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MANAGEMENT FOR
SUSTAINABLE
ORGANIZATION**



MASUDEM

MASTER STUDIES IN SUSTAINABLE DEVELOPMENT AND MANAGEMENT

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PROJECT MANAGEMENT FOR SUSTAINABLE ORGANIZATION

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INTRODUCTION

Project Management for Sustainable Organizations is a comprehensive approach to managing projects prioritizing sustainability and environmental management. This approach is important for organizations that want to minimize environmental impact, reduce waste, and promote sustainable practices. Project Management for Sustainable Organizations is designed to help organizations navigate the complexities of project management with a focus on sustainability, ensuring that projects are completed on time, on budget, and with minimal environmental impact.

The Project Management for Sustainable Organizations framework is built on the principles of the Project Management Institute's (PMI) Project Management Body of Knowledge (PMBOK) but with a special focus on sustainability. This framework provides a structured approach to managing projects, including project charter development, project planning, project execution, project monitoring and control, and project closure.

Project Management for Sustainable Organizations is particularly relevant for organizations committed to sustainability and want to ensure that their projects align with their sustainability goals. Adopting Project Management for Sustainable Organizations, organizations will be assured of, among other things: Design and deliver projects without problems, Increase the productivity of the company's human resources. Ensure projects are completed on time and within budget, Align projects with sustainability goals

Organization of Topics

Chapter 1 provides an introduction to project management. the chapter begins by introduces project management by first exploring the essence of project management: its definition, importance, and real-world examples. furthermore, it discusses the evolution and history of project management, a comparison of projects vs. routine operations and an overview of different project management methodologies: waterfall, agile, PRINCE2.

Chapter 2 deals with the project management framework and knowledge area which includes a detailed study of the PMBOK guidelines: their relevance and structure. explores the five process group : initiating, planning, executing, monitoring & controlling, and closing. and an introduction to the ten knowledge areas and their significance.

Chapter 3 Discusses how to start and define a project. The discussion includes the importance of a clear project initiation. Tools and techniques used for stakeholder identification, analysis and engagement. It goes on to explain how to create a clear and concise project charter. and Setting SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) objectives.

Chapter 4 provides Comprehensive Project Planning. This chapter develops a detailed project management plan. It consists of Techniques for creating work breakdown structures (WBS), Resource planning includes human, material, financial. Then discusses about Time management such as Gantt charts and critical path method. And also discusses about risk identification, assessment, and mitigation strategies.

Chapter 5 is about the Introduction to Lean Thinking in Project Management. Learn more about the Origin and Evolution of Lean Thinking, based on The Lean Principles, including Benefits and Challenges of Integrating Lean into Projects, and also comparative example of Lean vs. traditional project management.

Chapter 6 contains Monitoring, Controlling, and Lean Metrics. There is a discussion of the Role of KPIs in project monitoring and control; Visual management tools: Kanban boards, dashboards; Lean metrics: Lead time, cycle time, throughput; Effective feedback loops and their importance.

Chapter 7 Provides a Future View: Kaizen as a Driver of Sustainable Innovation. The discussion in this chapter includes: The Value of Kaizen; The Concept of Sustainability in a Business Context; The

Potential for Innovation Through a Kaizen Approach; and Forecasting Kaizen's Role in a Sustainable Business Future

Chapter 8 discusses Project Evaluation Using Net Present Value and Other Measures. The chapter covers calculating the net present value of a project; Calculating the internal rate of return of a project and knowing how to use the internal rate of return rule; Calculating the profitability index and knowing how to use the profitability index to choose between projects; Understanding the rule of return; Using the net present value rule to analyze projects.

Chapter 9 discusses Ethics, Leadership & Organizational Dynamics in Project Management. This chapter provides an understanding of ethical considerations in projects: Common dilemmas and best practices; Leadership styles and their relevance in project outcomes; The role of organizational culture in shaping project outcomes; and Navigating organizational politics and power structures.

Chapter 10 covers Digitalization and Technology Trends in Project Management. In detail, this chapter discusses the emergence and impact of digital tools in project management: Integrating AI and machine learning in lean project management; Virtual teams, remote work, and their challenges and opportunities; Cybersecurity considerations in modern projects.

Chapter 11 as the last chapter discusses Sustainability in Project Management. This chapter explains about Defining sustainability in a project context; The Triple Bottom Line; Strategies to make projects more sustainable: Environmentally, socially, and economically; Case studies on sustainable project management

CHAPTER 1: INTRODUCTION TO PROJECT MANAGEMENT

In their daily lives, humans are often involved in projects. Project management is a method of planning and managing resources that companies can use to complete a project. a process that starts from initiation, strategy formation, implementation, monitoring, to closure. There are various aspects that must be considered by the organizer so that the project can run according to plan.

1.1 THE ESSENCE OF PROJECT MANAGEMENT: DEFINITION, IMPORTANCE, AND REAL-WORLDEXAMPLES

The Project Management Institute (PMI) defines a project as a temporary endeavor undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists. Project management is the application of knowledge, skills, tools, and techniques applied to project activities in order to meet the project requirements. The project management process includes planning, putting the project plan into action, and measuring progress and performance. Projects have several characteristics (Watt,2014):

- Projects are unique.
- Projects are temporary in nature and have a definite beginning and ending date.
- Projects are completed when the project goals are achieved or it's determined the project is no longer viable

Managing a project includes identifying project needs and writing down what everyone needs from the project and setting goals. Make sure to set goals that everyone agrees on to avoid team conflicts later on. Understanding and meeting the needs of everyone affected by the project means the end result of your project is much more likely to satisfy stakeholders. Finally, as a project manager, you will also be balancing a variety of competing project constraints. There are a number of constraints that require attention in running a project. These constraints are cost, scope, quality, risk, resources, and time (Watt, 2014)

- **Cost** is the approved budget for the project including all costs required to complete the project. A poorly executed budget plan can result in a rush to spend the allocated funds. For almost all projects, cost eventually becomes a limiting constraint; few projects can go over budget without eventually requiring corrective action.

- **Scope** is what the project is trying to achieve. It entails all the work involved in delivering the project outcomes and the processes used to produce them. It is the reason and the purpose of the project.

- **Quality** is a combination of standards and criteria that a project product must meet in order to perform effectively. The product must serve to provide the expected functionality, solve the identified problems, and deliver the expected benefits and value. The product must also meet other performance requirements, or service levels, such as availability, reliability, and maintainability, and have an acceptable finish and polish. Quality on projects is controlled through quality assurance (QA), which is the process of regularly evaluating overall project performance to provide confidence that the project will meet relevant quality standards.

- **Risk** is defined as the potential for external events that if they occur will negatively impact the project. Risk refers to the combination of the probability of an event to occur and its impact

on the project if the event occurs. Resources are required to carry out the project tasks. They can be people, equipment, facilities, funding, or anything else capable of definition (usually other than labour) required for the completion of a project activity.

