PROJECT MANAGEMENT
Board Game

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Document description:	This ebook will provide a deep analysis of the best practices in PM, the standards and discussions on their use, their underlying approach, their key contents and their peculiar characteristics in the context of various standards that are currently being used around the world. Finally, the main aspects of PM that should be translated in a game-context are highlighted.

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1 Leading Project Management certifications in Europe

1.1 Certifications reviewed

The Project Manager is responsible for the management and operational management of a project, understood as a set of processes that include coordinated and controlled activities, with start and end dates, aimed at achieving a set of predefined objectives, which are realized with the release of expected results or products that meet specific requirements.

The new working dynamics, characterized by increasingly limited time and resources, flexible organizations and reactive to the demands of an extremely competitive and global market, have favored the development of organizational models for which the personal and managerial skills and abilities of qualified professionals are essential. In this context, Project Management has rapidly evolved as a real discipline that refers to the set of methodologies and techniques applied in the planning, detection and control phases of a project process.

Accredited certification guarantees the possession of the requirements of knowledge, skills and competence of this professional defined by the reference standard; moreover, the possession of a certification is a guarantee for the parties involved in the projects, who will thus know with certainty that the management is entrusted to highly qualified personnel.

The most popular Project Management certifications in Europe are:

- PMI (Project Management Institute) certifications;
- IPMA (International Project Management Association) certifications;
- PRINCE2 (Project IN a Controlled Environment) certifications;

For the purpose of the PMBOG project we will focus on those of the Project Management Institute and Prince2.

1.1.1 Project Management Institute

The Project Management Institute (PMI) is the leading international standardization body for PM today. It was founded in 1969 at the Georgia Institute of Technology in Atlanta, then the association set its headquarters in Newton Square, Pennsylvania (USA).

In 1983 he published the first study for the development of procedures and concepts necessary to support the profession of the project manager. His main publication is the PMBOK Guide - Project Management Body of Knowledge, born in 1987 as a result of the project to collect and order all the knowledge applied in project management.

There are now five certifications (or credentials) that attest to internationally recognized knowledge and experience in the field of Project and Program Management:

- CAPM (Certified Associate in Project Management);
- PMP (Project Management Professional)
- PgMP (Program Management Professional)
- PMI-SP (PMI Scheduling Professional)

- PMI-RMP (PMI Risk Management Professional)
- PMI-ACP (PMI Agile Certified Practitioner)

For the purpose of this analysis, we will look at PMBok 6th edition published in 2017 which is still at the time of this writing (July 2021) the basis for the CAPM and PMP exams.

1.1.2 PRINCE2

The second methodology, in order of diffusion, is of British origin and is called PRINCE 2, an acronym for PRojects IN a Controlled Environment. It is a methodology for Project Management based on a scalable process approach, according to requirements, in terms of size, complexity and risks of the project to which it applies.

PRINCE2 was released in 1996 for the purpose of having a PM guideline that was valid for all projects and not just information systems (as was the previous PRINCE version).

The PRINCE method was defined by the Central Computer and Telecommunications Agency (CCTA) and subsequently updated by the British Office of Government Commerce (OGC). In July 2013, ownership of the PRINCE2 rights was transferred from the British Cabinet Office to AXELOS Ltd, a joint venture between Cabinet Office and Capita plc.

2 Analysis of Certifications

Companies should consider five objectives when selecting a methodology to use for project management:

- The overall business strategy, which is how competitive the company is;
- The size of the project team and/or scope to be managed;
- Project Priority;
- How critical the project is to the company;
- How flexible are the methodology and its components;

PRINCE2 includes seven principles, seven control themes, a project management life cycle, and guidance on customizing the method to fit the project environment. PRINCE2 also collects a project management process model; this includes all the activities necessary to direct, manage, and release the project outcome. In contrast, PMBOK has 5 process groups and 49 processes, which are defined as "a set of related actions and activities performed to create a predetermined product, service, or outcome"

2.1 Certified Associate in Project Management

Introduced by PMI in January 2002, the **Certified Associate in Project Management** (CAPM) credential is intended for those about to enter the world of work in project management and is designed to provide a base level of certification prior to acquiring the professional level of PMP.

It is a certification that aims to attest the knowledge of Project Management and is also accessible to newcomers, such as recent graduates, who are thinking of orienting their profession to Project Management.

CAPM certification allows you to align with the PMI framework from the start, requiring theoretical knowledge of the processes defined in the PMBOK Guide, without application to hypothetical scenarios. PMBOK is the most established reference for the Project Management discipline and identifies the body of knowledge recognized as good practice for Project Management.

Its main strengths:

- Identification of universally recognized and accepted practices for proper project management.
- Definition of a common vocabulary in the Project Management domain.

The certification is valid for three years and it can be maintained by collecting 15 Professional Development Units (PDUs), the accreditation process for the PDUs is defined in the Continuous Certification Requirements handbook published by PMI.

The requirements to be eligible for the CAPM exam are attendance at a PMI course of at least 23 hours or a minimum of 1500 hours of experience on a project team.

The exam is fully computerized, consisting of 150 multiple-choice questions, the maximum time available to answer 150 questions is 3 hours, and you must answer approximately 75% of the questions exactly to pass the exam.

2.1.1 Critical Knowledge

CAPM certification is based entirely on the Project Management Body of Knowledge, which describes the set of standard project management practices defined by the (PMI) that
This standard is broken down into 10 Knowledge Areas and 5 Process Groups.

Knowledge Areas cover the set of knowledge and skills needed to fulfill a set of specific purposes:

- **Project Integration Management:** This groups together all the processes necessary to ensure that the various aspects of the project are properly coordinated.

