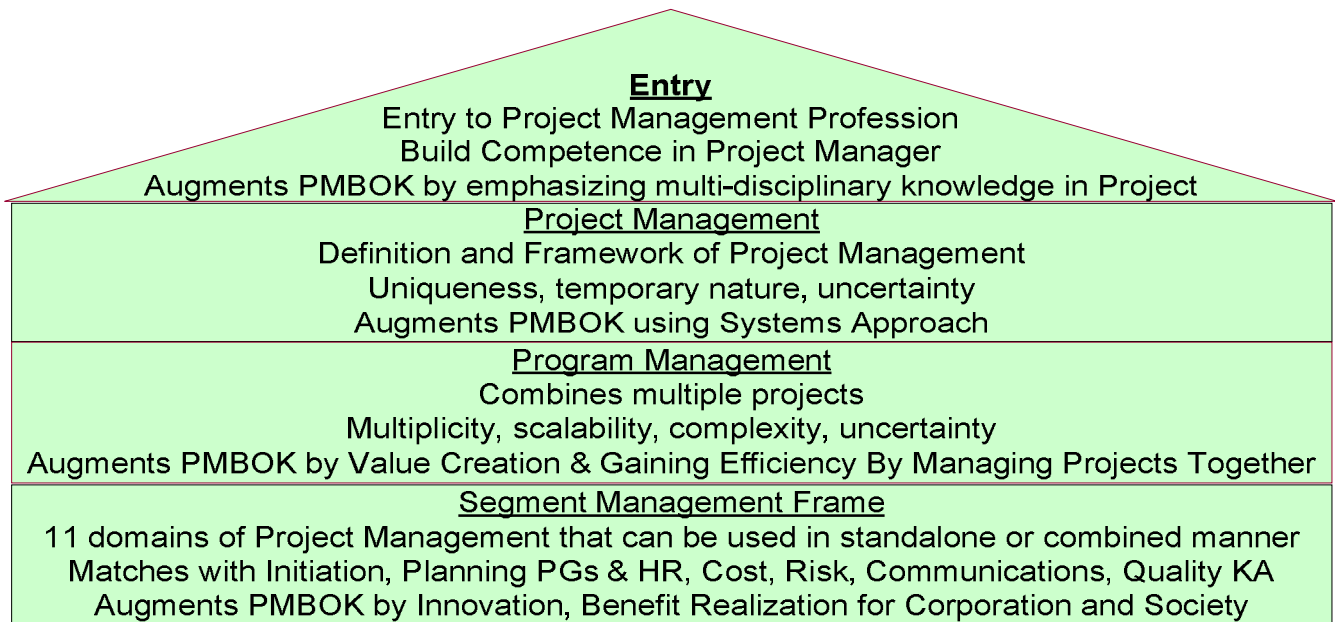


Fig 5.1: Tower Structure of P2M

5.3. High Level Synergies Between P2M and PMBOK

1. The Individual Management Frames match with Initiation and Planning PGs, HR, Cost, Risk, Communications and Quality KAs, OPAs and EEFs.
2. Entry of Tower Structure of P2M is partially covered in the Role of a PM (PMBOK section 1.6) and Project Management BOK (PMBOK section 1.7).
3. Project Management of Tower Structure of P2M is partially covered in Project and Project Management definition (PMBOK section 1.2 and 1.3).
4. Program Management of Tower of P2M is partially covered in Portfolio Management (PMBOK section 1.4.1) and Program Management (PMBOK section 1.4.2).
5. P2M manages Project Life Cycle through Scheme, Service and System Model. Scheme Model matches with Initiation and Planning PG of PMBOK. System Model matches with Planning and Executing PG of PMBOK. Service Model is not adequately covered in PMBOK.

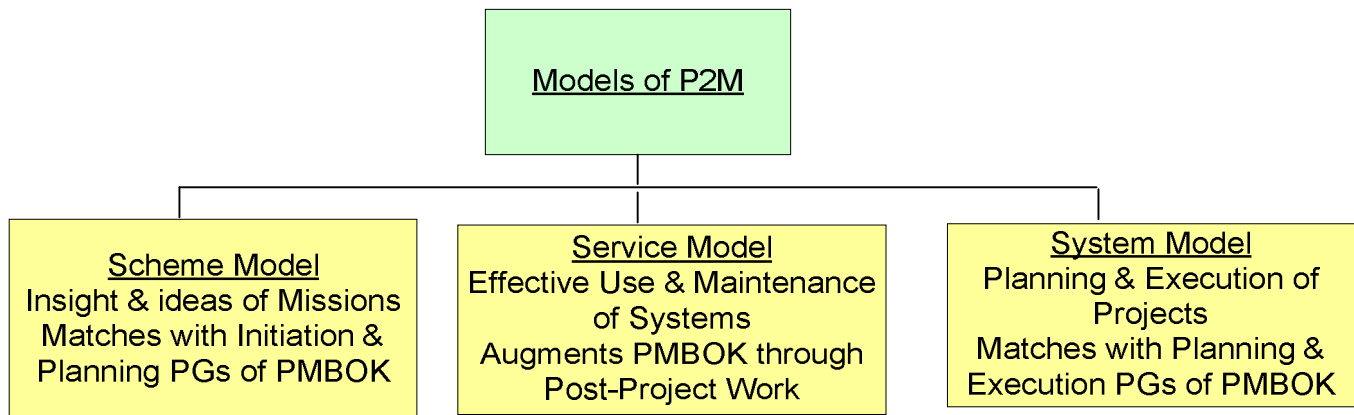


Fig 5.2: Models of P2M – Manages Project Life Cycle

5.4. High Level Differences In Approach Between of P2M and PMBOK

1. Both P2M & PMBOK focus on the Project, only P2M focuses on Organization and Program: P2M is based on a "tower structure" (Weymier, 2004) which is aligned with business objectives and multiple projects (program) in corporate portfolio. PMBOK is dedicated to single projects but P2M focuses on programs and portfolios. In that sense, P2M resembles OPM3. P2M by its very name reflects an intent to enlarge the scope of project to program management for benefit realization for the overall organization.
2. P2M acknowledges that a Project may affect a Portfolio: A single project, or a change in a project can affect multiple projects in a program and portfolio. PMBOK does not provide guidance on how change in a project affects an organization's objectives.
3. Influence of society and environment: P2M puts higher emphasis on the society and the environment that affects projects and programs, especially the ones with long durations.
4. The first generation of project management followed the triangle of Quality-Time-Cost. The second generation tried to improve organizational competitiveness. P2M opens up a third generation of project management using a holistic viewpoint by stating that a company, business, public works and public services need to adapt to changes in environment.
5. P2M manages Project Life Cycle through Scheme, Service and System Model. PMBOK is focused on a project which has an end date. For this reason, PMBOK does not cover ongoing operation. The post-project work that can be an operation, or a follow-up project is covered in Service Model of P2M.

6. Integration of project business strategy in P2M versus delivery focused traditional Project Management in PMBOK: P2M does it by efficiently managing projects under a program.

7. Value Creation in P2M versus Processes in PMBOK: P2M aims to create value for the business and the society and meet project targets by engaging skilled project professionals who can solve complex problems. On the contrary PMBOK prescribes 42 processes to improve project success.

5.5. High Level Gaps in P2M that are Covered in PMBOK

P2M provides a minimum set of 11 domains in Segment Management Frame. It assumes cost and time involved in the execution of 11 domains. However, it does not note procurement, which is a KA in PMBOK. Further, it does not list specific tools and techniques of the 11 domains. As P2M takes a holistic problem solving approach, it does not emphasize on the PGs of PMBOK. The PGs in P2M are hidden in Scheme, Service and System model that are used to define the life cycle of a project in P2M.

5.6. Detailed Comparison of P2M with PMBOK – Enhancing PMBOK

5.6.1. Entry of P2M Tower Structure Enhancing PMBOK

Entry introduces a professional to the discipline of project management and helps the professional build the necessary competencies required for project management. P2M emphasizes that the professional should have knowledge and discipline in multiple disciplines and emerging techniques. PMBOK notes that a PM is an expert in the discipline of project management but he may not have expert power. P2M emphasizes expert power, which can be used to enhance the knowledge base of a PM using PMBOK.

5.6.2. Project Management of P2M Tower Structure Enhancing PMBOK

Project management in P2M aims to solve complex problems by “deciphering complex issues, developing or interpreting missions for breakthroughs, and paving roads to optimal solutions through programs” (Ohara, 2005). Thus, P2M puts more stress on solving complex problems through creative thinking, break-through and innovation. This approach can enhance the Planning, Executing, Monitor and Control PGs, improve quality, reduce cost and time.

5.6.3. Program Management of P2M Tower Structure Enhancing PMBOK

P2M uses Project management to address complicated requirements, variable environments, wide application and efficiency of management of multiple projects as a program. It uses a comprehensive, multi-disciplinary, holistic approach which benefits

multiple projects in the program. P2M manages a program by aligning it with corporate strategy. This approach can enhance EEFs, OPAs in PMBOK and improve efficiency in program and portfolio management. Value Management (value creation), Strategy, Architecture Management (apply structure), Profiling Management (defines a mission) and Platform Management (collaborative space to share information) can enhance PMBOK.

5.6.4. P2M Segment Management Frame of P2M Tower Structure Enhancing PMBOK

11 Segment Management Frames can enhance Initiation, Planning PGs and HR, Cost, Risk, Communications and Quality KAs, OPAs and EEFs.

11 P2M Segment Management Frames	Enhancement of BOK and I/TT/O of PMBOK
1. Project Strategy Management: Strategy aligns a project with corporate strategy to create value for the corporation.	<i>Strategy</i> enhances project selection and input to Develop Project Management Plan. This improves competitiveness, reduces cost and improves quality. It aligns a project within a program and portfolio. <i>Balanced scorecard</i> adds as TT for Collect Requirements. Strategy helps a corporation mature into projectized organization.
2 Project Systems Management: It addresses uncertain or unexpected situations in planning and managing a project. Multi-disciplinary systems approach helps in resolving them.	Enhances input of Direct and Manage Project Execution Situational and Participative management. This style of management adapts to unique circumstances in a project. Adding <i>soft systems approach</i> is useful for resolving psychological, social and cultural problems in a project.
3. Project Finance Management: A project control method to build a structure for procuring funds for implementation of a project.	Enhances Cost, Risk and Procurement KA. <i>Optimum risk sharing, coordination and contracting</i> ensure the project's feasibility and profitability. <i>Assessment of business eligibility and economic efficiency</i> enhance TT of Cost KA and periodic health check of project.
4. Project Organization Management: Project organization creates value by engaging teams, corporations, departments, groups etc. which may have different objectives but come together to reach common goal of the project.	Enhances Scope, Cost, HR KA, EEFs and OPAs by realizing project and organizational objectives. It improves project productivity and organizational maturity. It increases job satisfaction of the project team through participation, engagement and showing of respect. Team decision-making ability is improved through collaboration.
5. Project Goal Management: Project aims to meet or exceed customer satisfaction by meeting scope and quality within time and budget.	Enhances input to Project Charter and Develop Project Management Plan by identifying project KPI and success criteria. The PM continually monitors project so that the target is met.
6. Project Resource Management: Resources include human, money,	Platform provides a space to collaborate work essential for building and sharing information. This

machine, material, project platform, information and any intelligence.	can enhance TT of Plan Communication and Distribute Information.
7. Risk Management: Proactive risk identification management is necessary throughout the project.	Enhances TT of Risk KA. Project can be terminated if it fails to realize business value and corporate objective. (Zeitoun, 2011). This is not covered in PMBOK.
8. Project Information Technology Management: Proper use of IT tools can improve project efficiency.	Enhances Project Management Information System (PMIS) and OPAs and TT of Plan Communication. It accumulates information in OPAs that can be used in future projects for parametric and analogous estimates.
9. Project Relationship Management: It defines the communication matrix for managing expectations of stakeholders of various interest and influence.	Enhances input to Identify Stakeholders and Manage Stakeholder Expectations. P2M emphasizes building long term relationships with stakeholders, win-win negotiation and managing interfaces between stakeholders.
10. Project Value Management: Projects create value for stakeholders. However, some stakeholders can be adversely affected.	Enhances output of Project Charter, Stakeholder Register, project KPI and benefits realization of the goods and services delivered by the project. It results in business continuation, investment collection and technology transfer.
11. Project Communication Management: Poor communication is prime reason for project failure.	Enhances TT of Communication KA. P2M recognizes that team members may be virtual and not co-located. It endorses communication that is appropriate for the team.

6.0. APMBOK versus PMBOK

6.1. History, Driving Force and Adoption of APMBOK - Comparison with PMI

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 formally named. The APM, based in the United Kingdom, is the largest member of the IPMA. The APM Body of Knowledge (APMBOK) was first published in 1991 because APM felt that the PMBOK only covered project execution and did not cover topics on the interactions with stakeholders and interpersonal skills. In 2006, the fifth edition of APMBOK was published. APM has a certification system similar to that of the ICB and IPMA. They also offer their own unique certification of *APM Registered Project Professional* (Boyce, 2010).