- **Time** is defined as the time to complete a project. Time is often the most frequent project oversight in developing projects. This is reflected in missed deadlines and incomplete deliverables. Proper schedule control requires careful identification of the tasks to be performed and accurate estimates of their duration, the order in which they will be performed, and how people and other resources will be allocated.

Project work can be described in the following ways:

- Projects are temporary and unique, while other work—commonly called operations—is more continuous.
- Project managers need certain “soft skills” and “hard skills” to be effective.
- Project managers frequently have more responsibility than authority.
- Managing a project requires identifying requirements; establishing clear and achievable objectives; balancing competing demands of quality, scope, cost, and time; and
 - meeting customer expectations by making adjustments to all aspects of the project.
 - The unique nature of a project often encompasses uncertainties and unknowns that present challenges to managing project work.
 - Projects are managed with competing constraints of time, cost, scope, and quality
 - Projects progress through predictable stages referred to as a life cycle.

The Importance of Project Management

In the present fast-paced and competitive business environment, organizational leaders must be able to manage with tighter budgets, shorter timeframes, scarcity of resources, and rapidly changing technology. The business environment is dynamic with an accelerating rate of change. To remain competitive in the world economy, companies implement project management to consistently deliver business value. Project management is considered important because it helps ensure that projects achieve the required quality by balancing budget, time constraints, and scope. It involves planning, organizing, and controlling resources to achieve specific goals and objectives. As a result, effective project management can help businesses improve their productivity, efficiency, and profitability. It also helps teams work together more effectively, reducing the risk of miscommunication, conflict, and other obstacles. Effective and efficient project management should be considered a strategic competency in organizations. It enables organizations to: link project outcomes to business objectives, compete more effectively in their markets, sustain the organization, and respond to the impact of changes in the business environment on projects by adjusting project management plans appropriately.

Real world examples of projects can be listed as below:

1. Modification of an ERP (Enterprise Resource Planning) system by revising the current
2. modules and adding new modules,
3. Installing new safety features to a vehicle (e.g., new airbags, traction systems, accident prevention systems),
4. Re-modeling a building or a parking lot,
5. Renovating the power lines all across a city or state,
6. Reorganizing the workflow in a workplace such as a restaurant, grocery market, local motor vehicles bureau, and a library,
7. Creating a designated area for self-checkout kiosks in markets,
8. Creating a new TV, YouTube, or social media advertisement for a hand sanitizer.

1.2 EVOLUTION AND HISTORY OF PROJECT MANAGEMENT

Project management has been practiced for thousands of years since the Egyptian era, however, it has been about half a century ago that organizations start applying systematic project management tools and techniques to complex projects. Projects were conducted throughout most of the world's history, but there was very little documentation of processes, techniques, and procedures. Therefore, there is no evidence of systematic planning and control. It is known that some early projects were accomplished at great human and financial cost and that others took exceedingly long periods of time to complete.

In the 1950s, Navy employed modern project management methodologies in their Polaris project. During the 1960s and 1970s, Department of Defense, NASA, and large engineering and construction companies utilized project management principles and tools to manage large budget, schedule-driven projects. In the 1980s, manufacturing and software development sectors started to adopt and implement sophisticated project management practices. By the 1990s, the project management theories, tools, and techniques were widely received by different industries and organizations.

Managing a project is challenging in the current global economy due to the exponential growth of information technology and ever-increasing market demands that compel organizations to offer high-quality, affordable products and services quickly. Understanding the characteristics of global projects for improving global project performance is of critical importance. The application of project management techniques and tools has grown quite rapidly and it is likely to continue. With increased international competition and a borderless global economy, customers want their products and services developed and delivered better, faster, and cheaper. Because project management techniques are designed to manage scope, quality, cost, and schedule, they are ideally suited to this purpose.

Four periods have been identified to better capture the history of modern project management:

1. Prior to 1958 ; Craft system to Human Relations Administration
2. 1958 – 1979, Application of Management Science
3. 1980 – 1994, Production Center : Human Resources
4. 1995 to present, Creating a new environment

Prior to 1958: Craft System To Human Relations Administration

The 1900s and 1950s saw the beginning of the current project management concept. During this time, technology advancement shortened the project schedule. Automobiles allowed effective resource allocation and mobility. Telecommunication system increased the speed of communication. The Gantt chart was created by Henry Gantt, and the work definition was widely utilized. Later, the Work Breakdown Structure (WBS) was developed using the task specification as a basis.

1958-1979: Application of Management Science

Technology developed significantly between 1958 and 1979. In 1959, Xerox introduced the first automatic plain paper copier. In the 1960s, many industries were influenced by the development of silicon chips and minicomputers. In 1969, Bell Laboratories developed the UNIX programming language and the computer industry grew rapidly. The success of NASA's Apollo project marked a historic event for humanity. In 1971, Intel introduced the microprocessor, and the Pentium in the 1990s. Ray Tomlinson in 1972 introduced the first email software. In 1975, Bill Gates and Paul Allen founded Microsoft. . Between 1950 and 1979, several core project management tools were introduced, including CPM/PERT, Material Requirements Planning (MRP), and others. CPM/PERT is calculated in large computer systems, and specialized programmers operate CPM/PERT primarily for

government sector projects. Organizations generally use the project office as an “information broker” with a small number of skilled schedulers and estimators (Vandersluis 1998)

1980-1994: Production Center: Human Resources

During the 1980s and early 1990s, the revolution in the information systems sector shifted society from using mainframe computers to multitasking personal computers that had high efficiency in managing and controlling complex project schedules. In the mid-80s, the Internet served researchers and developers, and local area networks and Ethernet technology began to dominate network technology (Leiner et al 2000). During the 1950s to 1970s, computer engineers were mostly responsible for operating project management systems because mainframe systems were not easy to use. Morris (1985) acknowledged the unfriendliness of mainframe software. During the late 1970s and early 1980s, project management software for PCs became widely available by several companies in the mid-1980s making project management techniques more accessible..

1995-Present: Creating a New Environment

In the mid-1990s, Internet Project Management began to change almost every business practice. The availability of fast, interactive, and customizable new media that allows people to search, buy, and track products and services online instantly. As a result, the Internet allows organizations to become more productive, more efficient, and more customer-oriented. Between 1995 and 2000, the project management community adopted Internet technology to more efficiently control and manage various aspects of projects. As information technology revolutionizes traditional business practices, various industries are starting to adopt and implement project management practices.