- **Project Scope Management:** This groups together all of the processes necessary to ensure that the project includes all of the work and only the work necessary to achieve the objectives.

- **Project schedule management:** This groups together all the processes necessary to ensure that the project runs and completes according to the required schedule.

- **Project Cost Management:** This encompasses all processes necessary to ensure that the project runs and completes according to the approved budget.

- **Project quality management:** It encompasses all processes necessary to ensure that the project meets the needs for which it was undertaken (client requirements, specifications, service levels).

- **Project Resource Management:** This encompasses all processes necessary to ensure the most effective use of the resources (human, equipment, materials, etc.) involved in the project.

- **Project Communication Management:** It encompasses all processes necessary to ensure the timely and effective creation, collection, distribution and storage of project information.

- **Project Risk Management:** This encompasses all processes necessary to ensure that project-related risks are identified and assessed, and responses to risks are identified.

- **Project Procurement Management:** This encompasses all of the processes necessary to ensure the procurement of goods and services to achieve project objectives through orders and contracts with third parties.

- **Project Stakeholder Management:** It encompasses all of the processes necessary to identify the people, groups, or organizations that could affect or be affected by the project, to analyze stakeholder expectations and their impact on the project, to develop appropriate management strategies, and to effectively involve stakeholders in project and execution decisions.

The Project Management Processes described in the PMBOK are 49 divided into 5 groups and illustrate what needs to be done to govern a project or a phase of a project; the phases are not sequential but interact with each other, overlap, and can also be modified during their execution.
The 5 groupings are related to:

- **Initiation Processes:** In this phase, the project is defined and authorized. It is the time when the project requirements are set, its objectives are established, in terms of time, cost, and quality, the stakeholders involved are defined, and the Project Manager who will have complete responsibility for the project is appointed.

- **Planning Processes:** Through the collection of data from multiple sources, a project plan is developed. The object of planning is the activity, determined through the analysis of the project requirements. The requirements allow for the identification of the deliverables that will be produced by the project, and from these it will be possible to define the list of activities that constitute them. The planning processes allow you to determine:
    - The project end date and all interim milestones;
    - stakeholders and the associated communications plan;
    - The risk and quality plan;
    - suppliers;
    - How resources will be managed;
    - project costs.

For each activity, a "baseline" will be defined, i.e. a time plan with which verification activities will be carried out during project monitoring.

- **Execution Processes:** processes aimed at managing and developing the project team, producing agreed deliverables, verifying the application of production standards, and managing the delivery process to the customer.
Execution processes allow the work defined during the planning phase to be completed, putting the project plan into execution and using the majority of the available budget.

- **Monitoring and Control Processes:** Aimed at assessing the progress of the work, managing any changes, and verifying the quality of what has been achieved. Monitoring and Control Processes. These processes regularly measure performance in order to identify deviations from the project plan. The primary functions of these processes include:
    - Evaluation of project progress
    - the dissemination of results through reporting
    - integrated management of any changes
    - Acceptance of deliverables based on criteria established during the planning phase.

- **Closing processes.** The project manager shall be able to determine whether the project has been completed and met stakeholders' expectations. The project manager should have the ability to determine whether the project is a success or a failure. At this stage, in addition to closing vendor

contracts, all data produced must be collected and catalogued. It is not uncommon to see projects that end by ignoring it, believing it to be a waste of energy and time, not realizing that a proper collection of documentation could ensure savings in the management of future projects similar in content, in which parts of previous projects could be used.

Knowledge Areas	Project Management Process Group					
	Initiating	Planning	Executing	Monitoring and Controlling	Closing	
Project Integration Management	Develop Project Charter	Develop Project Plan	Direct and Manage Project Work Manage Project Knowledge	Monitor and Control Project Work Perform Integrated Change Control	Close Project or Phase	7
Project Scope Management		Plan Scope Management Collect Requirements Define Scope Create WBS		Validate Scope Control Scope		6
Project Schedule Management		Plan Schedule Management Define Activities Sequence Activities Estimate Activity Durations Develop Schedule		Control Schedule		6

Project Cost Management		Plan Cost Management

Estimate Costs

Determine Budget | | Control Costs | | 4 |
| Project Quality Management | | Plan Quality Management | Manage Quality | Quality Control | | 3 |
| Project Resource Management | | Plan Resource Management

Estimate Activity Resources | Acquired Resources

Develop Team

Manage Team | Control Resources | | 6 |
| Project Communications Management | | Plan Communications Management | Manage Communications | Monitor Communications | | 3 |
| Project Risk Management | | Plan Risk Management

Identify Risks

Perform Qualitative Risk Analysis

Perform Quantitave Risk Analysis

Plan Risk Responses | Implement Risk Responses | Monitor Risks | | 7 |
| Project Procurement Management | | Plan Procurement Management | Conduct Procurements | Control Procurements | | 3 |
| Project Stakeholder Management | Identify Stakeholders | Plan Stakeholder Engagement | Manage Stakeholder Engagement | Monitor Stakeholder Engagement | | 4 |

	2	24	10	12	1	49

(49 PMBOK Sixth Edition Processes)

2.2 Agile Certified Practitioner

Agile project management refers to the management of agile projects.

Agile project management, originally called "Agile Software Development," is a set of principles and values rather than a methodology. They have their roots in the 1950s and were consolidated and published as the "Agile Manifesto" by 17 software developers in 2001 in Snowbird/Utah.

Common agile methods these days include extreme programming (XP), Kanban, disciplined agile delivery, and large-scale derivatives such as the scaled agile framework (SAFe) or Scrum.