6.2. APMBOK Concepts

APMBOK describes 30 technical, 9 behavioral and 8 contextual competencies. These competencies outline a broad range of skills for a PM ranging from technical skills and application to interpersonal skills with stakeholders and employees (APMBOK

Definitions, 2011). APMBOK includes ideas and knowledge that may only apply to some projects which is a "more inclusive" approach to project management knowledge. For example, APMBOK includes the topic of safety in projects whereas PMBOK does not (Brewin, 2010). However, APMBOK covers its wider range of topics at a lower level of detail with the assumption that detailed descriptions and methods can be found elsewhere (Morris, 2004).

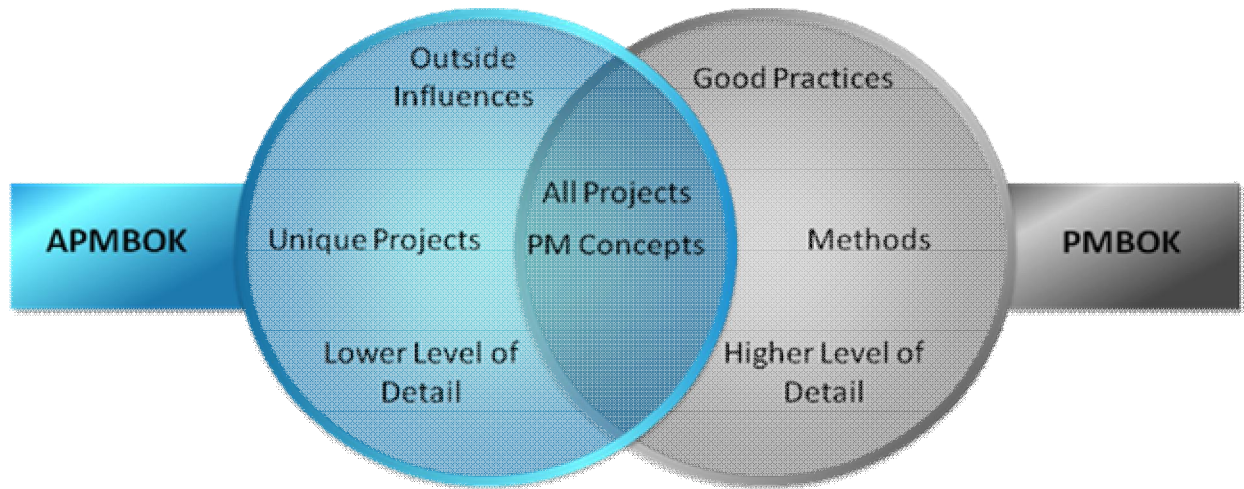


Figure 6.1: Graphical View of APMBOK compared to PMBOK

6.3. General Differences In Approach Between of APMBOK and PMBOK

1. A broader perspective: The APMBOK takes a broader and higher level overview of project management than the PMBOK.
2. PMBOK is more process based: PMBOK defines 42 processes that a PM could follow to execute a project. APMBOK focuses on defining core competencies that a PM should understand but not necessarily the steps a project manager should take to implement those competencies.
3. APMBOK is more concise: APMBOK covers a broader range of project management material and is less than 1/2 of the size of PMBOK. Each topic in APMBOK is covered at a high level of generality with the assumption that the reader can reference other sources on the topic for further detail. While PMBOK also references other sources for further material it goes into great detail into defining each process step.
4. PMBOK focuses on single projects: PMBOK is very focused on the management of single projects. APMBOK has sections for program and portfolio management. It also takes into account a company's project portfolio in the governance of project management within an organization.

5. PMBOK focuses on ideas that apply to all projects: APMBOK includes topics that only apply to some projects whereas PMBOK mainly focuses on topics that apply to all projects. (Morris, 2004)

6.4. High Level Gaps in APMBOK that are Covered in PMBOK

1. PMBOK details processes in somewhat linear fashion: The 42 project management processes in PMBOK are defined in an orderly fashion. PMBOK is aware that some processes will overlap or become iterative but it is laid out in a generally linear fashion. APMBOK seems to cover a wide range of topics with no clear order on how or when to execute or implement each competency.

2. PMBOK categorizes each process as part of PG: All of the 42 processes of PMBOK are assigned to one of the five PGs. The competencies in APMBOK are assigned to specific sections but the sections do not have to do the different phases of a project. The competencies in APMBOK are instead categorized by different aspects of project management (APMBOK Definitions, 2011).

6.5. High Level Gaps in PMBOK that are Covered in APMBOK

1. PMBOK Does not cover interpersonal skills in detail: PMBOK only recently added Appendix G to cover interpersonal skills whereas APMBOK has most of the "People and Profession" section dedicated to interpersonal skills (APMBOK Definitions, 2011). APMBOK recognizes that no matter how well a project is executed according to PMBOK's processes it will fail if the proper interpersonal skills aren't used with the stakeholders and employees.

2. APMBOK goes beyond planning, control tools and techniques: PMBOK focuses in great detail on project planning, project control tools and their associated techniques. However, it does not cover in detail broader topics that also have a major influence on project success. APMBOK includes some of these topics such as technology management, economics and finance, organization, people skills and social and environmental context (Morris, 2004).

6.6. Detailed Comparison of APMBOK with PMBOK- Enhancing PMBOK

The following section identifies the 47 competencies and their respective section defined in APMBOK and compares them to PMBOK's 5 PGs, 9 KAs and 42 processes. For each APMBOK competency it was stated how that competency could enhance PMBOK. Competencies that are already covered thoroughly in PMBOK are not included in the table.

Technical Competencies and Description	Enhancement of BOK and I/TT/O of PMBOK
2.1 Project Success & Benefits Management: Defines project success and its benefits to the organization.	Monitoring of benefits to the organization throughout the project can enhance PMBOK as part of the Monitoring & Controlling PG.
2.3 Value Management: Defines what value means to the organization or individual project.	This can enhance PMBOK in the Planning PG and the Monitoring and Controlling PG. Clearly identifying not only risks but also opportunities within the project will increase chances of success. PMBOK does not cover even at the text level (Morris, 2007).
3.8 Issue Management: Identification and resolution of issues that could endanger the success of the project.	Issue management can enhance the Project Quality Management KA with the Executing PG as a new PMBOK process. PMBOK does not describe at a topic level effective ways of identifying, managing and resolving issues that are bound to rise during a project. Issues are almost guaranteed to arise during a project and having detailed techniques for resolution could help to save projects.
4.2 Development: Progression of a preferred solution to an optimized solution during the initiating and planning phase.	Further discussion of this in PMBOK could make for product or services that better meet the stakeholder's wants and needs at project close. <i>Development</i> can enhance PMBOK in the Project Integration Management KA of the Initiating PG and Planning PG.
4.4 Technology Management: Identification of current and emerging technologies related to the project and how these can be used to improve or manage the project	This competency can enhance the Project Integration Management KA of the Executing PG. In Project Integration Management the tool/technique of <i>technology forecasting</i> , for example, could be useful in projects of longer duration (APMBOK, 2000). Technology becomes more complex every year and it is important for a project manager to be able to understand, utilize and manage existing and emerging technologies.
4.5 Value Engineering: Optimization of conceptual, technical and operational aspects of project deliverables.	It is briefly mentioned in PMBOK. A more detailed discussion of how a project manager can continually improve the product or service as it is being developed would be beneficial. This can enhance Project Integration Management KA of the Executing PG.
4.6 Modeling and Testing: Designing models that duplicate the physical or operational aspects of a deliverable and the testing of deliverables	The Project Risk Management KA can be enhanced by Modeling and Testing in the Planning PG. PMBOK sparsely covers modeling and can benefit from the potential time and cost savings effective models and test could offer.
4.7 Configuration Management: Creation, maintenance and change of configuration during the	Configuration Management is not covered well in PMBOK. PMI also publishes <i>Practice Standard for Project Configuration Management</i> . However, a higher level of detail as a general project management competency can enhance the body of

project.	PMBOK.
5.1 Business Case: Justification for undertaking a project. It evaluates the benefits gained from the project versus the costs and risks of the project.	This APMBOK competency can enhance PMBOK in the Project Integration Management KA of the Initiation PG. Validate the business justification of a project. Being able to identify both internal and external (e.g. <i>market forces</i>) that affect the Business Case are helpful during project initiation (RPP, 2011). Without a solid business case most projects can't begin or exist.
5.2 Marketing and Sales: Predict and identify client needs, provide and promote projects at the right time, cost and quality.	Marketing and Sales can enhance the Project Integration KA in the Initiating PG. This is another important aspect to starting certain types of projects. This is another example of how PMBOK covers only topics that apply to projects on a universal level. APMBOK is more inclusive with covering topics that only apply to some projects.
6.5 Handover and Closeout: Project deliverables are handed over and all aspects of the project. Project review also takes place in this section.	This section can be used to enhance the topics covered in PMBOK's Closing PG, specifically in section 4.6; PMBOK does not go into great detail on project closeout.
6.6 Project Reviews: Happens during and after project life cycle to monitor achievement and application of project objectives to original Business Case.	This competency can enhance the Project Integration Management KA of the Closing PG. PMBOK covers project review extensively during project execution but does not cover post project review in detail.

Behavioral Competencies and Description	Enhancement of BOK and I/TT/O of PMBOK
7.1 Communication: Importance of in PM and strategies and methods for effective communication.	APMBOK goes further in describing the ways communication works and its application to interpersonal skills. PMBOK is starting to cover this topic in the 4th edition with the addition of Appendix G: "Interpersonal Skills."
7.2 Teamwork: Collaboration as a team towards a goal as opposed to a group.	Enhancing PMBOK with knowledge from this competency from APMBOK can further improve Appendix G in PMBOK.
7.3 Leadership: Discusses importance of strong leadership for promoting the Project Vision (RPP, 2011).	This competency is briefly covered in Appendix G: "Interpersonal Skills" of PMBOK. Enhancing PMBOK with knowledge from this competency from APMBOK can further improve Appendix G in PMBOK.
7.4 Conflict Management: Methods and strategies for resolving conflict.	Enhancing PMBOK with further detail from this competency from APMBOK can improve PMBOK. Methods of anticipating and preparing for conflict preemptively could help avoid tense situations. Skills in being able to identify <i>root causes</i> of conflict would help a project manager resolve conflict more quickly.
7.5 Negotiation: Agree, accept, build consensus	Enhancing PMBOK with knowledge from this competency from APMBOK can further improve Appendix G in PMBOK.

among project parties.	
7.7 Behavioral Characteristics: Behavioral characteristics in PM for project leadership and management.	It is not covered at a topic level in PMBOK. Making project managers aware of behavioral traits that will improve their chances for success will help them continue to evolve in a positive way as a project manager.
7.8 Learning and Development: Continual improvement of competences.	It is important when working on projects and issues arise to learn and improve from those events. In not doing so a project manager will never fully develop.

Contextual Competencies and Description	Enhancement of BOK and I/TT/O of PMBOK
2.7 Health, Safety and Environmental Management: Identify laws, regulations, safety risks and manage them.	It can enhance PMBOK in both the Planning PG and Monitoring and Controlling PG. Identifying and managing health, safety and environmental risks are critical in certain types of projects.
5.3 Project Financing and Funding: Secure capital for a project and distribute it in project, as needed.	PMBOK does not include details on securing and obtaining project funds during project initiation. Concepts of <i>cash flow</i> and <i>currency fluctuations</i> could be important to project managers for managing funding throughout the project (APMBOK, 2000).
5.5 Legal Awareness: Briefly mentioned throughout PMBOK but is not covered at a topic level.	<i>Legal Awareness</i> enhances Project Integration Management KA of the Monitoring and Controlling PG would further improve PMBOK. Constant awareness of the legal aspects of a project and all of its associated resources will improve a project's chances for success.
6.10 Governance of Project Management: Centralized decision for corporate efficiency.	Effective governance ensures that a company's project portfolio is in line with the company's goals and objectives. PMBOK does not cover this because it only focuses on single projects.

7.0. Scrum versus PMBOK

7.1. History and Adoption of Scrum

In the early in 1990's after the traditional Waterfall model for project development was beginning to be seen as inadequate many lightweight software development models were introduced such as Scrum. Scrum was developed by Ken Schwaber and Jeff Sutherland in the early 1990s and was first published at an OOPSLA conference in 1995. The name came from rugby to emphasize teamwork for project success. Scrum was first implemented at companies such as Individual Inc, Fidelity Investments, and GE Medical. Since then the Scrum Alliance has garnered over 100,000 individual members and is still growing. Although Scrum was born in the IT world its processes

are far reaching. PMBOK could be improved by incorporating some of Scrum's agile methodologies which have proven to be very successful (Schwaber, 2011).