Table 1.1 The Brief History of Project Management

	Technology	Management Science	Project Management & Technology	Major Projects	Project Office
1958	Telegraph Telephone First Computer Automobile Airplane First Database	Adam Smith Frederick W. Taylor Henry Fayor Henry Ganti A McGregor’s XY Theory	Parametric Cost Estimating PERT/CPM Gantt Chart Monte Carlo Simulation Systematic Application	Inter Continental Rairoads Hoover Dam Polaris Manhattan Project Panama Canal	Focal Point “Proximity” Traditional Project Office Function Navy Special Project Office (SPO)
1959 – 1979	IBM 7090 Xerox Copier UNIX Microsoft Founded	ISO Total Quality Management Globalization Quality Management	PMI Inventory Control Material Requirement Planning	Apollo 11 ARPANET	Project Supporting Office
1980 – 1994	Personal Computer Wireless in Building Network Firs Internet Browser (MOSAIC)	Manufacturing Resources Planning Risk Management	Matrix Organization PM Software for PC	Boeing 777 Space Shuttle Challenger The English France Channel Project	Project Headquarter War Room
1995 – Current	Internet	Critical chain Enterprose Resources Planning	PMBOK (PMI)	Iridium YSK project	Virtual project OfficeWeb base Project office

Source : Young Hoon Kwak (The Story of Managing Projects, 2005)

1.3 COMPARISON OF PROJECTS VS. ROUTINE OPERATIONS

In the business world, project management and operations are two distinct but complementary disciplines. Both have different objectives and different methods of managing business activities. Project management deals with the management of unique projects, limited to a specific time, with the aim of achieving clear results. Project management involves planning, organizing, controlling, and supervising project activities from start to finish. On the other hand, operational management is concerned with managing the daily operations of an organization to achieve long-term goals. It involves managing routine processes, resources, and ongoing operational activities.

Operational management is concerned with the ongoing production of goods and/or services. Operations management ensures that business operations continue efficiently by using the optimal resources required to meet customer demands. Operations management is concerned with managing processes that convert inputs (e.g., materials, components, energy, and labor) into outputs (e.g., products, goods, and/or services). Operations, consists of the ongoing work required to ensure that the organization continues to function effectively. Project Management examples: Construction of a new building, launch of a new product, development of a software application. Operations Management examples: Production management in factories, supply chain management.

Time-based: Project management focuses on limited time, from the beginning to the end of the project. It involves schedule planning, deadline setting, and time control to achieve project goals on time. On the other hand, operational management focuses on continuous operational activities without clear time constraints. The goal is to maintain efficient and effective operations all the time.

Based on Objective: The goal of project management is to achieve clear and measurable results within a specified time limit. This involves achieving set quality, time, and cost targets. Meanwhile, the goal of operational management is to achieve efficiency and sustainability in running daily operations. The focus is on increasing productivity, controlling costs, and improving quality in the long run.

Based on Uniqueness vs Continuous: Project management is associated with unique projects that have a clear beginning and end. Each project has its own characteristics and challenges that require specialized planning and management. On the other hand, operational management deals with ongoing activities that are repetitive and performed continuously. It involves routine processes and stable resource management.

Based on Level of Risk: Project management usually involves a higher level of risk compared to operational management. Since projects are unique, they often involve uncertainties and challenges that must be overcome. Project management necessitates proactive risk identification and mitigation. Meanwhile, operational management focuses more on routine risk management and quality control.

1.4 OVERVIEW OF DIFFERENT PROJECT MANAGEMENT METHODOLOGIES: WATERFALL, AGILE, PRINCE2

Rapidly evolving market and technology conditions, short time-to-market cycles, and many other factors in the social and business world influence how projects are managed. Project management can use methodologies, techniques, and procedures to organize and execute projects effectively. Project management utilizes teams and resources efficiently to complete project tasks within budget, time, and scope constraints. There are several project management methodologies that can be used including: Waterfall, Agile, Prince2

WATERFALL

The Waterfall approach was introduced by Winston Royce in 1970, adopted by software project managers and further developed through learning from software projects. The Waterfall

approach treats the project as a linear process consisting of a series of sequential basic stages, each of which needs to be carried out sequentially, and formally validated before moving on to the next stage. The name of the waterfall steps has varied over the years but still consists of five distinct areas: system conceptualization, system analysis, system design, coding, and testing.

The classic waterfall approach model starts with the analysis stage which includes needs analysis. This model is considered to offer a well-defined set of criteria and indications of requirements even before starting the design and implementation phase of the project, thereby providing a basic plan of the project before starting in an orderly sequence of the project. She also states that this type of method does not ensure quick changes according to the stakeholders unless the project is finished or nearly finished. This type of method is suitable for those projects whose requirements are going to be stable for a longer time or till the finish of the project.

AGILE

The concept of Agile Manufacturing was introduced as a new paradigm in industry in the strategy report 21st Century Manufacturing: Industry Led-View and drove the agile manufacturing movement in the United States. Agility enables companies to thrive in the dynamic and turbulent contemporary environment. Some authors consider them different approaches, others as synonyms, but in general all agility allows companies to thrive in the dynamic and turbulent contemporary environment. Thus, organizations are forced to lead efficiently in an unpredictable, dynamic and constantly changing environment. Networking, reengineering, modular organizations, virtual enterprises, employee empowerment, and flexible manufacturing are examples of solutions to overcome these difficulties.

Agile Project Management (APM) is a project management methodology for agile manufacturing. Becoming agile requires major behavioral changes that impact how team members think and act within the company. Traditionally, project managers have structured and planned management, avoiding changes to plans whereas APM focuses on adaptation and response to inevitable changes, focuses on continuous innovation, product adaptability, improved time to market, human and process adaptability, quality and reliable results. APM is a project management approach that should be implemented if the organization/company has agility as an intrinsic value in its culture and strategy and there are variables that need to be considered such as the type of problem, organization, workforce, and leadership views.

PRINCE2

PRINCE2 (Projects in Controlled Environments), was created in 1989 by CCTA (Central Computer and Telecommunications Agency), later called OGC (Office of Government Commerce). PRINCE is a project management method developed based on experience gained from thousands of projects and contributions from various sponsors, managers, project teams, academics, trainers, and consultants. The first publication was in 1996, with contributions from 150 European organizations. PRINCE and PRINCE2 are registered trademarks of the UK Government. The latest version of the methodology tries to take a generic approach to be flexible to shape any type of design, that is, to be a practical reference, so that it can be applied to any type of project, scale, organization, geography, or culture. So it has been widely recognized as one of the more accepted project management methods. The main features of this methodology are based on a business-focused and project management team-directed organizational structure. Planning is done with an end-product orientation.

There are seven main principles in PRINCE2, including the following.

1. Starting the project
2. Steering the project to stay within budget
3. Evaluating the project
4. Controlling the project for delivery
5. Managing the product according to the timeline

6. Closing the project and providing reports

Summary

- A project is a temporary endeavor undertaken to create a unique product, service, or result.
- Projects are unique and temporary.
- Projects are constrained by various limits, scope, schedule, and cost. In addition, and closely related to three constraints, resources, quality, and risk.
- Project success relates to the impact of the project's final product or service on the stakeholders. Project management success focuses on project processes including successful achievement of scope, within budget (cost), within time (schedule), and quality aspects. A project may be successfully managed but not meet client or customer expectations.
- The project life cycle consists of phases that are generally named as inception (start-up, conceptualization), planning (organizing and preparation), implementation (execution, execution), and termination (closure, end).
- Unlike the phases of the project life cycle, but in line with these phases, processes are grouped into five groups of project management processes according to the PMBOK Guide 6th Edition. These processes are initiation, planning, execution, monitoring and control, and closure.
- A project management methodology that has high adaptability to changes that occur in each of its elements.