One of the fundamental ideas of agile software development (and, in broader terms, agile project management) is to create an increment as a result of each individual project phase that is usable on its own and adds value to the customer or organization. This is different from traditional approaches, where individual parts do not necessarily have value on their own before being integrated into the overall result. This results in shorter development cycles that also allow agile teams to embrace changes during the project, reduce the risk of creating functionality that is no longer needed, and increase overall customer satisfaction.

In a traditional project, the team would plan the project, gather and describe requirements, create specifications, develop and test applications, and finally deploy the entire solution simultaneously; it could take 1 or 2 years from the start of the project to the product launch.

An agile project, on the other hand, would divide the work into parts that are developed in a shorter time and can already be used by customers, to increase the level of satisfaction and receive useful feedback for the continuation of the work; if in fact a "traditional" project in the closing phase and release to the customer receives their feedback for the first time, an agile project will have already involved the customers in the previous phases, receiving and processing their feedback and then developing a solution more suited to the requests.

The PMI Agile Certified Practitioner (PMI-ACP) certification, the latest credential from PMI (2011), attests to knowledge and experience in the application of agile principles, practices, and tools and techniques used in leading "Agile" approaches and methodologies.

The certification embraces and illustrates the broad repertoire of agile methodological approaches, such as SCRUM, Lean Start up and Kanban, and provides application guidance about the most widely used techniques and tools.

The credential's reference to a plurality of agile approaches, although based on the values and principles of the Agile Manifesto, has not resulted in an unambiguous and rigid codification of the framework. As a result, there is no specific text to refer to for this credential, but a number of different resources that present methods and approaches from an "agile" perspective are suggested by PMI.

The course is aimed at professionals who want to consolidate their profession in project management by achieving PMI-ACP certification, in particular: Project Managers, Managers and members of the Project Management Office (PMO), Project Leaders, Team Leaders, Business Function Managers, IT Professionals, Scrum Masters.

The requirements to be eligible for the Agile Certified Practitioner exam are:
- 21 hours of hands-on training on Agile Project Management practices and methodologies;
- 2000 hours of experience working on a project team, gained within the last 5 years prior to the date of submission of the exam application;
- 1500 hours of experience working in a project team using agile methodologies, gained within the last 3 years prior to the date of submission of the exam application;

2.2.1 Critical Knowledge

Below is a compilation of the key knowledge addressed in the various domains of ACP certification.

2.2.1.1   AGILE PRINCIPLES AND MINDSET

"Agile principles and mindsets is the knowledge of "how to explore, embrace and apply agile principles and mindsets in the context of the project team and organization"
Critical knowledge of the early Domain:

- The 12 principles of the Agile Manifesto and the fundamentals of agile project management
  - User Involvement
  - Team enhancement
  - Fixed time box
  - High-level requirements
  - Incremental project releases
  - Frequent delivery
  - Complete the tasks one by one
  - Pareto Principle
  - Tests: early and frequent
  - Teamwork;

- Agile methodologies

The following are common Agile methodologies in practice, listed in order of importance for the PMI-ACP exam; understanding the processes and terminologies will help ensure Agile practices are carried out.
  - Scrum;
  - XP (eXtreme Programming);
  - Kanban;
  - LSD (Lean Software Development);
  - Crystal Family;

- FDD (Feature Driven Development);
- ASD (Adaptive Software Development);
- DSDM (Dynamic Systems Development Method);
- Atern;

- Information Radiators:

Information Radiators are highly visible graphs and figures that display project progress, (Kanban, burn-down charts). These show the real progress and performance of the project and team, improving transparency and trust between team members and Stakeholders.

- Agile Experiments:
  - Agile projects use empirical process control for project decisions, continuous observation and experimentation that is done throughout project execution, to help and influence planning
  - Using Spike[1] to perform a technical audit to reduce risk.

- Knowledge Sharing
  - Ideally, it's best for Agile teams to be co-located[2] to improve communication, support, and open collaboration;
  - Encourage face-to-face communication;
  - Improve pair programming;
  - Take advantage of daily stand-ups, reviews, and retrospectives as much as possible;
  - Use Agile tools to improve knowledge sharing:
    - Kanban Boards;
    - White Boards;
    - Message boards
    - burn-down/burn-up charts
    - instant messaging;

- Self-organization and empowerment

Self-organizing teams are the basis for Agile project management
Self-organization includes:
- team formation;
- assignment of work;
- self-management.

The agile team is given the power to self-direct and self-organize by making implementation decisions, including work priorities and timelines.
In Agile projects, the project manager/Coach/ScrumMaster practices
Service leadership to remove obstacles and enable the team to perform at its best.

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[1] Spike: a short experimental test to aid decision making
[2] Co-located: simultaneous tenancy of multiple eligible parties

2.2.1.2 Value Driven Delivery

The second Domain, Value Driven Delivery, encapsulates the knowledge to "Deliver valuable results by producing high-value increments for review, early and frequently, based on stakeholder priorities and by gathering feedback from stakeholders on these increments and using it to prioritize and improve future increments"(PMI-ACP Exam Content Outline).

Value Driven Delivery is a fundamental principle for Agile projects. Projects are implemented to realize value (e.g., economic benefits, competitive advantages, risk reduction, regulatory compliance, etc.). Value-based prioritization is about organizing activities so that the most important ones, which ultimately deliver value, are addressed first.