7.2. General Differences In Approach Between Scrum and PMBOK

Scrum's approach to a lightweight highly iterative process is very different from PMBOK's highly defined process focused project management style. Each model has success in completing projects but they have very different approaches and strengths. Scrum's approach is to complete work in a highly iterative set of tasks that is controlled by the product owner. This approach is focused on delivering a working product to market as fast as possible and then continuing to build upon it; and it succeeds time after time. Scrum can be very easy to learn and understand but mastering its methodology can be challenging. It requires strong management support, fundamental organizational changes and buy-in on core concepts from all stakeholders involved.

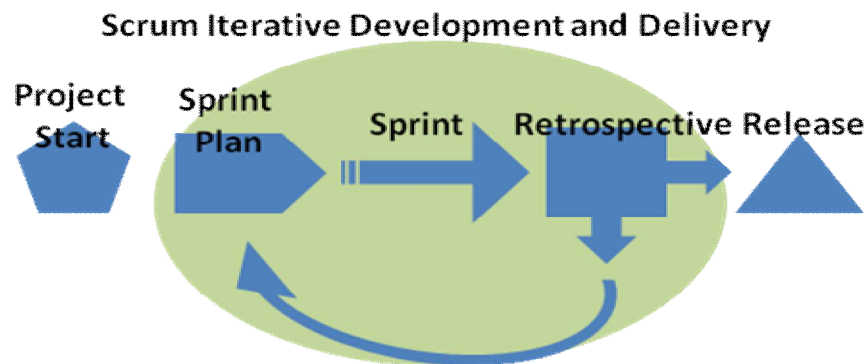


Figure 7.1: Life Cycle of Sprint in Scrum

- 1. Quick Turnaround:** Unlike PMBOK which uses a more traditional long running development period, Scrum focuses on small bursts of work that aim to create a functional deliverable. The bursts of work are done in development periods of 2-4 weeks (a Sprint) and a sprint can be canceled at any time. This is vastly different than PMBOK where the first deliverables can be months from project start.
- 2. High Agility:** Scrum sprints are short, allowing changes to be incorporated into the next sprint which is in just a few short weeks. This allows Scrum to make adjustments constantly.
- 3. Pre/Post Assessment:** Lessons learned are discussed before and after each Sprint meeting. This is done in PMBOK at end of a project or phase. Scrum holds these meetings once a month. The Initiation meeting incorporates lessons learned from the previous cycle. It decides the scope of work to be performed in the current Sprint. The closing meeting reflects on things that worked well and things that need to be improved for the next Sprint. These meetings provide momentum to project.

4. Ideology: PMBOK attempts to detail every process and knowledge area that is relevant to a project leaving little to interpretation and judgment. Scrum takes the opposite approach by only providing a framework to build a project around that can be customized to the Product Owner's desires. To give a basic idea of how different the approaches are between the models just look at their size: the PMBOK guide is 450 pages long whereas the Scrum guide is just 17!

5. Risk: Both PMBOK and Scrum provide methods for handling risk. PMBOK introduces a set of risk management guidelines from identification through closure by monitoring and buying down the risk as the project progresses. Scrum strategically attacks and closes risks in each Sprint. Tasks can be shifted to start early or later based on the discretion of the Product Owner to buy down risk early or push it out.

6. The Process Enforcer: Scrum does not just have a PM. It has a Scrum Master and Product Owner. The Scrum Master is the individual responsible for ensuring that the Scrum process is being followed properly and helps the team stick to the plan as well as aid the Product Owner by giving them information on the progress being made by the team. The Scrum Master will help everyone understand the Scrum process as well as act as a deputy to the Product Owner. This allows the Product Owner to focus on external problems while the Scrum Master focuses on internal problems for a divide and conquer approach to the project.

7.3. High Level Synergies Between Scrum and PMBOK

Although there are many differences between Scrum and PMBOK, there are also a few key similarities between the two processes.

1. Both Scrum and PMBOK claim to be a solution for completing complex problems/projects. While there are certainly differences between how each of the models go about solving this problem they both claim the ability to reach the same goal.

2. Both processes emphasize the importance of having their project teams speaking the same language. They will list several key words and define them and make sure that everyone on the project is familiar with those common terms which allows for clear communication.

3. Both follow the PDCA cycle for continual improvement, more so in Scrum.

7.4. High Level Gaps in Scrum that are Covered in PMBOK

There are many things in PMBOK that are not even attempted to be covered in Scrum. Scrum's largest strength and largest weakness is its simplicity. Scrum can be aligned and compared with PMBOK in a very few categories but in general PMBOK exceeds Scrum vastly. Adding more detail to Scrum would make it just like any other guide.

However the Scrum guide could perhaps be enhanced so that its core practices and structure could be applied above and beyond the low level project team. This type of practice could perhaps already be occurring, but altering the guide to be either more vague on its implantation or include a list of suggested implementations may help.

7.5. Detailed Comparison of Scrum with PMBOK - Enhancing PMBOK

This section will break down the major components of Scrum and describe how they are used within the Scrum process. That component is then analyzed to determine, which knowledge area (KA) and process group (PG) best matches up to from PMBOK.

7.5.1. Theory

Technical Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
1.01 Define Project Language: <i>Transparency</i> – Scrum artifacts, co-located team, daily meeting improves visibility among team members and who is doing the work. This also defines common standard and shared goal.	<ul style="list-style-type: none"> Enhances Communications KA and Initiation PG. It enhances Communications Mgt., gives team and customer a common language, increasing clarity and reducing rework
1.02 Perform Quality Control: <i>Inspection</i> - Scrum users must frequently inspect Scrum artifacts and progress toward a goal to detect undesirable variances. Inspection should not be so frequent that it gets in the way of the work. Inspections are most beneficial when diligently performed by skilled inspectors at the point of work.	<ul style="list-style-type: none"> Matches with Quality KA and Monitoring and Controlling PG. Enhances the content of Inspection TT of Quality Control process.
1.03 Deviation Correction: <i>Adaptation</i> – The resulting process will be acceptable if one or more aspects of a process deviate outside acceptable limits. The process or the material being processed must be adjusted as soon as possible to minimize further deviation.	<ul style="list-style-type: none"> Enhances Integration KA and Executing PG. Adding deviation control will be a powerful tool for the execution team to use in an effort to right the course of a project.

(Schwaber, 2011)

7.5.2. Team

Technical Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
2.01 Human Resource Plan: <i>The Product Owner</i> - Responsible for maximizing the value of the product and the work of the Development Team. Product Owner is the responsible for managing the Product Backlog.	<ul style="list-style-type: none"> Enhances HR KA and Planning PG. Enhances output to Develop HR Plan by defining roles and responsibilities.

<p>2.02 Human Resource Plan: <i>The Development Team</i> – A high performance team is comprised of mutually accountable, technically competent and diverse team members to deliver a potentially releasable increment of product at the end of each Sprint. Teams are structured and empowered to manage their own work.</p>	<ul style="list-style-type: none"> • Enhances HR KA and Planning Process Group • Enhances output to Develop HR Plan by creating high performance team which improves efficiency, effectiveness, synergy and motivation by building mastery.
<p>2.03 Human Resource Plan: <i>Project Process Champion</i> - Scrum Master is responsible for ensuring that Scrum is understood and enacted. He is a servant-leader. He manages expectations of stakeholders outside of the Scrum team. He helps everyone manage interactions to maximize the value created by the Scrum Team.</p>	<ul style="list-style-type: none"> • Enhances HR KA and Planning PG. • Enhances output of HR Plan by defining the role of Project Process Champion. He may be high ranking official with high stake in the project. He will support the project, resolve conflict and obtain funds.

(Schwaber, 2011)

7.5.3. Events

<p>Technical Competence and Description</p>	<p>Enhancement of BOK and I/TT/O of PMBOK</p>
<p>3.01 Agile Project Execution: <i>The Sprint</i> – The heart of Scrum is a Sprint. It is a time-box of one month or less during which a “Done”, useable, and potentially releasable product increment is created. Sprints have consistent durations. New Sprint starts immediately at the end of previous Sprint. A Sprint consists of Sprint Planning Meeting, Daily Scrums, development work, Sprint Review Meeting and Sprint Retrospective.</p>	<ul style="list-style-type: none"> • Enhances Integration KA and Planning, Execution, Monitor and Control PG. • Addition of Agile Project Execution instead of traditional project execution provides an alternative highly iterative process could be swapped in within the current PMBOK framework. This will time box tasks and improve time to market.
<p>3.02 Increment Planning: <i>Sprint Planning Meeting</i> – It plans the work to be done in a Sprint. This plan is created by the collaborative work of the entire Scrum Team. It determines what will be delivered in the increment resulting from the upcoming Sprint and how will the work needed to deliver the increment be achieved.</p>	<ul style="list-style-type: none"> • Enhances Integration KA, Planning and Monitoring and Controlling PG. • Add as input to Develop Project Management Plan and Monitor and Control Project Work. Add formal mini planning sessions at logical check points to speed transition from task to task.
<p>3.03 Alignment Meetings: <i>Daily Scrum</i> - The Daily Scrum meeting is a 15-minute time-boxed event for the Development Team to synchronize activities and create a plan for the next 24 hours. This is done by inspecting the work since the last Daily Scrum and forecasting the work that could be done before</p>	<ul style="list-style-type: none"> • Enhances Integration KA and Planning and Execution PG. • Add as input to Direct and Manage Project Execution. Alignment Meetings help team members to catch up on work performed in their area. It proactively identifies future problems.

the next one.	
<p>3.04 Project Retrospective: <i>Sprint Retrospective</i> – It is an improvement plan. This is enacted in the next Sprint. It occurs after Sprint Review and before next Sprint Plan meeting. It is a three-hour time-boxed meeting for one-month Sprints. Less time is allocated for shorter Sprints.</p>	<ul style="list-style-type: none"> • Enhances Integration KA and Closing PG. • It adds a formal process to reflect on what worked well and what did not work well and why will greatly benefit future projects.

(Schwaber, 2011)

7.5.4. Scrum Artifacts

Technical Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
<p>4.01 Sequence Activities: <i>Product Backlog</i> – It is a list of all unfinished tasks and change orders needed for product. These tasks are ordered by priorities and values, as decided by customer. It serves as the single source of requirements. The Product Owner manages it.</p>	<ul style="list-style-type: none"> • Enhances Time KA and Planning PG. • Backlog enhances input to Define Activities and Sequence Activities processes. It will incorporate change requests faster. Customer can decide on the features to implement.
<p>4.02 Sequence Activities: <i>Sprint Backlog</i> – It is a set of unfinished tasks (Product Backlog) plus a plan to deliver them to the product increment to realize Sprint Goal. It is a forecast made by development team. It includes tasks to be done in the next increment.</p>	<ul style="list-style-type: none"> • Enhances Time KA and Planning PG. • Enhances input to Sequence by iteratively forecasting features to deliver.

(Schwaber, 2011)

7.5.5. Miscellaneous

Technical Competence and Description	Enhancement of BOK and I/TT/O of PMBOK
<p>5.01 Monitor and Control Risks: <i>Risk Management</i> - Scrum proactively and iteratively manages risk before it becomes issue. Risks are identified and planned in Sprint Plan. Risks are closed in Sprint Retrospective. Product Owner manages risks and executes backlog.</p>	<ul style="list-style-type: none"> • Enhances Risk KA and Monitoring and Controlling PG. • Enhances TT of many of the processes in Risk KA by providing a way to identification, plan and respond to risk.
<p>5.02 Control Scope: <i>Scope Management</i> – Scope changes in dynamic business which impacts time, money and schedule. Scrum minimizes these impacts by breaking the product into features and delivering the features of higher value. Customer decides the features to deliver. A project or Sprint ends when benefit is realized, irrespective of the tasks</p>	<ul style="list-style-type: none"> • Enhances Integration KA and Monitoring and Controlling PG. • Enhances input to Define Scope and Control scope by implementing tasks that pertain higher values to the customer. Tasks included in a Sprint can come from both unfinished tasks and change orders based on its

delivered.	importance to the customer.
<p>5.03 Early Release Evaluation: <i>Increased Speed to Market</i> – Time to market and is most critical in R&D and break-through projects. Cost is irrelevant. Scrum allows core functions to be completed early. In software, core product can be deployed while future enhancements are still worked on. In the hardware realm, development can be stopped after meeting the core functionality.</p>	<ul style="list-style-type: none"> • Enhances Scope KA and Planning, Execution, Monitor and Control and Closing PG. • Enhances TT of many of the processes in the above KA and PG by adding check by evaluating if an early release is needed, or feasible. Being the first to market gives competitive advantage.