Discussion Questions

1. Explain the essence and importance of project management, give real world examples.
2. Discuss the difference between project management and routine operations, and provide examples of each
3. Project management can use methodologies, techniques, and procedures to organize and execute projects effectively. Describe the differences of each methodology you know. Which methodology do you think is most appropriate for a project that is full of dynamics and inevitable changes? give your arguments

Suggested Reading

- Cho, Sun-Ae, 2023, The decision-making process regarding the continuance intention of using branded apps: an integrated approach to the PAM and the TPB, *International Journal of Contemporary Hospitality Management* Vol. 35 No. 12.
- Carayannis, E. G., Kwak, Y. H., Anbari, F., 2005. *The story of managing projects : an interdisciplinary approach*, Praeger Publishers
- Kloppenborg, T.J., Anantamula, V.S and. Wells, K.N. 2023. *Contemporary Project Management: Plan-Driven and Agile Approaches*, Fifth Edition, Cengage, USA
- Loiro, C., Castro, H., Ávila, P., Cruz-cunha, M. M., & Cruz-cunha, L. F. M. (2019). ScienceDirect Agile Project Management : A Communicational Workflow Agile Project Management : A Communicational Workflow Proposal Proposal. *Procedia Computer Science*, 164, 485–490. <https://doi.org/10.1016/j.procs.2019.12.210>
- Matos, S., & Lopes, E. (2013). Prince2 or PMBOK – a question of choice. 9, 787–794. <https://doi.org/10.1016/j.protcy.2013.12.087>

- Oguz, Abdullah. 2022. Project Management : Navigating the Complexity with a Systematic Approach, Creative Commons Attribution-Non Commercial 4.0 International License
- Project Management Institute. (2017). A guide to the Project Management Body of Knowledge (PMBOK guide) (6th ed.). Project Management Institute.
- Project Management Institute. (2021). The standard for project management and a guide to the project management body of knowledge (PMBOK guide). (7th ed.). Project Management Institut, Newtown Square, Pennsylvania
- Thesing, T, Feldmann, C., Burchardt, M., 2021, Agile versus Waterfall Project Management: Decision Model for Selecting the Appropriate Approach to the Project, Procedia Computer Science 181 (2021) 746–756
- Watt, Adrienne. 2014. *Project Management* - 2nd Edition. a Creative Commons Attribution 4.0 International

CHAPTER 2: PROJECT MANAGEMENT FRAMEWORK AND KNOWLEDGE AREAS

PMBOK (Project Management Body of Knowledge) is used as a foundation on which companies can build policies, procedures, rules, techniques, or cycles needed to practice project management.

PMBOK Guide contains various important points in project management. Some of them explain about 5 process groups namely initiating, planning, executing, monitoring and controlling, closing, as well as 10 knowledge areas. Knowledge areas are areas of knowledge that need to be understood for effective project management.

2.1 DETAILED STUDY OF THE PMBOK GUIDE: ITS RELEVANCE AND STRUCTURE

Managing a project is not an easy task. The role of a project manager is needed to carry out the management process and ensure that the methods applied can achieve the agreed goals. In order for the project to achieve the desired results in accordance with the schedule, budget, and business objectives, a guide called the **Project Management Body of Knowledge or PMBOK** is used. Project Management Body of Knowledge Guide or PMBOK Guide is a document that contains a collection of processes, practices, terminology, and guidelines that are standard in the project management industry. Project Management Body of Knowledge is a publication of the Project Management Institute (PMI), an international organization for project management. This organization aims to advance the field of project management by setting standards, providing certificates, conducting research, or professional conferences.

The fundamental purpose of the PMBOK Guide is to explain the knowledge and systems that can be applied to projects. The PMBOK Guide is generally recognized as good practice.

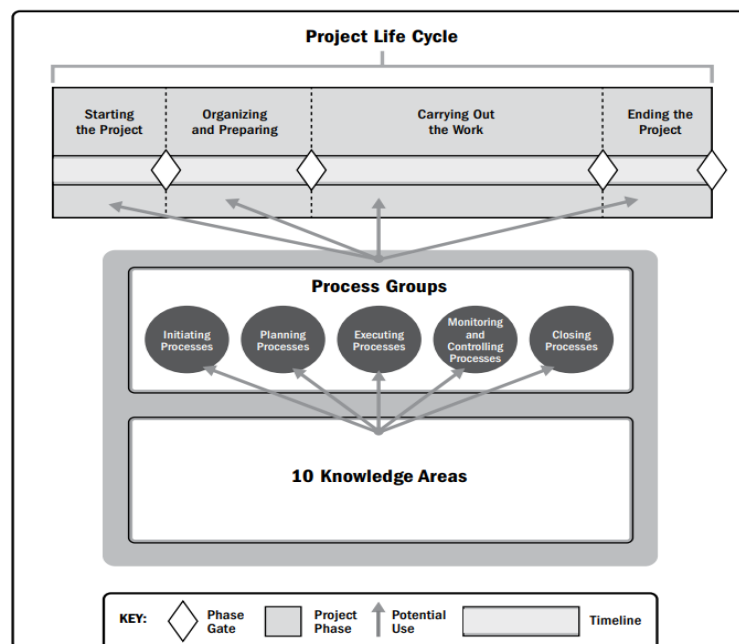


Figure 1. 1 Interrelationship of PMBOK Guide Key Components in Projects

Source : PMBOK Guide, 6th ed, 2017

The PMBOK Guide contains various important points in project management. Some of them explain about 5 process groups and 10 knowledge areas.

PMBOK uses five process groups to categorize the stages required in project management, namely:

1. Initiating

The core of the initiating stage is defining the project vision, documenting what is to be achieved, and getting approval from stakeholders.

2. Planning

Planning is the phase where you build the project infrastructure that enables you to achieve the project goals within predetermined time and budget constraints.

3. Executing

In this phase, the plans that have been made will be executed according to the predetermined timeline. Here, most of the budget will be spent to achieve the expected results.

4. Monitoring and Controlling

Monitoring and Controlling is done to oversee the progress of the ongoing project and see if it is in accordance with the plan. If things happen that are out of the plan that has been made, corrective action can be taken.

5. Closing

Closing is the final stage of the project life cycle. The project must be officially closed and obtain approval from the customer, stakeholder, or project sponsor.