Critical knowledge of the second Domain:

- Return on Investment (ROI), Net Present Value (NPV), and Internal Rate of Return (IRR) are metrics to evaluate priority based on monetary values:
  - ROI - the values that a project has realized (using present value) relative to the investment; a positive ROI means that the project is profitable
  - NPV - the net future cash flow (profit-spend) in terms of today's value; a positive NPV means the project is profitable
  - IRR - similar to the interest rate of the investment; the higher the positive IRR, the more profitable the project will be

- Customer-assessed priority:

Value prioritization schemes:
  - Simple patterns - ranking from top to bottom;
  - MoSCoW Priority Scheme;
  - Monopoly Money: customers distribute fake money to each individual business feature to compare their priorities;
  - Kano analysis: plot features on a graph with axes as Needs Satisfied or Unsatisfied, each feature will then be classified as "excitatory, satisfactory, unsatisfactory, indifferent".

- Requirements Prioritization Model:

Evaluate each feature based on benefits, penalties, production cost, and risks, and calculate a score using a predefined weighted formula.
  - CARVER (Criticality, Accessibility, Return, Vulnerability, Effect, and Recognizability) with respect to the project goal and mission.
    - Criticality: how important it is to act early
    - Accessibility: can you work on it right away? or does it depend on other work/skills?
    - Return - ROI / NPV / IRR
    - Vulnerability: how easy is it to get the desired results?
    - Effect - what are the effects on the project (help achieve the project goal)?
    - Recognizability: have the goals been clearly identified?

- Minimally Marketable Features (MMF)
  - The feature set that can provide useful values to customers or end users;
  - a distinct and deliverable feature of the system that provides
  - Significant value to the customer as it can be sold/used immediately;
  - Can get a return on investment instantly.

- Minimal Viable Product (MVP)
  - The minimal product, with only essential functionality, that allows it to be shipped to early adopters and get feedback instantly. Similar concept to Minimally Marketable Feature (MMF) where MVP is the first product that can be shipped with the first set.

- Earned Value Management (EVM):
  - Earned Value Management is a tool used in traditional project management to measure project progress.
  - In Agile, EVM is a measure of the cost performance of the Agile project, but it does not indicate the quality of the project outcome, i.e., whether it will be a success or not;
  - The value is calculated at the end of each iteration for the work performed;
  - EVM Formulas:
    - Schedule Performance Index (SPI) = Earned Value / Planned Value
    - Cost Performance Index (CPI) = Earned Value / Actual Cost.

2.2.1.3   Stakeholder Engagement

The third domain Stakeholder Engagement encapsulates the knowledge to "engage stakeholders, current and future, by building an environment of trust that aligns their needs and expectations and balances their demands with an understanding of the costs/efforts involved. Need to promote participation and collaboration throughout the project lifecycle and provide the tools for effective and informed decision-making"
Critical Knowledge of the Third Domain:

- Stakeholder Management:
  - Stakeholder definition: anyone who impacts the project or will be impacted by the project (e.g., sponsors, vendors, end customers, community, etc.);
  - the project team is considered a stakeholder in traditional project management but not in Agile projects.
  - Stakeholder management processes:
    - Periodically identify all stakeholders (especially key stakeholders who will have a major impact on the success of the project);
    - Communicate with selected stakeholders to gather requirements and needs;
    - Improve stakeholder engagement through active communication and information sharing;

- o As the project evolves, the interests of key stakeholders must be actively managed;
- o Discuss up-to-date estimates and projections early and openly to facilitate future planning;
- o Maintain a good relationship with all stakeholders by disseminating necessary information and gathering feedback;

- Knowledge Sharing

Knowledge sharing is a key component of Agile project management. Knowledge should be shared across the team, customers, community, and organization.

- Participatory decision-making models

Encourage and facilitate stakeholder involvement in the decision-making process through simple techniques such as:

- simple vote;
- thumbs up/down/sideways;
- Jim Highsmith's Decision Spectrum: Choose a value from a spectrum of feelings ranging from "favorable," "OK with reservations," to "veto."
- Fist-on-Five Voting: vote from 1 to 5 fingers to express the degree of agreement (i.e. 1 - totally in favor, 5 - totally against)

- Conflict Resolution

It is advisable to try to resolve conflicts early on to reach consensus with effective resolution strategies:

- Confrontation: open dialogue that leads to problem solving to create a win-win situation.
- Collaboration: working together to reach an agreed-upon solution.

- Project Charter:
  - The Project Charter is recommended for Agile project management to help create a common understanding of project goals, mission, and success criteria but this might not be considered mandatory is some organization where other artifacts can be used to kick off an Agile project;
  - This is the first documentation created for the Agile project to help formally kick off and will be progressively elaborated as the project evolves;
  - Includes at least three elements:
    - o Vision: the purpose of the project;
    - o   Mission: describes what will be accomplished or done;
    - o Success Criteria: describes how the project will be considered a success or achieve an end;

2.2.1.4   Team Performance

The fourth Team Performance domain encapsulates knowledge to "create an environment of trust, learning, collaboration, and conflict resolution that promotes team self-organization, improves relationships among team members, and cultivates a culture of high performance."

Fourth Domain Critical Knowledge.

"A Team is "a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold each other accountable" (Jon Katzenbach and Douglas Smith).

In Agile project management, team members and their interaction are considered much more valuable than following standard processes or using predefined tools.

- Team formation phases: Tuckman's model
    - Formation: the team is formed, everyone acts independently;
    - Stroming: disagreements arise between team members;
    - Norming: team members accept each other by emphasizing the goal of the team;
    - Execution: the team is highly motivated and efficient;
    - Update: Activities completed;

- Building Empowered Teams:

Agile teams are, ideally, highly motivated by practicing self-management and self-organization. Organization gives the Agile team a high level of confidence.

The Empowered Teams are:
    - Self-organizing: because the team has the best knowledge of the project and is in the best position to organize the work;
    - Self-directed: the team can make its own decisions.