7.6. Application of Scrum in Non IT Projects

Although Scrum was developed and is intended for use in the IT world, many of its paradigms can be applied to other industries such as engineering, finance, health-care and more. Every project could benefit by having their high value base features first with additional features following afterwards. This allows for change in scope, feedback incorporation, risk reduction and in turn higher customer satisfaction. Many organizations world-wide have implemented Scrum with success and even more organizations have taken concepts from Scrum and applied them to conventional project management models to speed up development time with success as well.

8.0. Specific Emphasis of 5 Standards and PMBOK

Research of 5 standards and PMBOK reveal that these standards emphasize on different areas. PMBOK is the most comprehensive standard. Few of the concepts below are from Morris. (2007).

Higher Emphasis	PMBOK	ICB	PRINCE2	P2M	APM	Scrum
Project Life Cycle	√			√		
Program and Portfolio				√		
Process Management	√			√	√	
Product Management			√			√
Competence of PM, Interpersonal Skills		√			√	
Customer Collaboration					√	√
Design and Technology Management					√	
Project Tools and Techniques	√					
Self-Managed, High Performance Team						√
Society, Environment		√		√	√	
Business Case			√		√	
Transparency in Communication, Management Support						√
Leadership, Conflict, Negotiation		√			√	
Innovation and Value Engineering		√		√	√	

Higher Emphasis	PMBOK	ICB	PRINCE2	P2M	APM	Scrum
Marketing		√			√	
Short Turn Around Time						√
Post Project Evaluation				√	√	
Adapt to Change						√
Health, Safety, Legal		√		√	√	
Early Risk Identification			√			√
Delivery of High Value Features First						√

9.0. Unity in Diversity Among 5 Standards and PMBOK

All the standards are performance based, not prescriptive. However, Scrum tends to be prescriptive in certain areas by requiring a daily stand-up meeting. PRINCE2 leans towards being prescriptive by providing clear guideline on what needs to be done and by whom. They all provide guidelines that can be followed to improve the success rate of project. The standards agree that one size does not fit all. As such, the non-prescriptive nature of these standards give liberty in choosing tools and techniques that best fit the particular project. All the standards can be applied in various degrees to meet the need for small, medium and large scale projects. The standards agree that quality, customer satisfaction and benefit realization are the key measures for project performance success. All the standards aim to improve project success rate by finding the right balance between people and organization structure, despite the uncertainties and risks presented by the unique nature of the project. The project manager is recommended to carefully choose the right standard that meets the unique need for a project based on the intra and extra organizational aspects of the corporation (Eberle, 2011).

10.0. This Project Report Aims To Enhance Future Edition(s) of PMBOK

PMI is planning to publish the next edition (edition 5) in the year 2012-2013. Early draft will be available in February 2012. Findings from this project could enhance PMBOK edition 5. PMBOK will continue serving as the generic, non-prescriptive guideline. The 9 KAs and 5 PGs will remain the same. The number of processes may increase or decrease from 42. There may be more coverage on agile program management in PMBOK, or in its newly created Agile Project track. PMBOK can certainly benefit by adding behavioral skills, innovation, safety and legal issues, without much change to its current content and structure. If not PMBOK, some of the findings of this project can certainly augment the foundational and practice standards of PMI. OPM3 can benefit from the findings of P2M. Many of the Practice Standards of PMI can be augmented by the competences identified in this project.

11.0. Global Effort to Create A Single Universal Standard

In the last 10 years, there had been an effort to create a single Project Management standard. None emerged as a single strong standard. Researchers of this project believe that it is a daunting task to create a single standard because of the vast area of expertise in Project Management. A single standard cannot cover it all. Politics and territorial mentality of different standards will impede the formulation of a single standard. Operational Level Cooperation Initiative (OLCI) was established in 1999 to create a global body of Project Management knowledge. It recognizes that Project Management knowledge exists independently in various guides. A project for development of a framework of Global Performance-Based Standards for Project Management was initiated in 2000 to develop an agreed framework. The Global Alliance for Project Performance Standards (GAPPS) was introduced in 2002 as an alliance of government and private companies to create globally applicable competency based standards. PMBOK, ICB, Prince2, P2M map to GAPPS.

12.0. Summary

This project report notes high level similarities and differences between PMBOK and 5 Project Management standards. It makes a deep dive into 5 standards to identify concepts and competences that are not sufficiently covered in PMBOK. It describes how these new competences enhance the BOK and/or I/TT/O of one or more processes of PMBOK.

13.0. Conclusion

There is unity among different standards of Project Management. They all intend to increase the project success rate. Different standards do so by putting emphasis on different competences. PMBOK emphasizes on repeatable processes, ICB stresses on technical, contextual and emotional competences, Scrum brings customer collaboration, quick turnaround time, PRINCE2 focuses on product of the project in a controlled environment, P2M devises innovation and alignment with project portfolio and finally APM does so by design and technology management, business case and interpersonal skills. PMBOK will continue serving as the most dominant standard for the years to come. Other practice based standards will emerge to manage business in a dynamic environment. Key concepts from 6 standards of this project are shown below in Fig 13.1. This figure shows the inter-relationship between Process, People and Organization. These elements need to be managed at the right level with the right balance to improve success rate in a project.

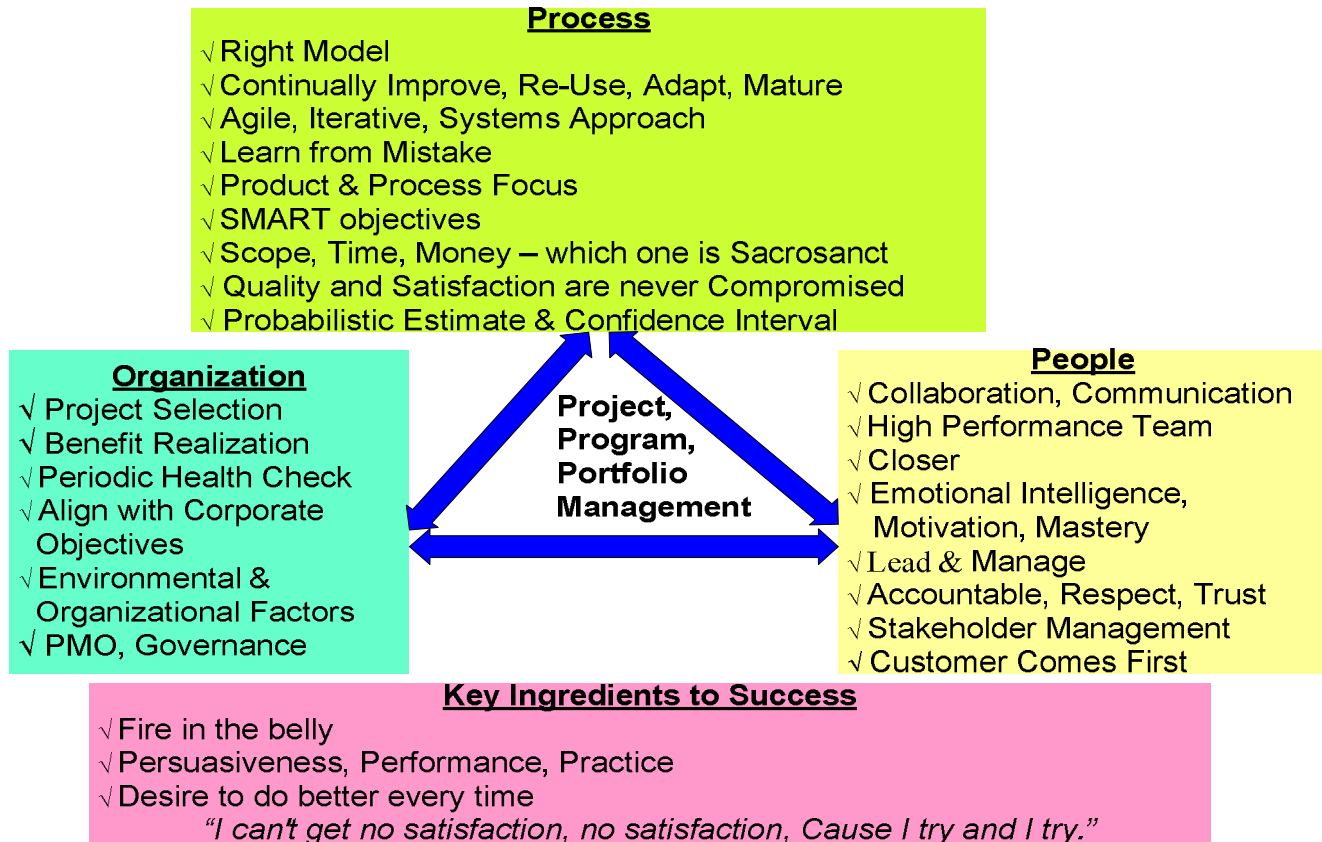


Fig. 13.1 Project Management Best Practices: Compiled from 6 Project Standards

14.0. Key Reflections

Project Management can realize benefit for the society and corporation by producing service and products that can be used for the years to come. At the same time, it can make positive changes to organizational culture and workplace environment which will improve the physical, mental, spiritual and emotional well-being of the employees, increase engagement, motivation, and make work more meaningful and rewarding.

APPENDICES

A 1. Project Plan

ENCE 662, Fall 2011
Team Project 1, The University of Maryland, College Park

Enhance PMBOK by Comparing it with P2M, ICB, PRINCE2, APM and Scrum Project Management Standards

Presented by:

Constructive Subversive Knowledge Seekers
“Change From Within”

A.1.1 Project Description

While PMBOK is the most widely recognized project management standard it does not cover all possible aspects of project management. There exist a variety of other standards that cover topics and ideas that are absent in PMBOK. It is the belief that some of these topics and ideas could be used to augment PMBOK to make a stronger project management standard. This project will be used a vector to conduct research on other widely known project management standards throughout the world and to find ways that the other standards could be used to supplement PMBOK with new or more in depth information.

This project will, at minimum, compare PMBOK to the following standards:

- IPMA Competence Baseline (ICB)
- P2M
- PRINCE2
- APMBOK
- Scrum Agile Standard

A.1.2 Project Requirements

The project requirements are separated into two sections, Report Body requirements and Appendix requirements.

The report body will meet the following requirements:

- Maximum of 25 pages
- Font is to be Times Roman 12 pt or Arial 11 pt.
- Report must be in Microsoft Word format.
- Compares and contrasts each the identified standards to PMBOK.
- States how each standard could potentially augment PMBOK.

- Includes diagrams and graphics to strengthen the presentation.
- Further compare/contrast PMBOK to additional standards if there is time.

The appendix will meet the following requirements:

- Include all project management information related to this project.
- Include lessons learned during the execution of the project.
- Include Works Cited to credit any external sources used during project research.
- Include definitions of key glossary terms or abbreviations used throughout the paper.

A.1.3 Project Communication

Meet weekly every Sunday between 8:30 PM – 9:30 PM using Scopia, ENCE 60662 pass code. Response is required within 12 hours. First send email. If response is not obtained, call over phone.

Tools and technologies used in project communication are:

- Microsoft Project for project plan
- Scopia Video Conference was more effective than Teleconference.
- Email for permanent notes, record keeping, meeting minutes
- Phone for one-on-one conversation, addressing ambiguity and conflict.
- Google Docs for document sharing and editing
- Microsoft Office, Visio

A.1.3.1. Communications Matrix

Team member	Preferred Method of Communication	Not Available	Limited Availability	Available	Expected Response Time	Email	Phone
Bryan Wolfe	Email and Phone		Mon-Fri, 8 AM – 6 PM	Evenings and Week ends	12 hrs.	bwolfe02@shepherd.edu	
Danny Forrest	Email and Phone	Wed. evening	Mon-Fri, 8 AM – 6 PM	Evenings and Week ends	12 hrs.	danny333@gmail.com	
Danielle Lambert	Email and Phone				12 hrs.	dlambe24@gmail.com	
Sam Ghosh	Email and Phone	Wed. evening	Mon-Fri, 8 AM – 6 PM	Evenings and	4 hrs.	sgho@aol.com	

				Week ends			
Thomas DiNetta	Email and Phone		Mon-Fri, 8 AM – 6 PM	Evenings and Week ends	12 hrs.	tdinetta7@gmail.com	

A.1.3.2. Sample Meeting Agenda

Meeting Date and Time: October 19, 2011, 8:30 PM – 9:30 PM
 Venue: ENCE 60662, Scopia
 Meeting Attendees: Bryan, Danny, Danielle, Sam, Tom

Before Meeting:

Read over comments to your section of the paper that is attached. Skim over entire paper to get a "visual feel" for how it looks. Have Scopia working.

Meeting Agenda:

- 8:30 PM – 8:45 PM: Report on individual progress.
- 8:45 PM – 9 PM: Open issues from previous week(s), new issues, future risks.
- 9:00 PM – 9:15 PM: Open discussion, address variation in planned versus actual work.
- 9:15 PM – 9:25 PM: Task assignments for next week(s).
- 9:25 PM – 9:30 PM: Q&A and set up next meeting.