Ten Knowledge Areas in the PMBOK Guide

1. Project integration management

Project integration management is an area that helps teams work together more smoothly. Integration management contains a collection of processes, systems, and methodologies that form a cohesive strategy for project management.

2. Project scope management

Project scope management refers to the total amount of work that must be done to produce a product, service, or other project deliverable with predefined functions and features. Without comprehensive project scope management, it is likely that your team will perform unnecessary out-of-scope work.

3. Project time management

Project time management refers to analyzing and developing a schedule or timeline for completing a project. Time management has a direct impact on project quality, scope, and cost, making it one of the most important knowledge areas.

4. Project cost management

Project cost management is the process of planning, estimating, and controlling costs or budgets for running projects. With cost management, you can control project costs to stay within the budget provided.

5. Project quality management

Project quality management is carried out to measure the quality of all ongoing activities. To control the quality of the project, during this quality management process, you can take corrective action if there are things that are not according to plan.

6. Project resource management

Project resource management is the management and determination of resources within the company that are needed to work on the project. Some of these are budget, capacity, and team members. Effective project resource management takes the available bandwidth of the team and

identifies the strengths and weaknesses of each team member. From this process, strategies can be organized to prepare the team for the success of the project.

7. Project communication management

Project communication management outlines the processes and procedures needed to ensure that information and data collected during the project can be properly collected, stored, and distributed to the entire project team involved. This process is necessary because effective communication is key to delivering a successful project.

8. Project risk management

Risk is one of the things that cannot be separated in the project management process. Therefore, project risk management is needed. Project risk management will reduce the potential negative impact of unexpected events on project costs, time tables, or other project resources.

9. Project procurement management

Project procurement management refers to the process of managing and optimizing the available project budget for goods, services, and resources needed to complete the project. The team member responsible for procurement management is often the project manager. In managing the budget, the project manager will ensure that resources can be purchased, rented, and acquired smoothly.

10. Project stakeholder management

The last knowledge area is project stakeholder management. Project status, costs, and obstacles will be communicated to stakeholders. This is done to increase visibility, navigate changes in project direction, and manage expectations.

The eight performance domains summarize the relevant elements that are critical to the success of a project, namely:

1. Team Performance Domain

Desired outcomes include shared ownership, high performing teams, leadership by all. To achieve these outcomes: determine the right amount of centralized or distributed management and leadership, facilitation, and servant leadership. Develop project teams by defining vision, goals, roles, team operations, growth, transparency, integrity, and respect. Use a variety of leadership skills, as appropriate to the situation

2. Stakeholder Performance Domain

Desired outcomes include productive working relationships, agreement on objectives, supportive and satisfied stakeholders, and ensuring that opposition does not negatively impact the project. To achieve these desired outcomes: Create alignment and engagement; identify, understand, analyze, prioritize, and engage stakeholders; and monitor their feelings, emotions, beliefs, and values.

3. Development Approach and Life Cycle Performance Domain

The desired outcomes include the development approach, lifecycle, and phases to deliver value. To achieve these outcomes, choose a predictive, hybrid (iterative or phased), or adaptive development approach based on the desired product, service, or outcome; project; and organization. Stages should have exit criteria. If the main risk comes from regulations, use a predictive approach, but if the main risk comes from stakeholder acceptance, use an adaptive approach.

4. Planning Performance Domain

Desired outcomes include the project is on track, a holistic approach is used, evolving information is outlined, the right amount of planning is used, stakeholder expectations are met, and there is a process to adapt. To achieve these outcomes, iterative or incremental projects use epics, features, stories, and backlogs, while predictive projects use estimation, scheduling, and planning.

5. Uncertainty Performance Domain

Desired outcomes include environmental awareness, proactive responses to uncertainty, awareness of interdependencies, ability to anticipate risks, delivery with little negative impact, realized opportunities, and reserves used wisely. To achieve these outcomes, consider and manage uncertainty, ambiguity, complexity, volatility, and risk. Gather information, prepare for multiple outcomes, investigate alternative designs, and build in resilience. Deal with complexity by decoupling, simulating, viewing from diverse perspectives, balancing data used, iterating, engaging, and building in redundancy. Deal with threats (negative risk) by avoidance, escalation, transfer, mitigation, or acceptance. Deal with opportunity (positive risk) by exploiting, escalating, sharing, enhancing, or accepting

6. Delivery Performance Domain

Desired outcomes include projects contributing to business objectives, realizing intended outcomes and benefits at an appropriate time frame, the team having a clear understanding of requirements, stakeholders accepting and being satisfied with deliverables. To achieve these outcomes, define business value and determine where and how it can be measured; decompose scope; assure completion of deliverables; use quality costs; and monitor moving targets.

7. Measurement Performance Domain

Desired outcomes include a reliable understanding of project status, actionable data for decision making, actions to keep performance on track, achieving targets, and generating business value. To achieve these outcomes, use leading and lagging indicators. Metric types include deliverable, delivery, baseline performance, resources, business value, stakeholders, and forecast metrics. Adaptive projects also use throughput, dashboards, information radiators, and visual controls. Metrics should have thresholds beyond which corrective action is taken.

8. Project Work Performance Domain

Desired outcomes include efficient and effective performance and appropriate processes to manage stakeholder engagement, physical resources, procurement, change, and improvement. To achieve these outcomes, establish and tailor processes; use audits to make them efficient and effective; balance constraints and team and project needs; monitor and integrate new work, changes, and risk; and capture and share both explicit and tacit knowledge.

2.2 DEEP DIVE INTO THE FIVE PROCESS GROUPS: INITIATING, PLANNING, EXECUTING, MONITORING & CONTROLLING, AND CLOSING

Initiation Phase

The Initiating Process Group consists of those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase. The purpose of the Initiating Process Group is to align the stakeholders' expectations and the project purpose, inform stakeholders of the scope and objectives, and discuss how their participation in the project and its associated phases can help to ensure their expectations are met. Within the Initiating processes, the initial scope is defined and initial financial resources are committed. Stakeholders who will interact and influence the overall outcome of the project are identified. If not already assigned, the project manager is appointed. This information is captured in the project charter and stakeholder register. When the project charter is approved, the project is officially authorized, and the project manager is authorized to apply organizational resources to project activities.

Planning Phase

The Planning Process Group consists of those processes that establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives. The processes in the Planning Process Group develop the components of the project management plan and the project documents used to carry out the project. The nature of a project may require the use of repeated feedback loops for additional analysis. As more project information or characteristics are gathered and understood, additional planning will likely be required. Significant changes that occur throughout the project life cycle may initiate a need to revisit one or more of the planning processes and, possibly, one or both of the Initiating processes. This ongoing refinement of the project management plan is called progressive elaboration, indicating that planning and documentation are iterative or ongoing activities. The key benefit of this Process Group is to define the course of action to successfully complete the project or phase.