- Tabaka's model for a high-performance team:
    - self-organization;
    - The power to make a decision;
    - Faith in vision and success;
    - committed team;
    - trust each other;
    - participatory decision making;
    - consent as a guide;
    - constructive disagreement.

- Team participation

The entire project team will discuss customer needs in detail through face-to-face communication:
    - Brainstorming: everyone can freely express their opinions without immediate judgment;
    - Innovation games: games are used to engage team members and the customer;
    - Parking Lot Chart: a piece of paper for entering issues, important but off-topic questions, discussions.

- Two-way communication
  - Agile project management emphasizes feedback as it can help reduce misunderstandings and risks and generate better ideas.
  - Communication should always be two-way, with all parties being given the opportunity to express their concerns and viewpoints.

- Daily Stand-Up
  - Daily stand-ups are ana fixed meeting (~15 minutes) and focused meetings held with all team members to do a quick update on the project;
  - Stakeholders may attend but may not speak at the meeting;
  - Each member answers the following 3 questions:
    - What have you been up to since the last meeting?
    - What are you planning to do at the next meeting?
    - What impediments are affecting the work performance?

- Negotiation
  - Collaboration on contract negotiation;
  - Communicate with two or more parties to reach an agreement and resolve conflicts;
  - Negotiation Strategies:
    - Distributive Negotiation: adopt extreme positions initially and work toward agreement through tactics;
    - Integrative negotiation: working together collaboratively to achieve greater success by creating more value with a win-win solution.

2.2.1.5   Adaptive Planning

The fifth domain Adaptive Planning brings together the knowledge to "Produce and maintain an evolving plan, from inception to closure, based on goals, values, risks, constraints, stakeholder feedback, and review results."

Critical Knowledge of the Fifth Domain.

- Agile Planning Steps
  - Product vision: a document created by the product owner that describes what the product is, who will use it and why they will use it, and how the product supports the business strategy.
  - Product Roadmap: a document created by the product owner that describes high-level requirements and timelines for final deliverables, providing a visual overview of all planned releases and major components.
  - Release Plan: a document created by the product owner that describes the high-level timeline for product releases (features with higher values have higher priority).
  - Sprint Plan - Iteration Plan: a document created by the product owner, scrum master, and development team that describes the goals, activities, and requirements of the sprint and how those activities will be completed.

- o Iteration 0: useful for performing tasks before the actual development work begins, for technical and architectural setup, and for gathering initial requirements in the backlog.
  - o Iteration H: represents the reinforcement iteration; time used to test and prepare the launch software.
- Iteration Planning and Release Planning
  - o Iteration planning involves developing planning at a less detailed level on activities and time;
  - o Release planning involves developing high-level planning on functionality and iterations; it is the meeting to plan the project at a strategic level to deliver increased value to customers;
- Daily Stand-up / Daily Scrum: a planning meeting attended by the project team and stakeholders.
- Sprint Review: a meeting scheduled at the end of each sprint to demonstrate the working product or progress, deliverable to stakeholders for feedback and/or acceptance.
- Sprint Retrospective: a meeting scheduled at the end of each sprint attended only by team members; will discuss product and process improvements to increase efficiency and effectiveness.

- Agile Adaptation:

Make design, product, and process changes to deliver the best value to customers and special circumstances of the project environment. May involve:
- customization of processes;
- integration continues;
- adaptive leadership;
- negotiations on soft skills;
- The delivery of business value;
- revised vendor management;
- change management.

2.2.1.6 Problem Detection and Resolution

The sixth Domain, Problem Detection and Resolution, encapsulates the knowledge for "continuously identifying problems, impediments, and risks; prioritizing and resolving them in a timely manner; monitoring and communicating the resolution status of problems; and implementing process improvements to prevent their recurrence."
Critical Knowledge of the Sixth Domain.

- Risk and Threat Management

Risk is the uncertainty that could affect the success or failure of the project. Risks become problems or issues once they actually occur; risks can be threats or opportunities.

To maximize the value generated, negative risks must be minimized, while positive risks should be exploited. Once problems or issues arise, they must be resolved promptly to reduce the effects on value creation.

Risk identification should involve the client, project team, and stakeholders.

Risks are assessed based on their likelihood and impact:
- The probability of a risk may be a percentage value or a number on a relative scale
- Risk impact can be the monetary of the loss or a number on a relative scale;
- Risk Severity = Risk Probability x Risk Impact

- Five key risks:
  - Change in Productivity, difference between planned and actual performance;
  - Scope Creep, considerable additional requirements beyond the initial agreement;
  - Breakdown of Specifications, lack of stakeholder consensus on requirements;
  - Inherent Planning Defect, poor estimates of activity durations;
  - Loss of Personnel, the loss of human resources.

- Frequent validations and verifications

Frequent testing and rehearsal both inside and outside the development team is very helpful in reducing the cost of quality.
- Validation: (usually external) assurance that a product, service, or system meets customer requirements
- Verification: usually internal to the team, an assessment of whether or not a product, service, or system complies with an imposed requirement, specification, or condition.

- Nimble measures to ensure frequent validation and verification:
  - Testers are included in the development team from the beginning by participating in the collection of user requirements;
  - Unit tests are created for continuous feedback for improvement and quality assurance;
  - Automated testing tools are used that enable rapid and robust testing. (Examples: peer review, periodic code reviews, refactoring, unit testing, automated and manual testing).

- Problem Resolution: Analysis of the fishbone diagram

One tool for performing cause and effect analysis to help uncover the root cause of a problem or process bottlenecks is the fish list diagram (cause and effect diagram or Ishikawa diagrams)

To use the fishbone diagram technique:
- Annotate the problem as the "head of the fish" and draw a horizontal line as the "spine" of the fish;
- Think about the major factors (at least four or more) involved in the problem and draw a line off the backbone that represents each factor;
- Identify possible causes and draw a line away from the major factors;

- Analyze the fishbone diagram to identify as many possible causes as possible for further investigation.