A.1.3.3 Sample Meeting Minutes

Meeting Date and Time: October 19, 2011, 8:30 PM – 9:30 PM
 Venue: ENCE 60662, Scopia
 Meeting Attendees: Bryan, Danny, Danielle, Sam, Tom

1. Everyone finishes the core draft for his/her assigned standard by Oct. 23 midnight and email all team members. Include graphics and references. Make it consistent with the outline discussed.
2. Abstract, Introduction, Commonalities, Conclusion core draft be finished by Sam by Oct 23 midnight. Sam emails everyone upon completion.
3. Secondary review of Tom’s Scrum will be started by Sam on Oct 24 and will be finished after mid-term.
4. Secondary review of Danielle’s P2M will be started by Sam on Oct 26 and will be finished after mid-term.
5. Secondary review of Bryan’s PRINC2 will be started by Danny on Oct 24 and will be finished after mid-term.
6. Secondary review of Danny’s APM will be started by Bryan on Oct 24 and will be finished after mid-term.
7. Integration of entire paper including Appendix of entire paper must start no later than Nov 7, if not earlier. These tasks will be decided and allocated on next week’s meeting.

A.1.4 Project Activities and Responsibilities

A.1.4.1 Project Activities, Estimation and Responsible Parties (Modified RACI)

If it were possible to estimate (approximate) the duration of a task, it was not broken any further. In the chart below:

(P) means primary contributor, who is accountable for the task

(S) means secondary contributor who collaborates with the primary contributor

(T) means tertiary contributor who collaborates with the primary and secondary contributor

It will not miss reader’s eye that many of the tasks started later than the planned start date and took longer than what was planned for. Secondary contributor was assigned to mitigate risk, collaborate, learn from each other and improve overall quality of the project.

Task #	Task Description	Contributor	Planned Start Date	Actual Start Date	Planned End Date	Actual End Date	Planned Hour	Actual Hour
1	Project Initiation (Form Team, Roles, Project Outline)	Everyone	Sept 12	Sept 12	Oct 1	Oct 1	20	24
2	Cover Page	Sam	Oct 10	Oct 10	Oct 15	Oct 16	4	7
3	Abstract, Intro., Specific Emphasis, Unity among Std., Global Std., Summary, Conclusion, Reflection	Sam	Sept 12	Sept 13	Nov 9	Nov 10	30	37
4	ICB	Sam	Sept 10	Sept 11	Oct 9	Oct 16	50	62
5	P2M (P)	Danielle	Sept 18	Sept 25	Nov 4	Nov 7	70	96
6	P2M (S)	Sam	Oct 15	Oct 24	Oct 21	Nov 12	6	30
7	Prince2 (P)	Bryan	Sept 12	Sept 18	Oct 16	Oct 23	30	40
8	Prince2 (S)	Danny	Oct 15	Oct 29	Oct 22	Oct 30	2	1
9	Prince2 (T)	Sam	N/A	Nov 7	N/A	Nov 12	0	10
10	APM (P)	Danny	Sept 21	Sept 21	Oct 22	Nov 12	20	26
11	APM (S)	Bryan	Oct 15	Oct 22	Oct 22	Oct 29	2	1

12	Scrum (P)	Tom	Sept 21	Sept 21	Nov 7	Nov 11	40	52
13	Scrum (S)	Sam	Oct 10	Oct 24	Oct 17	Nov 8	6	18
14	Project Management	Sam	Sept 18	Sept 18	Nov 13	Nov 13	15	34
15	Comparison with other standards in Appendix	Danielle	Oct. 22	Oct. 27	Oct. 29	Oct. 27	4	6
16	Paper Integration	Danny, Sam	Nov 6	Nov 12	Nov 12	Nov 13	10	20
17	Project Plan in Appendix	Danny, Sam	Sept 21	Sept 21	Oct 01	Nov 12	8	12
18	Microsoft Project Plan	Tom	Sept 21	Sept 21	Nov 12	Nov 13	10	12
19	Lessons Learnt - Hours Combined for Everyone	Everyone	Nov 6	Oct 27	Nov 6	Nov 13	4	5
20	Acronym List	Sam	Nov 7	Nov 7	Nov 13	Nov 13	4	3
21	Peer Feedback - Hours Combined for Everyone	Everyone	Nov 10	Nov 13	Nov 10	Nov 3	4	4

Total Planned Hours= 339

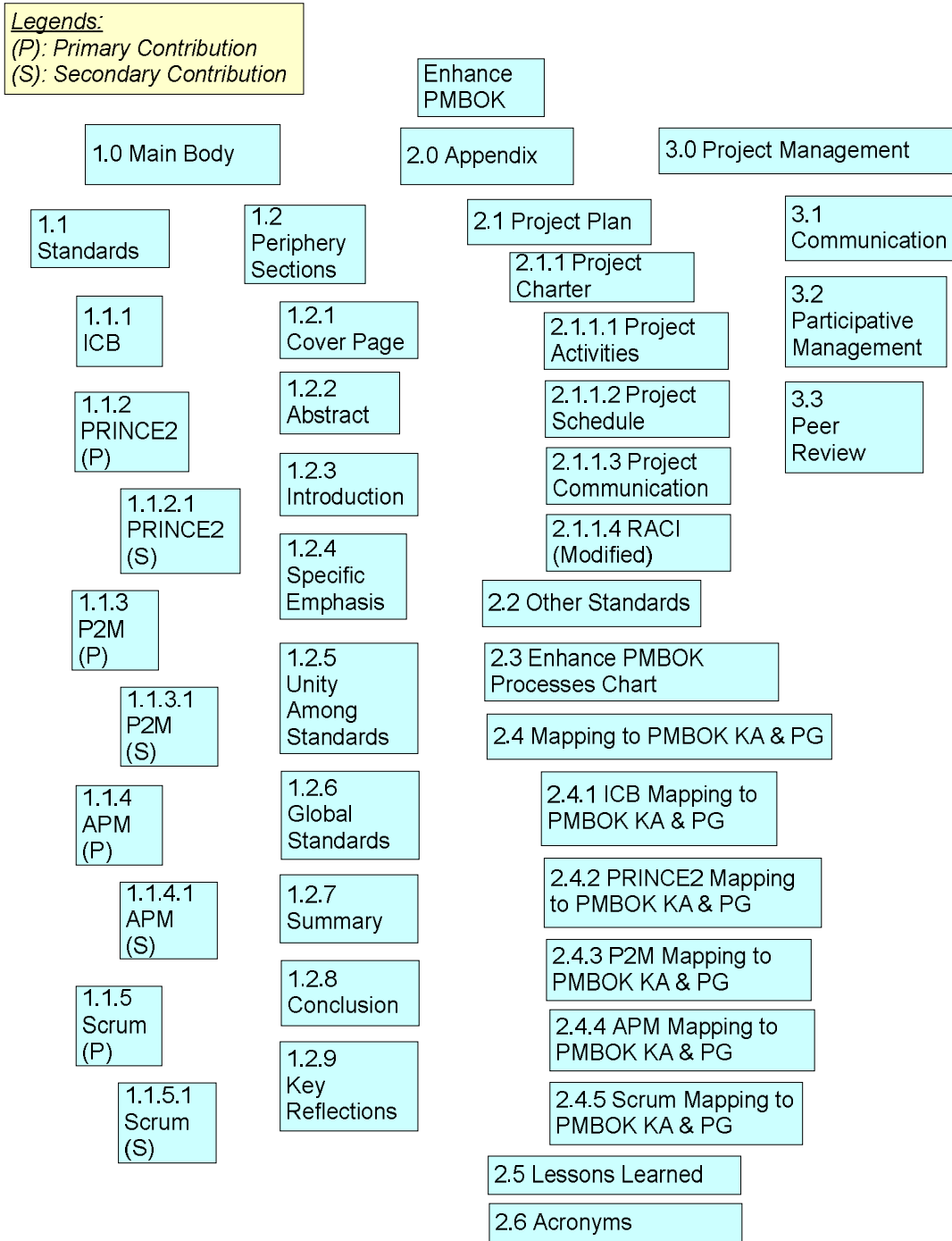
Total Actual Hours= 500 --> 161 additional hours (cost variance)

(Actual - Planned) / Planned = (500-339) / 500 = 47.5% (cost performance index)

The differences between planned and actual dates can be used to calculate schedule variance. However, at the end of the project the schedule variance becomes zero.

A.1.4.2 Work Breakdown Structure

The WBS includes all the tasks identified in section A.1.4.1



A.1.5 Human Resource Plan

See section A.1.4.1 that shows modified RACI with name of team member responsible for the primary task and the secondary contributors for the project task. Primary contributors were assigned in many tasks to mitigate risk, improve collaboration, team building, knowledge sharing and quality of the project.

A.1.6 Risk Management Plan

Producing consistent quality of work and meeting deadlines were identified as risks in the project. These were mitigated by:

- Assigning a second team member as the collaborator to many of the activities.
- Identifying unavailability of team members during the time-frame of the project.
- Project schedule did not require any project related work during the week of mid-term exam.
- Any unplanned change in a team member's scheduled needed to be notified ASAP.
- Team members were requested to share responsibility of work and help each other in case someone faced any unanticipated schedule conflict.

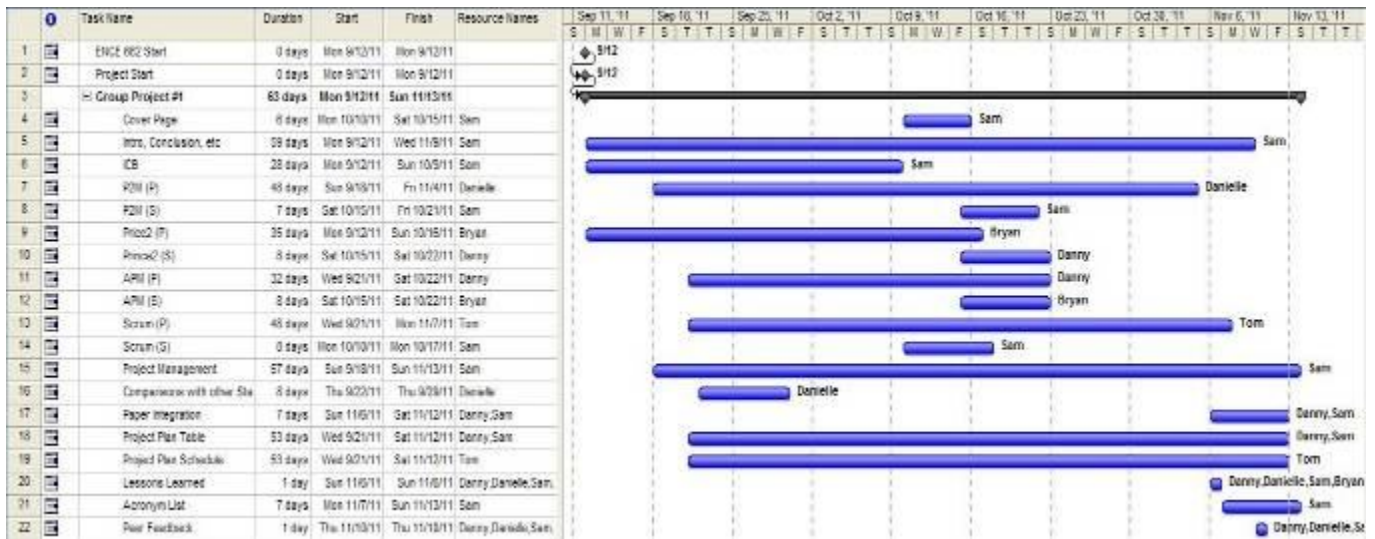
A.1.7 Project Time/Cost

Time (actual and planned) was only measured in this project. If a dollar value were assigned to the hours, cost of the project could also be calculated. Schedule slipped even with planning and risk mitigation plans. Time was fixed. Actual number of hours spent on the project was more than the planned.

A.1.7.1 Gantt Chart

The following two pages show the planned schedule outlined in Microsoft Project and the actual schedule outlined in Microsoft Project.