The planning phase, is where the project solution is further developed in as much detail as possible and the steps necessary to meet the project's objective are planned. In this step, the team identifies all of the work to be done. The project's tasks and resource requirements are identified, along with the strategy for producing them. This is also referred to as "scope management." A project plan is created outlining the activities, tasks, dependencies, and timeframes. The project manager coordinates the preparation of a project budget by providing cost estimates for the labour, equipment, and materials costs. The budget is used to monitor and control cost expenditures during project implementation. Once the project team has identified the work, prepared the schedule, and estimated the costs, the three fundamental components of the planning process are complete. This is an excellent time to identify and try to deal with anything that might pose a threat to the successful completion of the project. This is called risk management. In risk management, "high-threat" potential problems are identified along with the action that is to be taken on each high-threat potential problem, either to reduce the probability that the problem will occur or to reduce the impact on the project if it does occur. This is also a good time to identify all project stakeholders and establish a communication plan describing the information needed and the delivery method to be used to keep the stakeholders informed. Finally, you will want to document a quality plan, providing quality targets, assurance, and control measures, along with an acceptance plan, listing the criteria to be met to gain customer acceptance. At this point, the project would have been planned in detail and is ready to be executed.

Implementation (Execution)

Phase During the third phase, the implementation phase, the project plan is put into motion and the work of the project is performed. It is important to maintain control and communicate as needed during implementation. Progress is continuously monitored and appropriate adjustments are made and recorded as variances from the original plan. In any project, a project manager spends most of the time in this step. During project implementation, people are carrying out the tasks, and progress information is being reported through regular team meetings. The project manager uses this information to maintain control over the direction of the project by comparing the progress reports with the project plan to measure the performance of the project activities and take corrective action as needed. The first course of action should always be to bring the project back on course (i.e., to return it to the original plan). If that cannot happen, the team should record variations from the original plan and record and publish modifications to the plan. Throughout this step, project sponsors and other key stakeholders should be kept informed of the project's status according to the agreed-on frequency and format of communication. The plan should be updated and published on a regular basis. Status reports should always emphasize the anticipated end point in terms of cost, schedule, and quality of deliverables. Each project deliverable produced should be reviewed for quality and

measured against the acceptance criteria. Once all of the deliverables have been produced and the customer has accepted the final solution, the project is ready for closure.

Monitor and Control Project Work

Monitor and Control Project Work is the process of tracking, reviewing, and reporting the overall progress to meet the performance objectives defined in the project management plan. The key benefits of this process are that it allows stakeholders to understand the current state of the project, to recognize the actions taken to address any performance issues, and to have visibility into the future project status with cost and schedule forecasts.

Monitoring is an aspect of project management performed throughout the project. Monitoring includes collecting, measuring, and assessing measurements and trends to effect process improvements. Continuous monitoring gives the project management team insight into the health of the project and identifies any areas that may require special attention. Control includes determining corrective or preventive actions or replanning and following up on action plans to determine whether the actions taken resolved the performance issue. The Monitor and Control Project Work process is concerned with: Comparing actual project performance against the project management plan; Assessing performance periodically to determine whether any corrective or preventive actions are indicated, and then recommending those actions as necessary; Checking the status of individual project risks; Maintaining an accurate, timely information base concerning the project's product(s) and their associated documentation through project completion; Providing information to support status reporting, progress measurement, and forecasting; Providing forecasts to update current cost and current schedule information; Monitoring implementation of approved changes as they occur; Providing appropriate reporting on project progress and status to program management when the project is part of an overall program; and Ensuring that the project stays aligned with the business needs

Closing Phase

During the final closure, or completion phase, the emphasis is on releasing the final deliverables to the customer, handing over project documentation to the business, terminating supplier contracts, releasing project resources, and communicating the closure of the project to all stakeholders. The last remaining step is to conduct lessons-learned studies to examine what went well and what didn't. Through this type of analysis, the wisdom of experience is transferred back to the project organization, which will help future project teams.

Close Project or Phase is the process of finalizing all activities for the project, phase, or contract. The key benefits of this process are the project or phase information is archived, the planned work is completed, and organizational team resources are released to pursue new endeavors. This process is performed once or at predefined points in the project. When closing the project, the project manager reviews the project management plan to ensure that all project work is completed and that the project has met its objectives. The Close Project or Phase process also establishes the procedures to investigate and document the reasons for actions taken if a project is terminated before completion. In order to successfully achieve this, the project manager needs to engage all the proper stakeholders in the process.

2.3 INTRODUCTION TO THE TEN KNOWLEDGE AREAS AND THEIR SIGNIFICANCE

A Knowledge Area is an identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and

techniques. Although the Knowledge Areas are interrelated, they are defined separately from the project management perspective. From an organizational perspective, knowledge management is about making sure the skills, experience, and expertise of the project team and other stakeholders are used before, during, and after the project. Because knowledge resides in the minds of people and people cannot be forced to share what they know (or to pay attention to others' knowledge), the most important part of knowledge management is creating an atmosphere of trust so that people are motivated to share their knowledge. Even the best knowledge management tools and techniques will not work if people are not motivated to share what they know or to pay attention to what others know. In practice, knowledge is shared using a mixture of knowledge management tools and techniques (interactions between people) and information management tools and techniques (in which people codify part of their explicit knowledge by documenting it so it can be shared).

The ten Knowledge Areas identified in this guide are used in most projects most of the time. The ten Knowledge Areas described in this guide are:

1. Project Integration Management. Includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the Project Management Process Groups.
2. Project Scope Management. Includes the processes required to ensure the project includes all the work required, and only the work required, to complete the project successfully
3. Project Schedule Management. Includes the processes required to manage the timely completion of the project.
4. Project Cost Management. Includes the processes involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs so the project can be completed within the approved budget.
5. Project Quality Management. Includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements, in order to meet stakeholders' expectations.
6. Project Resource Management. Includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.
7. Project Communications Management. Includes the processes required to ensure timely and appropriate planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and ultimate disposition of project information.
8. Project Risk Management. Includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.
9. Project Procurement Management. Includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.
10. Project Stakeholder Management. Includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

Tabel 2. 1 Project Management Process Group and Knowledge Area Mapping

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work 4.4 Manage Project Knowledge	4.5 Monitor and Control Project Work 4.6 Perform Integrated Change Control	4.7 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Schedule Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Durations 6.5 Develop Schedule		6.6 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Manage Quality	8.3 Control Quality	
9. Project Resource Management		9.1 Plan Resource Management 9.2 Estimate Activity Resources	9.3 Acquire Resources 9.4 Develop Team 9.5 Manage Team	9.6 Control Resources	
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Monitor Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses	11.6 Implement Risk Responses	11.7 Monitor Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Engagement	13.3 Manage Stakeholder Engagement	13.4 Monitor Stakeholder Engagement	

Source : PKMOK Guide, 6th ed, 2017

Summary

- Project Management Body of Knowledge Guide or PMBOK Guide is a document that contains a collection of processes, practices, terminology, and guidelines that are standard in the project management industry.
- The fundamental purpose of the PMBOK Guide is to explain the knowledge and systems that can be applied to projects.
- The Project Management Body of Knowledge can be used as an important guideline needed to produce successful project management. It contains various knowledge related to how to manage projects properly so that companies can avoid failure.