2.2.1.7 Continuous Improvement (Product, Process, People)

The seventh Domain Continuous Improvement encapsulates the knowledge to "Continuously improve the quality, effectiveness, and value of the product, process, and team."
Critical knowledge of the 7th Domain.

- Retrospective: an Agile process for self-assessment to be performed at the end of each iteration leading to continuous process improvement for timely implementation.

It represents a valuable learning opportunity for the team by going to analyze adapt and improve the entire development process and improve productivity, capacity and quality.

- focus on what went right, what went wrong, and how the team can improve in the next iteration.
- Introspective: is an ad hoc Agile team discussion or meeting to review team practices or teamwork during the sprint, often required when something has gone wrong.

- Value Stream Analysis

Value Stream Analysis objectives:

- Provide an optimal value stream to customers through value creation processes;
- Eliminate waste in every process through analysis and improvement.

- Value Stream Mapping

Value stream mapping is originally a graphical tool for analyzing the flow of materials in production from the beginning to the customer. It is later adopted for value creation of services.
It usually involves the following steps:

- Recognize the current status of the project:
  o create a visual map of the value stream of the current state;
  o distinguish between value-added processes and non-value-added operations;
  o Find delays, waste, and constraints;
- Analyze and modify the ideal future state:
  o create a new value stream map for the desired state after optimization;
- Communicate and implement improvements:
  o Ensure that all team members understand the parameters of the improvement work;
  o Develop a roadmap for action implementation;
- Verify and validate improvements.

2.3 Project Management Professional

The **Project Management Professional** (PMP) certification is the most recognized and valued project management credential in the world. The PMP program is designed to assess professional knowledge in the field; the PMP exam, no longer follows the PMBOK benchmark, but bases its assessment on knowledge and skills gained from both practical and theoretical experience and the soft skills a manager must possess to successfully lead a team.

The requirements to qualify for PMP certification are:
- Category 1 - For those with a bachelor's degree or equivalent college degree:
  o University degree (even a Bachelor's degree is fine, as it is equivalent to the Bachelor's degree required in the PMP® Handbook)
  o Have a minimum of 4,500 hours of experience gained within the 5 process groups of Project Management (Initiating, Planning, Executing, Monitoring/Controlling and Closing).
  o Have gained the above experience over a period of at least 36 months of activity (non-overlapping) beginning 8 years prior to the date of submission of the application for the certification examination.
- Category 2 - For those with a secondary school diploma or equivalent:
  o High School Diploma
  o Have a minimum of 7,500 hours of experience gained within the 5 process groups of Project Management (Initiation, Planning, Execution, Monitoring/Control and Closing)
  o Have gained the above experience over a period of at least 60 months of activity (non-overlapping) beginning 8 years prior to the date of application for the certification exam

The PMP exam is 230 minutes long and contains 180 questions. The questions are a combination of multiple-choice, multiple-answer, matching, hotspot, and limited-fill questions.

2.3.1 Critical Knowledge

Nowadays, many organizations prefer to hire PMP-certified project managers to manage their projects, so PMP certification is a wise choice to invest in to demonstrate your knowledge and experience in project management. It also represents a high level of professionalism that helps increase credibility in the market.

The PMI certification, in its new content structure, describes three new Domains each reflecting one of the 3 dimensions of the PMI Talent Triangle (Leadership, Technical Skills, and Strategic Management). Each Domain contains a list of activities, what Project Managers actually need to do, accompanied by several enablers, i.e., actions that must be taken to complete the activities:
- People: includes team building and team management activities;
- Processes: focus on integration processes, planning and change control management;
- Corporate Environment; addresses compliance, strategic benefits, project value and change management.

About half of the exam will be based on predictive project management approaches, while the other half of the exam will be based on agile or hybrid approaches.

2.3.1.1 People

This Domain reflects the Leadership dimension of PMI's Talent Triangle.
Specifically, it covers:

- Conflict Management:
  - Interpret the source and stage of conflict;
  - Analyze the context of the conflict;
  - Evaluate, the most appropriate conflict resolution solutions;

- Team management and leadership:
  - Leading a team:

Establish a clear vision and mission; support diversity and inclusion; value leadership; determine an appropriate leadership style; inspire, motivate, and influence team members and stakeholders; analyze team members and stakeholder influence; distinguish various options for guiding various team members and stakeholders.

  - Address and remove impediments, obstacles and blockages for the team:

Determine critical impediments, obstacles, and blockages; use the network to implement solutions; continually reassess to ensure impediments, are addressed.

  - Engage and support virtual teams:

Review virtual team member needs; investigate alternatives; implement options for team member involvement; continually evaluate effectiveness of team member involvement.

  - Define the team's ground rules:

Communicate organizational principles with team and external stakeholders; establish an environment conducive to compliance with ground rules; manage and correct ground rule violations.

  - Promoting team performance through the application of emotional intelligence:

Evaluate behavior through the use of personality indicators; analyze personality indicators and adjust to the emotional needs of key project stakeholders.

  - Negotiation:
    - o Negotiate project agreements:

Analyze negotiation boundaries; assess priorities and determine end goals; verify that project agreement goals are met; participate in negotiations; determine a negotiation strategy.

  - Stakeholder Involvement:
    - o Collaborate with stakeholders:

Assess stakeholder engagement needs; optimize alignment between stakeholder needs, expectations, and project goals; build trust and influence stakeholders to achieve project goals.