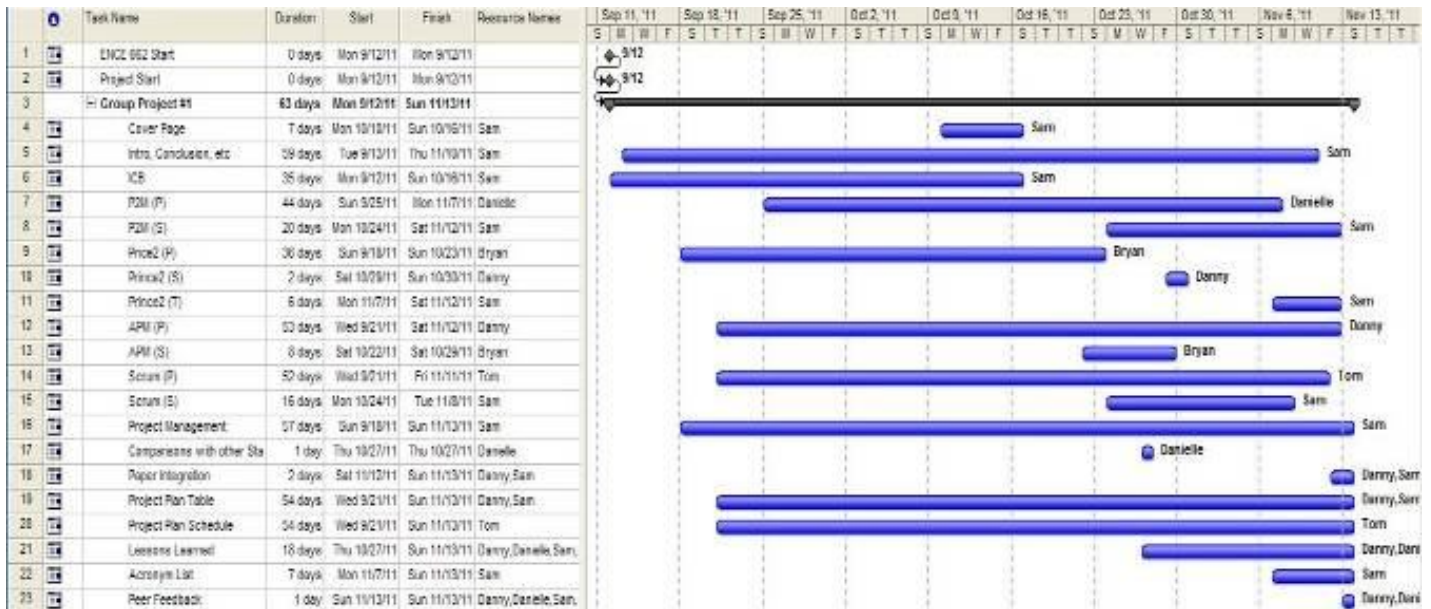
Project Schedule - Planned



- (P) – Primary researcher
- (S) – Secondary researcher/editor
- (T) – Tertiary researcher/editor

Intro Conclusion etc – This task included Introduction, Specific Emphasis, Unity among Std., Global Std., Summary, Conclusion, Reflection

Project Schedule - Actual



- (P) – Primary researcher
- (S) – Secondary researcher/editor
- (T) – Tertiary researcher/editor

Intro Conclusion etc – This task included Introduction, Specific Emphasis, Unity among Std., Global Std., Summary, Conclusion, Reflection

APPENDIX A.2

Overview of Other Worldwide Project Management Standards and Models

1. PMI Foundational Standards: Organizational PM Maturity Model (OPM3®), The Standard for Portfolio Management, The Standard for Program Management.

OPM3 helps identify and deliver projects to advance strategy. A new approach towards PM maturity wherein projects are considered not only at project level but also at program and portfolio level. It tells you when to stay the course and when to change direction. OPM3 uses inputs to align and select projects that will have results immediately and with long-term success. It helps make an assessment and decide to implement whichever is suited to them in terms of resources, priority and time available. Improve performance, return on investment and improves processes while increasing external pressures, operational and organizational efficiency (Bourne, 2011).

2. PMI Practice Standards and Frameworks: Risk, Configuration, Scheduling, Project Manager Competency Development Framework, Earned Value, WBS, Estimating.

Project risk management is a tool you can use to identify and prioritize risks before they occur, in order to minimize negative impacts on your projects. PCM is the collective body of processes, activities, tools and methods project practitioners can use to manage items during the project life cycle. PCM addresses the composition of a project, the documentation defining it and other data supporting it. It is a baseline- and requirements-management process that provides managed control to all phases of a project life cycle. Effective project scheduling and time management are critical factors in the success or failure of a particular project. The Practice Standard for Scheduling transforms chapter six of the PMBOK, Project Time Management, into an actionable and objective measurement process for project schedules and schedule models. This framework standard identifies ways to improve the personal competencies you need to be successful. Increase your capacity for personal growth with guidance for refining the three areas of PM competence: knowledge and skills, performance, and personal behavior and attitudes. Based on the fundamental principle that past patterns and trends can be good indicators of the future, EVM helps you clearly and objectively see where your project is going and compare it to where it's supposed to be. This standard describes the elements of EVM and offers examples of how it can fit any project or situation. WBS are used to define project deliverables and establish the structure to manage work to completion. This standard supplies PM's and team members with direction for the preliminary development and implementation of WBS. Effective PM requires consistent and repeatable processes and methodologies to manage the constraints of scope, time, cost and quality. The Practice Standard for Project Estimating provides guidance for achieving that through a sound estimating discipline for your project.

3. PMI Standards Extensions: Construction, Government.

The construction extension guide is applicable to construction projects worldwide through PM concepts and practice. The changes differ sufficiently from other industries and applications to warrant this update extension. The government extension guide outlines the principles for government projects and provides a framework to ensure efficiency, effectiveness and accountability. It provides an overview of the key processes used in most public sectors, defines

key terms, describes how government projects operate and reviews government program life cycles. PMI and the PMBOK have nine units of knowledge: Integration, Scope, Time, Cost, Quality, Human resources, Communications, Risk and Procurement Management. PMI also has Life Cycle and Organization, PM Processes for a Project, Safety Management, Environmental Management, financial management and claim management.

4. ISO 1006 for Quality Management.

ISO projects are strategically aligned. A project in ISO project has some degree of risk and uncertainty, an original phase of processes and activities. ISO is a specified quality of results with parameters pre-determined with a planned start and finish date that determine cost and resource constraints. ISO's quality plan documents procedures and associated resources specific to each project, product, process or contract. PMBOK projects are constrained by limited resources and planned, executed and controlled by people. PMBOK's quality plan describes how the PM team will implement its quality policy and which standards are relevant to the project. (Stanleigh, 2004)

5. P3M3, Portfolio, Program, and PM Maturity Model.

P3M3 is a mark of Office of Government Commerce UK. P3M3 offers a staged approach that supports an organization's journey through progressive maturity in all three domains. Both P3M3 and OPM3 have PM, Project vs. Program, PM processes, Portfolio Management, Role of PM, and organizational PM Processes. P3M3 are building on PRINCE2 for projects and managing successful programs. P3M3 is developed by PMI and PMBOK and the standards for Program Portfolio Management. (Bourne, 2007)

6. Australian Institute of PM (AIPM) National Competency Standards.

The AIPM is the national PM organization within Australia and has adopted the PMBOK as the basis of their certification program. The AIPA offers its own PM certifications for both individuals and organizations. In addition, Australia sits somewhat at the crossroads of PRINCE2 and the PMBOK, since both are well represented in that country. AIPM adopted the PMBOK nine units of knowledge: Integration, Scope, Time, Cost, Quality, Human resources, Communications, Risk and Procurement Management.

7. HERMES, Swiss Government PM method.

Based off of the German V-model. The five sub-models are PM, Quality assurance, Configuration management, Risk management, and Project marketing. HERMES improves integration of information security and data protection in project procedures. There are two project types, System development and System adaption with three dimensions result (what), Procedure (How), and Role (Who). Produced would be the project proposal, the operation manual, and system design while the procedure will be done by activities, and the work done will be by the PM, Purchaser, Solution architect, Users' representative, Quality manager, and Risk manager. Both PMBOK and HERMES have the WBS, PM's, communication, and project portfolio. (Belle, 2009)

8. ITIL, Information Technology Infrastructure Library.

ITIL deals with ITSM which is Information Technology Service Management which deals with quality issues, best practices and processes dealing with service delivery and service support. ITIL is a framework which is adjusted to fit the culture of the organization where as PMBOK leads to PM processes. Both ITIL and PMBOK share management practices, how management processes interact, techniques and tools, focus on descriptive process specification provide reference guidance a common language, and include many same elements applied to different domains. Both also provide the body of knowledge and code of best practice. PMBOK focuses on individual professional, code of ethics, and Procurement and ITIL does not. (Pultorak, 2005) In addition to standards, several models available are CMM, SEI Maturity Model, V-Model, Waterfall, Berkeley Maturity Model.

APPENDIX A.3

Enhancing PMBOK Processes from all 5 Standards

Chart below identifies new competencies from 5 Project Management standards and shows how they enhance and enrich the processes of PMBOK. This chart is a pictorial representation of the enhancements that are de cribbed in the body of the project report.

PMBOK Processes	ICB	Prince2	P2M	APM	Scrum
4.1 Develop Project Charter	Integration of social, technical and environmental (2.08),	Plan the initiation stage (13.9) Select project approach & assemble project brief (13.8) Authorize initiation (15.3.1)		Development (4.2) Business Case (5.1) Marketing and Sales (5.2)	
4.2 Develop Project Management Plan	Moving between the whole project to the detail and back again (1.08)	Update Project Plan (18.4.2) Update the Business Case (18.4.3)		Project success & Benefits Management (2.1) Value Management (2.3) Development (4.2) Organization Structure (6.7)	Define Project Language (1.0)
4.3 Direct and Manage Project Execution	Computer aided design, Creativity techniques, (2.07)	Accept a Work Package (17.3.1) Execute a Work Package (17.3.4)	Domain of P2M Project Finance Management, Project Objectives Management, and Risk Management.	Technology Management (4.4) Value Engineering (4.5)	Deviation Correction(1.03), Agile Project Execution (3.01), Alignment Meetings (3.03)
4.4 Monitor and Control	Change authority (1.14), Detailed		Project Management,	Value Management	Increment Planning(3.03)

Project Work	project structure for inexperienced team (1.09), KPI (3.03)		Project Strategy, Project Objectives Management, Project resource Management, Communication s Management and Risk Management	(2.3) Legal Awareness (5.5)	02), Early Release Evaluation (5.03)
4.5 Perform Integrated Change Control	Change order, Product re-design (1.14), Creativity techniques, intuition, new combination, optimism, imagination, holistic thinking (2.07)		Project Organization Management, and Project Objectives Management.	Configuration Management (4.7)	
4.6 Close Project or Phase	Financial transactions, Hand-over documents (1.20), Success criteria (1.01)			Handover & Closeout (6.5) Project Reviews (6.6)	Project Retrospective(3.04)
5.1 Collect Requirements	Balanced scorecard (1.03), Systems and Lateral thinking (1.08), Address ill-defined requirements (1.19)		Value Management		
5.2 Define Scope	Systematic and structured thinking (2.10)		Entry, Program Management Scope		
5.3 Create WBS					
5.4 Verify Scope			Entry, Project Objectives Management		

5.5 Control Scope			Entry, Project Management, Project Objectives Management		
6.1 Define Activities			Entry, Project Strategy Management, Project Systems Management, Relationship Management, and Value Management		
6.2 Sequence Activities	Information and Communication Technology (1.09)		Relationship Management		
6.3 Estimate Activity					
6.4 Estimate Activity Durations	Systems development and Systems theory (3.07)				Sequence Activities (4.01)
6.5 Develop Schedule					
6.6 Control Schedule					
7.1 Estimate Costs	Cost & finance (1.13), General accounting (3.10)		Entry, Project Strategy Management, Information Management, Project Objectives Management, and Risk Management		
7.2 Determine Budget	Financial markets, Financing models, Treasury (3.10)		Entry, Project Resource Management and Risk Management.		
7.3 Control Costs	Financial management (1.13)		Entry, Project Strategy Management,		

			Information Management, Project Objectives Management, and Risk Management		
8.1 Plan Quality	Systems theory (3.07)		Entry, Project Strategy Management, Project Systems Management, Project Objectives Management, and Project Resources Management		
8.2 Perform Quality Assurance		Deliver a Work Package (17.3.5)	Project Strategy Management, Project Systems Management, Project Objectives Management, and Project Resources Management	Issue Management (3.8)	
8.3 Perform Quality Control					
9.1 Develop Human Resource Plan	Benefits for the project personnel, Career development (3.08)		Entry, HR viewpoints, Project Organization Management	Teamwork (7.2) Leadership (7.3) Behavioral Characteristics (7.7) Learning & Development (7.8)	
9.2 Acquire Project Team	Resource efficiency (2.08, 2.09)		Project Organization Management		

9.3 Develop Project Team	Systematic and disciplined working (2.13), Solidarity (2.15)		Project Organization Management		Human Resource Plan(2.01)
9.4 Manage Project Team	Delegation (2.08), Systematic and disciplined working (2.13), Ability to work in teams and cooperation with management (1.07), Individual profile assessment, Group dynamics (1.07)		Project Organization Management	Conflict Management (7.4) Negotiation (7.5)	
10.1 Identify Stakeholders	Involve interested parties at appropriate steps (1.08), Interface to stakeholders, formally hand over the deliverables (1.10), Manage unrealistic expectations of customers (1.19)		Project Management, Communication Management, Relationship Management, and Information Management		
10.2 Plan Communications	Confidentiality (1.18), Negotiation, Transparency (2.06)		Project Organization Management, Communication Management, and Information Management		
10.3 Distribute Information	Accessibility (2.06)	Authorize Stage or Exception Plan (15.3.3) Report Highlights (16.4.5)	Entry, Project Objectives Management, Communications Management, Information Management, and Project Resource Management		
10.4 Manage	De-escalation (2.05), Diplomacy		Project Management, Communication		

Stakeholder Expectations	(2.10), Interface management (1.06)		Management, Relationship Management, and Information Management		
10.5 Report Performance		Give ad hoc direction (15.3.4) Produce Exception Plan (18.4.5)			
11.1 Plan Risk Management	New combination, optimism (2.07)		Risk Management		
11.2 Identify Risks			Project Management, Project Strategy Management, Project Finance Management, and Risk Management	Health, Safety and Environmental Mgt.(2.7)	
11.3 Perform Qualitative Risk Analysis			Risk Management		
11.4 Perform Quantitative Risk Analysis			Risk Management	Modeling & Testing (4.6)	
11.5 Plan Risk Responses			Project Strategy Management, Project Finance Management, and Risk Management		
11.6 Monitor and Control Risks			Program Management, Project Management, Project Strategy		

			Management, Project Finance Management, and Risk Management		
12.1 Plan Procurements					
12.2 Conduct Procurements	Select preferred option(1.08)Strategic partnerships (1.14)				
12.3 Administer Procurements					
12.4 Close Procurements	Penalty (1.20)	Prepare Premature Closure (19.4.2) Recommend Project Closure (19.4.5)			

APPENDIX A.4

Mapping 5 Standards to PMBOK Knowledge Areas and Process Groups

The key competences identified in the 5 standards are mapped to 9 KAs and 5 PGs of PMBOK. Relationships are identified as strong, implied and minor.