– The PMBOK Guide contains various important points in project management. Some of them explain about 5 process groups and 10 knowledge areas. PMBOK uses five process groups to categorize the stages required in project management, namely: Initiating, Planning, Executing, Monitoring and Controlling, Closing.

– Ten Knowledge Areas in the PMBOK Guide are : Project integration management, Project Scope Management, Project Time Management, Project Cost Management, Project Quality Management, Project Resource Management, Project Communication Management, Project Risk Management, Project Procurement Management, Project Stakeholder Management

Discussion Questions

1. A project has two main attributes that differentiate it from work in progress and routine work which is a business operation, namely Unique and temporary, explain this definition and give an example of its application to a project

2. There are a number of constraints that require attention in running a project. Explain the constraints that need to be considered in carrying out the project. How to reduce each of these constraints!

3. What do you think constitutes a successful project? What factors can be used to measure the success of a project? give an example

Suggested Reading

Kloppenborg, T.J., Anantatmula, V.S and. Wells, K.N. 2023 Contemporary Project Management: Plan-Driven and Agile Approaches, Fifth Edition, Cengage, USA

Oguz, Abdullah. 2022. *Project Management : Navigating the Complexity with a Systematic Approach*, Creative Commons Attribution-Non Commercial 4.0 International License

Project Management Institute. (2017). *A guide to the Project Management Body of Knowledge (PMBOK guide)* (6th ed.). Project Management Institute.

Project Management Institute. (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide)*. (7th ed.). Project Management Institut, Newtown Square, Pennsylvania

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CHAPTER 3: INITIATING AND DEFINING PROJECTS

Project management processes are grouped into five categories known as Project Management Process Groups (or Process Groups): These five process groups are: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group. Initiating Process Group are those processes executed to define a new project or a new phase of an existing project by gaining authorization to start the project or phase. Within the initiation phase, the business problem or opportunity is identified, a solution is defined, a project is formed, and a project team is appointed to build and deliver the solution to the customer. A project is successful when it achieves its objectives and meets or exceeds the expectations of the stakeholders

3.1 THE IMPORTANCE OF CLEAR PROJECT INITIATION

Initiation Phase

The project management process defines how to manage projects. The project life cycle describes the high-level process of completing a project and the steps taken to make it happen. The project life cycle describes how a project happens; how the phases of a project are carried out by the team from brief to delivery. Project management processes are grouped into five categories known as Project Management Process Groups (or Process Groups): These five process groups are: Initiating Process Group, Planning Process Group, Executing Process Group, Monitoring and Controlling Process Group, and Closing Process Group.

Initiating Process Group are those processes executed to define a new project or a new phase of an existing project by gaining authorization to start the project or phase. The purpose of Project Initiation is to define and initial financial resources are committed, Identify the Internal and external stakeholders who will interact and influence the overall outcome of the project, if not already assigned, the project manager will be selected. Once we have come up with an appealing new project idea, the approach to this first phase of project management lay a solid foundation for the essential activities to get started with the new project. The key purpose of the Initiating Process Group is to align the stakeholders' expectations with the project's purpose, give them visibility about the scope and objectives, and show how their participation in the project and its associated phases can ensure that their expectations are achieved. Initiation processes can be performed at the organizational, program, or portfolio level and would therefore be outside the control level of the project. With the business case in hand and an understanding of what is possible within the confines of the organization, the project initiation process can begin. This includes developing a project charter, a project scope statement and identifying project stakeholders.

The project initiation phase is the first phase within the project management life cycle, as it involves starting up a new project. Within the initiation phase, the business problem or opportunity is identified, a solution is defined, a project is formed, and a project team is appointed to build and deliver the solution to the customer.

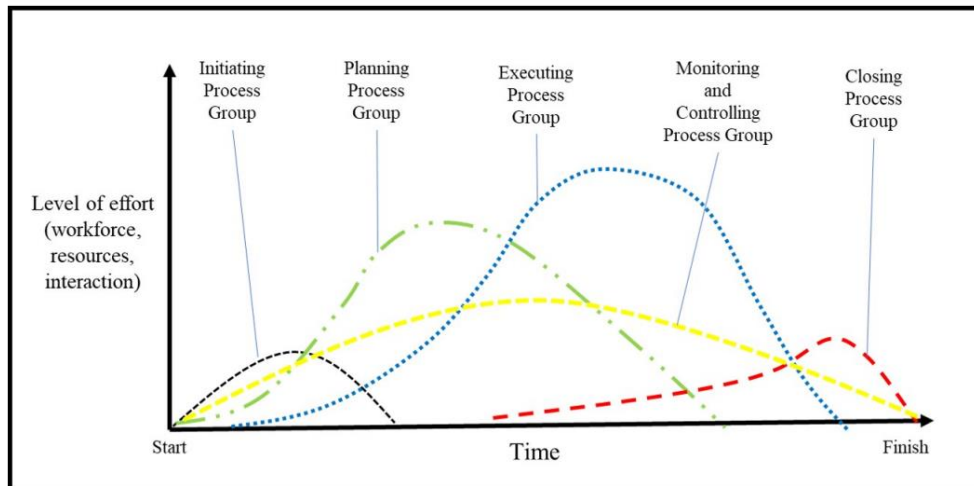


Figure 3.1 Project Management Process Groups (Adapted from PMBOK Guide 6th Edition)
Source : Oguz, 2022

The key activities or components to initiating a project the right way includes :

1. Creating a business case; to establish the benefits and costs associated with the work to be performed;
2. Conducting a feasibility study; to identify project constraints, alternatives, and related assumptions;
3. Establishing a project charter; to provide formal authorization to perform the work and the authority to assign organizational resources to the work;
4. Identifying stakeholders and making a stakeholder register; to consider the perspective of anyone who may have a vested interest in the project or project outcome;
5. Assembling the team and establishing a project office; To identify personnel with the talents and skills to deliver the project;
6. Project Kick-Off Meeting; Once the team formation is done, it's time for the kick off meeting to introduce the team and stakeholders and discuss everything that will guide the project to success

3.2 TOOLS AND TECHNIQUES FOR STAKEHOLDER IDENTIFICATION, ANALYSIS, AND ENGAGEMENT

STAKEHOLDER IDENTIFICATION

Project success is partly determined by identifying and prioritizing stakeholders (based on importance and influence), managing strong relationships with them, and making decisions that match stakeholder expectations. Therefore, it is good practice to identify key stakeholders at the beginning of a project. Stakeholders are all people who impact or are impacted by the project. They can be internal or external to the organization, support or oppose the project, and have an interest in the project process and/or project outcomes. Some stakeholders may also influence project management implementation and outcomes. Project managers and teams start by identifying all stakeholders and determining which ones are most important.