    - o Building a shared understanding:

Analyze the situation to identify the root cause of a misunderstanding; review all parties necessary to reach a consensus; support the outcome of the agreement; investigate potential misunderstandings.

  o Mentor relevant stakeholders:

Dedicate time to mentoring; recognize and act on mentoring opportunities.

2.3.1.2 Processes

This Domain covers the technical aspects of project management.
Specifically it covers:

- Plan and Manage:
  - Budget and Resources:

Estimate budget needs based on project scope and lessons learned from past projects; anticipate future budget challenges; monitor budget variances and collaborate with governance process; plan and manage resources.

  - Program:

Estimate project activities; use benchmarks and historical data; prepare schedule based on methodology; measure ongoing progress based on methodology; modify schedule as necessary based on methodology; coordinate with other projects and operations.

  - Quality of products and deliverables:

Determine the required quality standard for project outcomes; recommend improvement options based on quality gaps; continually review the quality of project outcomes.

  - Project Scope:
  - Determine and prioritize requirements; scope breakdown (WBS, backlog); scope monitoring and validation.
  - Procurement:

Define resource requirements and needs; communicate resource requirements; manage vendors and contracts; plan and manage procurement strategy; develop a delivery solution.

  - Project Modifications:

Anticipate and embrace the need for change; determine the strategy to manage change; execute the change management strategy according to the methodology; determine a change response to move the project forward.

  - Project closure or transition:

Determine criteria to successfully close the project or phase; validate readiness for transition; conclude activities to close the project or phase.

- Assess and manage:
  - Risks:

Determine risk management options; assess and prioritize risks iteratively.

  - Issues:

Recognize when a risk becomes a problem; address the problem with optimal action to achieve project success; collaborate with stakeholders on approach to solve problems.

- Determine appropriate project methodologies, methods, and practices:

Assess project needs, complexity, and scope; recommend project execution strategy; recommend project methodology or approach; use iterative and incremental practices throughout the project life cycle.

2.3.1.3   Corporate Environment:

The third Domain represents the Strategic Management dimension of the Talent Triangle. Specifically it covers:

- Plan and manage project compliance:

Confirm project compliance requirements; classify compliance categories; determine potential threats to compliance; use methods to support compliance; analyze consequences of non-compliance; determine approach and actions needed to meet compliance requirements; measure the extent to which the project is in compliance

- Evaluate and provide project benefits and value:

Identify benefits; agreement on ownership for realization of benefits; verify that measurement system is in place to track benefits; evaluate delivery options to demonstrate value; make stakeholder estimate of gain progress.

- Evaluate and address changes in the external business environment for impact on scope:

Survey changes to external business environment; evaluate and prioritize project scope impacts based on changes in external business environment; recommend options for scope/backlog changes; continually review external business environment for project scope impacts.

- Supporting Organizational Change:

Assess organizational culture; assess the impact of organizational change on the project and determine actions needed; assess the impact of the project on the organization and determine actions needed.

2.4 PRINCE2

Two levels of certification are available for PRINCE2:
- Foundation level, which tests the candidate's knowledge of the method;
- The Practitioner level, which aims to assess whether the candidate is able to apply the method to a case study.

Adopting PRINCE2 as your project management method has many benefits:
- It can be applied to any type of project;
- It provides all who apply it with a common vocabulary and approach;

- Includes explicit definitions of roles and responsibilities so that everyone understands what is expected of them and what to expect of others;
- It can be easily integrated with other methods from specific industries;
- Imposes a focus on continued project feasibility;
- Applies the concept of "management by exception" which allows for efficient use of management time.

2.4.1 Critical Knowledge

In PRINCE2, decisions and related responsibilities in a project are assigned to the personnel with the greatest   expertise   in   the   field.
The Project Manager is a facilitator, an expert in Project Management processes who can ensure the proper circulation of information and simplify the taking of major decisions by the Project Committee. PRINCE2 certifications are structured in:

- 7 Processes, defined as a "structured set of activities designed to achieve a specific goal."
- 7 Processes that define what needs to be done and the responsibilities for various phases of the project.
- 7 Key Topics for Project Management;
- 35 Activities that are "a set of recommended actions designed to achieve a particular result;

2.4.1.1 The principles of PRINCE2

The term **Principles** indicates guidelines that a project must follow if it is decided to use PRINCE2.
The principles are part of *best practices[3],* and are derived from lessons, both positive and negative, that have influenced the success of many projects.
People involved in a project can use the principles as a framework to ensure that the method is not applied in an overly prescriptive way or only formally, but with the goal of contributing to the success of the project.
The principles behind PRINCE2 certification are:

- *Continued business justification*: a PRINCE2 project must ensure continued business justification.
- *Learn from experience*: PRINCE2 project teams learn from previous experience.
- *Defined roles and responsibilities*: A PRINCE2 project define and agrees roles and responsibilities with an organizational structure that takes into account the interests of the business, users and suppliers.
- *Manage by stages*: a PRINCE2 project is planned, monitored and controlled stage by stage.
- *Manage by exception*: a PRINCE2 project defines tolerances for each project objective to establish the limits of delegated authority.

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[3] *Best Practice*: A set of activities (procedures, behaviors, habits, etc.) that, organized in a systematic way, can be taken as a reference and reproduced to help achieve the best results.

- Focus on *products*: A PRINCE2 project focuses on the definition and release of products, particularly their quality requirements.
- *Tailor to suit the project environment*: PRINCE2 adapts to the size, environment, complexity, importance, capacity and risk of the project.

➢ PRINCE2 Processes

PRINCE2 provides a process model for managing a project. This model encompasses the set of activities required to direct, manage, and release the products of a project.