√ means Strong Relationship, the competences from the standard is directly related to the KA or PG of PMBOK.

∞ means Implied Relationship, the competences from the standard is indirectly related to the KA or PG of PMBOK.

≠ means Minor Relationship, the competences from the standard has minor, or low relationship to the KA or PG of PMBOK.

A 4.1 Mapping ICB Competences to PMBOK KAs and PGs

	PMBOK Knowledge Area	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1.01 Project management success	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	∞
1.02 Interested parties:	√	√	∞	∞	∞	∞	∞	∞	∞	∞	√	√	√	∞	∞	∞
1.03 Project requirements & objectives:	√	√	∞	∞	∞	∞	∞	∞	∞	∞	√	√	√	∞	∞	∞
1.04 Risk & opportunity	√	≠	√	√	√	≠	≠	√	∞	∞	∞	∞	∞	≠	≠	∞
1.05 Quality	∞	∞	∞	∞	√	≠	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
1.06 Project organization	√	∞	≠	≠	≠	∞	≠	∞	≠	√	√	≠	∞	∞	∞	≠
1.07 Teamwork	∞	∞	∞	∞	∞	√	√	∞	≠	√	∞	∞	√	∞	≠	∞
1.08. Problem resolution	∞	∞	√	√	√	√	√	√	∞	∞	∞	√	√	∞	∞	∞

1.09 Project structures	■	∞	√	√	√	∞	∞	√	∞	∞	■	∞	∞	∞	√	∞
1.10 Scope & deliverables	■	∞	√	√	√	∞	∞	∞	√	√	■	√	√	√	√	√
1.11 Time & project phases	■	∞	∞	√	√	√	∞	∞	√	∞	■	∞	√	√	∞	∞
1.12 Resources	■	∞	∞	√	√	√	√	√	√	∞	■	∞	∞	∞	∞	∞
1.13 Cost & finance	■	∞	∞	√	√	√	√	≠	√	√	■	√	√	∞	∞	∞
1.14 Procurement & contract	■	∞	∞	√	√	√	≠	∞	√	√	■	≠	√	∞	∞	≠
1.15 Changes	■	∞	∞	√	√	√	≠	≠	∞	∞	■	≠	∞	∞	∞	≠
1.16 Control & Reports	■	√	∞	∞	∞	√	√	∞	√	≠	■	≠	≠	∞	√	≠
1.17 Information & documentation	■	∞	√	√	√	∞	√	√	∞	∞	■	∞	∞	∞	√	∞
1.18 Communication	■	√	∞	∞	∞	∞	∞	√	∞	∞	■	∞	√	∞	√	√
1.19 Start-up	■	≠	√	√	√	∞	∞	∞	√	≠	■	√	√	≠	≠	≠
1.20 Close-out:	■	∞	∞	∞	∞	≠	≠	≠	≠	≠	■	∞	∞	∞	∞	√
2.01 Leadership	■	∞	≠	≠	≠	≠	√	√	√	≠	■	∞	∞	∞	√	∞
2.02 Engage & motivate	■	∞	∞	√	√	√	√	√	≠	≠	■	∞	∞	∞	∞	∞
2.03 Self-control	■	∞	≠	√	≠	√	√	√	≠	≠	■	∞	∞	∞	∞	∞
2.04 Assertiveness	■	√	≠	≠	≠	∞	√	√	∞	√	■	∞	∞	∞	∞	∞
2.05 Relaxation	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
2.06 Openness	■	∞	∞	∞	∞	≠	√	√	∞	≠	■	∞	∞	∞	∞	∞
2.07 Creativity	■	∞	∞	∞	∞	∞	√	≠	∞	∞	■	∞	∞	∞	∞	∞
2.08 Results orientation	■	∞	∞	∞	∞	∞	∞	√	∞	≠	■	∞	∞	√	√	∞

2.09 Efficiency		∞	∞	∞	∞	∞	∞	∞	≠	≠	≠		∞	∞	∞	∞	∞
2.10 Consultation		∞	≠	≠	≠	≠	√	√	≠	≠		∞	∞	∞	∞	∞	∞
2.11 Negotiation		∞	∞	≠	≠	≠	√	√	∞	≠		∞	∞	∞	∞	∞	∞
2.12 Conflict & crisis		∞	≠	∞	≠	≠	√	√	√	∞		∞	∞	∞	∞	∞	∞
2.13 Reliability		∞	≠	≠	√	√	√	√	≠	≠		∞	√	∞	∞	∞	∞
2.14 Values appreciation		∞	≠	≠	≠	≠	√	√	≠	≠		∞	∞	∞	∞	∞	≠
2.15 Ethics		∞	≠	≠	≠	≠	√	√	≠	≠		∞	∞	∞	∞	∞	∞
3.01 Project orientation		∞	∞	√	√	√	∞	∞	∞	∞		∞	∞	√	∞	∞	∞
3.02 Program orientation		∞	∞	√	√	√	∞	∞	∞	∞		∞	∞	√	∞	∞	∞
3.03 Portfolio orientation		∞	∞	√	√	√	∞	∞	√	∞		∞	∞	√	∞	∞	∞
3.04 Project, program & portfolio		∞	∞	√	√	√	∞	∞	√	∞		∞	∞	√	∞	∞	∞
3.05 Permanent Organization		∞	∞	√	√	√	∞	∞	√	∞		∞	∞	√	∞	∞	∞
3.06 Business		∞	∞	√	√	√	∞	∞	√	√		∞	∞	√	∞	∞	∞
3.07 Systems, products & technology		∞	∞	∞	∞	∞	≠	≠	√	∞		∞	∞	√	∞	∞	∞
3.08 Personnel management		∞	∞	∞	∞	∞	√	√	∞	∞		∞	√	√	∞	∞	∞
3.09 Health, security, safety & environment		∞	∞	∞	∞	∞	∞	∞	√	∞		∞	∞	√	∞	∞	∞
3.10 Finance		∞	√	√	√	∞	∞	∞	∞	√		∞	√	√	∞	∞	∞
3.11 Legal		∞	∞	∞	∞	∞	√	√	√	√		∞	∞	∞	∞	∞	∞

A 4.2 Mapping PRINCE2 Competences to PMBOK KAs and PGs

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
Appoint the Executive and Project Management Board	✓	≠					✓	✓			✓	✓	✓	✓	✓	≠
Capture previous Lessons	✓	✓							∞		✓	∞	∞	∞	∞	≠
Designing and Appointing the Project Management Team	✓						✓	✓			✓	✓	✓	✓	✓	≠
Preparing the Outline Business Case	✓	✓							∞		✓	∞	∞	∞	∞	≠
Prepare Risk Management Strategy	✓								✓		✓	✓				
Prepare Configuration Management Strategy	✓	✓									✓	✓	∞			
Prepare Quality Management Strategy	✓					✓					✓	✓	∞			
Prepare Communications Management Strategy	✓							✓			✓	✓	∞	∞	∞	≠
Setting Up Project Controls	✓	✓						≠			✓					

Create the Project Plan	■	√	√					∞			■	∞	√	∞	∞	∞
Refining the Business Case	■			√	√				√		■	√	√	∞		
Assemble Project Initiation Document	■	√	√	√	√	√	√	√	√		■	√	√	√	√	√
Authorize the Project	■	√	≠	≠	≠	≠		∞			■	√	∞	∞	∞	
Authorize Project Closure	■	√						∞			■			∞	≠	√
Authorize a Work Package	■		√								■		√	∞	∞	
Review Work Package	■		√								■		√	∞	∞	
Receive Completed Work Package	■		√			∞					■		√	∞	∞	
Review the Stage Status	■	√						√			■			∞	√	
Capture & Examine Issues & Risks	■							≠	√		■			∞	√	
Escalate Issues & Risks	■							≠	√		■			∞	√	
Take Corrective Action	■	√									■	√	∞	∞	∞	
Plan the Next Stage	■	√						∞			■	≠	√	≠	≠	
Report Stage End	■							√			■				√	≠
Prepare Planned Closure	■	√									■					√
Handover Products	■									√	■			∞	∞	√
Evaluate the Project	■					√	≠	∞			■					

A 4.3 Mapping P2M Competences to PMBOK KAs and PGs

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1.01 Entry	√	∞	√	√	√	∞	√	≠	≠	√	≠	≠	√	√	√	
1.02 Project	∞	∞	√	√	√	≠	√	≠	≠	∞	∞	√	∞	√		
1.03 Program	∞	∞	√	√	√	≠	∞	≠	≠	√	≠	∞	√	√	∞	
1.04 Strategy	√	√	√	√	√	≠	∞	√	∞	√	√	∞	∞	√	∞	
1.05 Systems	√	√	∞	∞	√	∞	∞	∞	∞	√	∞	√	√	∞	∞	
1.06 Objectives	√	√	∞	√	√	∞	∞	∞	∞	√	√	≠	√	√	∞	
1.07 Risk	√	≠	∞	√	∞	≠	∞	√	∞	√	√	√	√	√	≠	
1.08 Relationship	≠	≠	∞	∞	∞	√	√	∞	≠	√	∞	∞	∞	∞	≠	
1.09 Finance	≠	≠	√	√	∞	∞	∞	√	√	√	√	√	√	∞	∞	
1.10 Organization	√	≠	∞	∞	∞	√	√	√	∞	√	∞	√	∞	≠	≠	
1.11 Resource	∞	∞	√	√	√	√	∞	∞	≠	√	√	∞	∞	√	≠	
1.12 Information	≠	≠	∞	√	∞	∞	√	≠	≠	√	√	∞	∞	∞	∞	
1.13 Value	√	≠	√	√	√	≠	≠	√	∞	√	∞	∞	∞	≠	≠	
1.14 Communication	∞	√	√	√	√	∞	√	√	∞	√	√	∞	√	∞	∞	

A.4.4 Mapping APM Competences to PMBOK KAs and PGs

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1.1 Project management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.2 Program Management	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
1.3 Portfolio Management	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠	≠
1.4 Project Context	✓	≠	≠	≠	≠	∞	∞	✓	✓	≠	✓	✓	∞	≠	≠	≠
1.5 Project Sponsorship	✓	∞	∞	∞	∞	✓	∞	∞	∞	≠	✓	∞	≠	∞	∞	✓
1.6 Project Office	✓	≠	≠	≠	≠	≠	∞	∞	∞	≠	✓	∞	∞	∞	∞	∞
2.1 Project Success & Benefits Management	✓	≠	≠	≠	≠	✓	≠	✓	∞	≠	✓	∞	≠	≠	∞	∞
2.2 Stakeholder Management	✓	≠	≠	≠	≠	∞	≠	✓	∞	≠	✓	∞	✓	≠	≠	≠
2.3 Value Management	✓	∞	≠	∞	∞	✓	≠	≠	✓	≠	✓	≠	✓	∞	✓	≠
2.4 Project Management Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	∞	✓	✓	✓	✓
2.5 Project Risk Management	✓	∞	≠	∞	∞	≠	≠	≠	≠	✓	✓	≠	✓	≠	✓	≠
2.6 Project Quality Management	✓	✓	≠	≠	≠	✓	≠	∞	≠	≠	✓	≠	✓	✓	✓	≠

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
2.7 Health, Safety and Environmental Management	√	√	≠	≠	≠	≠	√	∞	∞	≠	√	∞	√	∞	≠	≠
3.1 Scope Management	√	√	√	≠	≠	∞	≠	≠	≠	≠	√	≠	√	≠	√	≠
3.2 Scheduling	√	√	≠	√	≠	≠	√	≠	≠	≠	√	≠	√	≠	√	≠
3.3 Resource Management	√	√	≠	∞	≠	≠	√	≠	≠	≠	√	∞	√	≠	∞	≠
3.4 Budgeting and Cost Management	√	√	≠	≠	√	≠	≠	≠	≠	∞	√	∞	√	≠	√	≠
3.5 Change Control	√	√	√	√	√	√	≠	∞	≠	≠	√	≠	≠	∞	√	≠
3.6 Earned Value Management	√	√	∞	∞	∞	≠	≠	≠	≠	≠	√	≠	≠	∞	√	≠
3.7 Information Management	√	√	≠	≠	≠	∞	≠	√	∞	≠	√	≠	∞	√	√	√
3.8 Issue Management	√	√	∞	∞	∞	√	≠	≠	∞	≠	√	≠	≠	√	√	≠
4.1 Requirements Management	√	√	√	≠	≠	∞	≠	∞	∞	≠	√	≠	√	≠	√	≠
4.2 Development	√	√	≠	≠	≠	≠	≠	∞	≠	≠	√	√	√	∞	≠	≠
4.3 Estimating	√	√	≠	√	√	≠	≠	≠	≠	∞	√	√	√	≠	√	≠
4.4 Technology Management	√	√	≠	≠	≠	≠	≠	≠	≠	∞	√	∞	√	∞	√	≠
4.5 Value Engineering	√	√	≠	≠	≠	∞	≠	≠	≠	≠	√	√	√	≠	≠	≠
4.6 Modeling and Testing	√	√	≠	≠	≠	≠	≠	≠	∞	≠	√	∞	∞	∞	√	≠

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
4.7 Configuration Management	√	√	≠	≠	≠	√	≠	∞	≠	≠	√	≠	≠	∞	√	≠
5.1 Business Case	√	√	≠	≠	≠	≠	≠	≠	≠	≠	√	√	≠	≠	≠	√
5.2 Marketing and Sales	√	√	≠	≠	≠	≠	≠	≠	≠	≠	√	∞	≠	≠	≠	≠
5.3 Project Financing and Funding	√	√	≠	≠	√	≠	≠	≠	≠	∞	√	√	≠	≠	∞	≠
5.4 Procurement	√	√	≠	≠	∞	≠	≠	≠	≠	√	√	≠	√	√	√	√
5.5 Legal Awareness	√	√	≠	≠	≠	≠	≠	≠	∞	≠	√	√	≠	∞	√	≠
6.1 Project Life Cycles	√	√	≠	≠	≠	≠	≠	≠	≠	≠	√	√	√	√	√	√
6.2 Concept	√	√	≠	≠	≠	≠	≠	≠	≠	≠	√	√	≠	≠	≠	≠
6.3 Definition	√	√	√	√	√	√	√	√	√	√	√	≠	√	√	√	√
6.4 Implementation	√	√	√	√	√	√	√	√	√	√	√	≠	≠	√	√	≠
6.5 Handover and Closeout	√	√	≠	≠	≠	≠	≠	≠	≠	√	√	≠	≠	≠	≠	√
6.6 Project Reviews	√	√	≠	≠	≠	≠	≠	≠	≠	≠	√	≠	≠	≠	∞	√
6.7 Organization Structure	√	√	≠	≠	≠	≠	≠	√	≠	≠	√	√	√	√	√	√
6.8 Organizational Roles	√	√	≠	≠	≠	∞	√	∞	≠	≠	√	∞	∞	∞	∞	≠
6.9 Methods and Procedures	√	√	≠	≠	≠	≠	≠	≠	≠	∞	√	∞	∞	∞	∞	∞

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
6.10 Governance of Project Management	■	√	≠	≠	≠	≠	≠	≠	≠	≠	■	∞	≠	≠	≠	≠
7.1 Communication	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.2 Teamwork	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.3 Leadership	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.4 Conflict Management	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.5 Negotiation	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.6 Human Resource Management	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.7 Behavioral Characteristics	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.8 Learning and Development	■	∞	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞
7.9 Professionalism and Ethics	■	√	≠	≠	≠	≠	√	√	≠	≠	■	∞	∞	∞	∞	∞

A.4.5 Mapping Scrum Competences to PMBOK KAs and PGs

	PMBOK Knowledge Areas	Integration	Scope	Time	Cost	Quality	Human Resource	Communication	Risk	Procurement	PMBOK Process Groups	Initiating	Planning	Executing	Monitoring and Controlling	Closing
1.01 Define Project Language:	■							√			■	√				
1.02 Perform Quality Control:	■	≠	≠			√					■		≠	∞	√	
1.03 Deviation Correction:	■	√	≠	≠	≠						■			√	∞	
2.01 Human Resource Plan:	■						√				■		√	≠	≠	
2.02 Human Resource Plan:	■						√				■		√	≠	≠	
2.03 Human Resource Plan:	■						√				■		√	≠	≠	
3.01 Agile Project Execution	■	√		≠	≠	≠					■			√	∞	
3.02 Increment Planning	■	√	∞	∞					≠		■		∞	≠	√	
3.03 Alignment Meetings	■	√	∞	∞	∞	∞		≠	≠		■			√	∞	
3.04 Project Retrospective	■	√	≠	≠	≠	≠	≠	≠	≠	≠	■	≠	≠	≠	≠	√
4.01	■	≠		√							■		√			

Sequence Activities																
4.02 Sequence Activities		≠		√									√			
5.01 Monitor and Control Risks								√							√	
5.02 Control Scope		√	∞	≠	≠	≠		≠							√	
5.03 Early Release Evaluation			√	∞	≠	∞		≠						≠	√	≠

APPENDIX A.5

Lessons Learned:

A.5.1. Bryan Wolfe – Lessons learned

The most important lesson that I learned while completing this project was the importance of scheduling deadlines and sticking to the deadlines. We started the project within the first few weeks of class and set deadlines for certain parts of the project to be done. Without setting these deadlines I would not have started on the project until a lot later on in the class. Another important lesson that I learned was the importance of communication. Without good communication we would not have succeeded with this project. We used videoconference and teleconference for our means of communication. These 2 factors of deadlines and communication led to the successful completion of our project.

A.5.2. Danny Forrest – Lessons learned

The first major lesson that I have learned from this project is the importance of communication. Early on in our project the style of communication seemed too excessive. This large level of communication distanced the team members. People were hesitant and slow to check emails. There were also times where a question would be stated in an email and no one would respond. Stating information in a concise & clear manner is important to maintain people's attention spans. While our communication has greatly improved over the course of the project, there is still room for improvement. This was a valuable lesson to learn early on in project management.

The other major lesson that I learned was the importance and challenge of team development. This holds especially true in a virtual team format. While team members can see each other via video, we have never met face to face. This automatically makes it harder to develop a strong team bond. Creating a strong and positive feeling of mutual accountability is important in any project. The feeling of mutual accountability was in our team, but I feel like it could have been at a higher level. I do not yet know the solution for this, but it was very helpful to experience the challenges of evolving from a group to a team in a virtual format. I do believe that the communication within the group played a role in this issue. This will be something I focus on heavily in future teams, specifically virtual ones.

A.5.3. Danielle Lambert – Lessons learned

I learned from our first project to communicate better as a team. I have never worked with students online before, and the amount of emails I received from classmates became overwhelming. I know now I need to speak up sooner in order to get work done efficiently and on time. We each took the Myers Briggs test to see how we compare to each other. If we would have learned about the Myers Briggs earlier in the semester then it would have helped me to understand that all five of our group members are completely different and how someone would respond better to different communication strategies.

The schedule was very helpful to look at each task, and when tasks were to be completed. We used Microsoft Project and Google Documents as the tools to manage the project. Our team meetings started off with a group member setting our objectives for that week. Our

communication was done via Scopia and Teleconference. I enjoyed scopia more because we could see everyone talk which helped with when more than one person wants to talk at a time. I find it very difficult to jump in over teleconferences without cutting people off then no one can hear what anyone is saying when more than one person is talking.

A.5.4. Sam Ghosh – Lessons learned

There is no substitute to proper planning and communication. This project taught me again that it is important to work the plan. I learned about ICB as the primary contributor. I also learned about PRINCE2 and P2M as the secondary contributor and APM as tertiary contributor. Although I had practical experience using Scrum, I have never written any project report on Scrum. This project gave me an opportunity to write an article on Scrum as the secondary contributor and further solidify my understanding of Scrum. As the primary contributor of introduction, specific emphasis of 5 standards and PMBOK®, unity in diversity among the standards, intent to enhance PMBOK®, global effort, summary, conclusion and key reflections; I was able to tie in the commonalities and differences among the different standards and PMBOK®.

A.5.5. Thomas DiNetta – Lessons learned

I think overall the project went very well for our group. I feel like we got a very early start compared to where some of other classmates may have been which was nice. Getting work done upfront really helped us evaluate how to size our paper and where to spend our effort. It also allowed us to completely take a week off to focus on the midterm which I was grateful for.

There are also several areas in which we could have either started doing earlier or done better overall. For example we started with phone conferences and eventually moved to using scopia. I think the scopia conferences were more effective as it seemed to keep everyone more focused on the conversation. Although I still haven't gotten my webcam to work (still working on it) it was good to be able to see everyone's faces while discussing the project. Also during the middle of the project it seemed that we kind of stalled a bit, I'm not sure why this happened, but it is certainly an area that we will focus on going forward with the next project. This stall caused us to have to make up a fair amount of work towards the end of the project. Although personally it was not nearly as bad as it has been for me on previous projects.

APPENDIX A.6**Abbreviations and Acronyms**

ANSI - American Standard National Institute
APM - Association for Project Management
APMBOK - APM Body of Knowledge
BOK - Body of Knowledge
CBB - Capability Building Baseline
CMM - Capability Maturity Model
EEFs - Enterprise Environmental Factors
EVM - Earned Value Management
GAPPS - Global Alliance for Project Performance Standards
HR - Human Resource
IPECC - Initiation, Planning, Execution, Monitor & Control, Closing Process Groups
ICB - IPMA International Competence Baseline
IPMA - International Project Management Association (IPMA)
I/TT/O -Input, Tool & Technique, Output
IT - Information technology
ITIL - Information Technology Infrastructure Library
JPMF - Japanese Project Management Forum
KA - Knowledge Area
KPI - Key performance Indicator
MBTI - Myers-Briggs Type Indicator
NCB - National Competence Baseline
OGC - Office of Government Commerce
OLCI - Operational Level Cooperation Initiative
OOPSLA - Object-Oriented Programming, Systems, Languages & Applications
OPAs - Organizational Process Assets
PDCA - Plan-Do Check Act of Edward Deming
P2M - Project Planning and Project Management
PBS - Product Breakdown Structure
PCM - Project Configuration Management
PG - Process Group
PM - Project manager
PMAJ - Project Management Association of Japan
PMBOK® - Project Management Body of Knowledge
PPP - Project, Program Portfolio
PMI - Project management Institute
PRINC2® - PProjects IN Controlled Environments
RACI - Responsible, Accountable, Consulted, Informed
SLA - Service Level Agreement
OBS - Organization Breakdown Structure
OGC - Office of Government Commerce
SEI - Software Engineering Institute
SMART - Specific Measurable, Attainable, Realistic, Timely
SWOT - Strength, Weakness, Opportunity Threat
TT - Tool and Techniques
VIA - Values in Action
WBS - Work Breakdown Structure
XP - eXtreme Programming

APPENDIX A.7**References & Works Cited**

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Course: ENCE662 Introduction to Project Management; (3 credits)

Introduction to project management including: overview and concepts of project management (principles, body of knowledge, strategies); planning successful projects (defining, specifying, delivery options, scheduling, budgeting); implementing (organizing the team, work assignments, team building, effective leadership); executing (performance measurement, maintaining the schedule, adjustments/mid-course corrections, record keeping, status reporting, communications, managing conflict, time management); and closeout(performance measurement, maintaining the schedule, adjustments/mid-course corrections, record keeping, status reporting, communications, managing conflict, time management). Two team projects are assigned in the course. It is offered by The University of Maryland, College Park. This is a core course for the Master of Engineering in Project Management. This course can also be taken by the students in Master of Science degree program and the PhD program.

Taught By: Mr. John Cable, Director, Project Management Center for Excellence
http://pm.umd.edu/files/public/documents/resumes/Cable_09.pdf

Home page for the Project Management Center of Excellence at the University of Maryland - <http://pm.umd.edu/page.php?id=1>