- *Starting up a project*: Includes all pre-project activities necessary for commissioning[4] the project. Allows you to obtain a commitment from company or program management to invest in the initiative.

- *Directing a project*: Lists the activities of the Project Board as it exercises control over the project. The activities focus on the decision-making process necessary for Project Board members to successfully fulfill their responsibilities while delegating the day-to-day management of the project to the Project Manager.

- *Initiating a project*: Describes the activities that the Project Manager must conduct to get the project off to a solid start. Every PRINCE2 project has an Initiating phase. The key element of this phase is the Project Initiation Documentation, which includes an overall Project Plan and defines benchmarks for the six performance objectives; time, cost, quality, scope, risk, and benefit.

- *Managing a Stage Boundary*: Outlines the activities that the Project Manager must undertake to provide the Project Board with sufficient information to evaluate the success of the current stage, approve the next stage plan, review the updated Project Plan, and confirm business justification and risk acceptability.

- *Controlling a Stage*: Describes how the Project Manager manages project execution/delivery activities during a stage and reports progress and exceptions to the Project Board.

- *Managing Product Delivery*: Provides guidance to Team Managers on the oversight of the project's product delivery work and enables the connection between the Project Manager and the teams undertaking the project work.

- Closing *a Project*: Describes the closing activities that take place prior to the completion of the final phase of the project. The Project Manager leads the process that provides for orderly decommissioning, including any project acceptance and delivery requirements.

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[4] Commissioning: putting into production/service

2.4.1.2   PRINCE2 themes

The term "issues" refers to those aspects of project management that need to be addressed throughout the project life cycle.

The topics provide guidance on how PRINCE2 processes can be put into practice.

Taken together, the PRINCE2 themes describe:

- How to establish benchmarks for benefits, risk, scope, quality, cost, and time (Business Case, Quality, and Planning topics).
- How the project management team monitors and controls work as the project progresses (issues status, quality, change, and risk).
- Finally, the organization theme supports the other themes since it provides a structure of roles and responsibilities with clear paths of delegation and escalation.

3 Game play recommendations

The goal of this document is to identify which of the critical knowledge, useful for obtaining PM certifications, can be integrated within the structure of the gameplay.

The objective of the PMBOG project is to make the notions of Project Management concrete within the game and the e-book. This will allow players to experience the interconnection that exists between all the knowledge and how it is actually translated into everyday actions; moreover, it will allow them to acquire skills that will increase their work productivity in real life and facilitate their daily decision-making processes.

All of the certifications analyzed contain useful insights into the implementation of both the game and the preparation course.

The CAPM and PRINCE2 foundation certifications are the ones that most base their exams on knowledge of the basics of Project Management. To better understand these two certifications, it is necessary to understand their commonalities and differences.

The PMBOK is recognized as an international standard, providing the fundamentals of project management. PRINCE2 is a structured method, considered a standard and recognized in both the public and private sectors.

The definition of project is distinct for both approaches. For the PMBOK, a project is a temporary effort undertaken to create a singular product, service, or outcome. For Prince2, a project is a management environment created for the purpose of delivering one or more business products based on a specific business case.

The methodology or technique used by each is also distinct. The PMBOK is a descriptive methodology, i.e., a detailed explanation of project management techniques, while Prince2 focuses on a perspective, i.e., how project management techniques should be structured and implemented.

The PMBOK follows an orientation toward the processes used in project development, PRINCE2 has a guideline for the final product, focusing on successful delivery and quality.

The project manager does not have the same relevance for both approaches: in PMBOK the project manager is the person responsible for achieving the objectives, while for PRINCE2 the authority to manage is given to the project manager but always subordinate to the project board.

For PMBOK, 5 groups of processes are considered, while for Prince2, 7 are considered. However, it is possible to find equivalences between the processes. The PMBOK Start Process is equivalent to the first two processes in Prince2, namely Start and Direction. The PMBOK Planning process embodies the same principles and processes as Prince2. The Execution and Control processes will be equivalent to three groups of processes: the Control phase, Product Delivery Management, and Direction. Finally, the closure process is common to both approaches.

The PMP and Prince 2 Practitioner certifications are based on the same theoretical knowledge but assume that Project Managers have real project management experience, hence we can assume that there is no significant difference from a game play standpoint.

For the purpose of the mechanics of the game we shall focus on a sequential (Waterfall) project approach because Agile approaches cannot be mixed into a single and coherent game play but we shall consider the project selection criteria between Agile and Sequential in the topics to be covered.

Key knowledge areas to be included in the game play and the tools / best practices to include in the game play are the followings:

- Stakeholder engagement
  - Business Case definition
  - Benefit Management
  - Project Strategic alignment
  - Selection of Project Approach
  - Project charter
- Integration
  - Definition of Project Management plan
- Scope Management
  - Requirement definition
  - Acceptance Criteria
  - Definition of Done
  - Work Break Down
- Communication
  - Stakeholder communication
  - Project reporting
- Time Management
  - High level project plan (focus is assumptions and constraints identification)
- Cost Management
  - High level cost plan (focus is assumptions and constraints identification)
- Risk Management
  - Risk identification
  - Risk Qualitative analysis
  - Risk Mitigation plans
- Resource Management
  - Team Development stages
  - Team Working Agreements
  - Decision Making
  - Conflict management and resolution (within the team and with the environment)
  - Retrospective
- Monitoring and control.
  - Change Management
  - Project controlling
  - Project Monitoring
- Project Closure
  - Verify project success criteria
  - Close the team

   o Close the project

Based on my experience procurement and quality knowledge area are too complex and difficult to experience during a game.