The project sponsor, generally an executive in the organization with the authority to assign resources and enforce decisions regarding the project, is a stakeholder. Customers, subcontractors, suppliers, and sometimes even the government are also stakeholders. Project managers, project team members, and managers from other departments in the organization are also stakeholders.

STAKEHOLDER ANALYSIS

Project stakeholders. In a project, there are both internal and external stakeholders. Internal stakeholders may include top management, project team members, your manager, peers, resource manager, and internal customers. External stakeholders may include external customers, government, contractors and subcontractors, and suppliers.

Top management; may include the president of the company, vice-presidents, directors, division managers, the corporate operating committee, and others. These people direct the strategy and development of the organization.

The Project Team; is made up of those people dedicated to the project or borrowed on a part-time basis. As project manager, you need to provide leadership, direction, and above all, the support to team members as they go about accomplishing their tasks. Working closely with the team to solve problems can help you learn from the team and build rapport. Showing your support for the project team and for each member will help you get their support and cooperation.

Your Manager; Typically the boss decides what the assignment is and who can work with the project manager on projects. Keeping your manager informed will help ensure that you get the necessary resources to complete your project. If things go wrong on a project, it is nice to have an understanding and supportive boss to go to bat for you if necessary

Peers are people who are at the same level in the organization as you and may or may not be on the project team. These people will also have a vested interest in the product. However, they will have neither the leadership responsibilities nor the accountability for the success or failure of the project that you have.

Resource Managers; Because project managers are in the position of borrowing resources, other managers control their resources. So their relationships with people are especially important. If their relationship is good, they may be able to consistently acquire the best staff and the best equipment for their projects. If relationships aren't good, they may find themselves not able to get good people or equipment needed on the project.

Internal customers are individuals within the organization who are customers for projects that meet the needs of internal demands. The customer holds the power to accept or reject your work. Early in the relationship, the project manager will need to negotiate, clarify, and document project specifications and deliverables. After the project begins, the project manager must stay tuned in to the customer's concerns and issues and keep the customer informed.

External customers are the customers when projects could be marketed to outside customers. In the case of Ford Motor Company, for example, the external customers would be the buyers of the automobiles. Also if you are managing a project at your company for Ford Motor Company, they will be your external customer.

Government Project managers working in certain heavily regulated environments (e.g., pharmaceutical, banking, or military industries) will have to deal with government regulators and departments. These can include all or some levels of government from municipal, provincial, federal, to international.

Contractors, subcontractors, and suppliers There are times when organizations don't have the expertise or resources available in-house, and work is farmed out to contractors or subcontractors. This can be a construction management foreman, network consultant, electrician, carpenter, architect, or anyone who is not an employee. Managing contractors or suppliers requires many of the skills needed to manage full-time project team members.

STAKEHOLDER ENGAGEMENT

The process of building strong relationships with stakeholders using the following methods.

Stakeholder analysis: Conduct a stakeholder analysis, or assessment of the key project participants, and how the project will affect their problems and needs. Recognize the characteristics and interests of each stakeholder. Determine roles and levels of participation, and determine if there are conflicts of interest among stakeholder groups.

Analyze stakeholders: Conduct a stakeholder analysis, or an assessment of a project's key participants, and how the project will affect their problems and needs. Identify their individual characteristics and interests. Find out what motivates them, as well as what provokes them. Define roles and level of participation, and determine if there are conflicts of interest among groups of stakeholders.

Assess influence: Measure the degree to which stakeholders can influence the project. The more influential a stakeholder is, the more a project manager will need their support. Think about the question, "What's in it for them?" when considering stakeholders. Knowing what each stakeholder needs or wants from the project will enable the project manager to gauge his or her level of support. And remember to balance support against influence. Is it more important to have strong support from a stakeholder with little influence, or lukewarm support from one with a high level of influence? Understand their expectations: Nail down stakeholders' specific expectations. Ask for clarification when needed to be sure they are completely understood.

Define "success": Every stakeholder may have a different idea of what project success looks like. Discovering this at the end of the project is a formula for failure. Gather definitions up front and include them in the objectives to help ensure that all stakeholders will be supportive of the final outcomes.

Keep stakeholders involved: Don't just report to stakeholders. Ask for their input. Get to know them better by scheduling time for coffee, lunch, or quick meetings. Measure each stakeholder's capacity to participate and honour time constraints.

Keep stakeholders informed: Send regular status updates. Daily may be too much; monthly is not enough. One update per week is usually about right. Hold project meetings as required, but don't let too much time pass between meetings. Be sure to answer stakeholders' questions and emails promptly. Regular communication is always appreciated – and may even soften the blow when you have bad news to share.

3.3 CREATING A CLEAR AND CONCISE PROJECT CHARTER

A project charter, project definition, or project statement is a statement of the scope, objectives, and participants in a project. It provides a preliminary delineation of roles and responsibilities, outlines the project objectives, identifies the main stakeholders, and defines the authority of the project manager. It serves as a reference of authority for the future of the project.

The purpose of a project charter is to:

- Provide an understanding of the project, the reason it is being conducted, and its justification
- Establish early on in the project the general scope
- Establish the project manager and his or her authority level. A note of who will review and approve the project charter must be included.

Project charter is a short document (usually about one to four pages) serves as an informal contract between the project team and the sponsor (who represents both senior management of the organization and the outside customer, if there is one). Negotiation skills of the project manager play an important role in developing a viable project charter.

The four main objectives of the charter are to:

1. Authorize the project manager to proceed.
2. Help the project manager, sponsor, and team members (if any have been assigned) develop a common understanding of the project.
3. Help the project manager, sponsor, and team members to commit to the spirit of the project. of the project.
4. Quickly filter out obviously bad projects.

First, a project charter is “a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.” Many project managers do not have the authority to commit resources without a charter. This gives the project and the project manager official status within the parent organization. Second, a project charter helps everyone involved in the upcoming project to develop a common understanding of what the project entails. This includes at least the broad justification for the project, how it aligns with the goals of the parent organization, determination of what is included and excluded in the project scope, rough schedule, success measures, major risks, rough estimate of resource needs, and stakeholders. On larger and more complex projects, additional understanding may be required at this point. Small, simple projects may use a simplified single-page charter. Once everyone has a common understanding of clear project goals, several additional benefits occur. First, a project charter is “a document that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.”¹ Many project managers do not have the authority to commit resources without a charter. This gives the project and the project manager official status within the parent organization. Second, a project charter helps everyone involved in the upcoming project to develop a common understanding of what the project entails. This includes at least the broad justification for the project, how it aligns with the goals of the parent organization, determination of what is included and excluded in the project scope, rough schedule, success measures, major risks, rough estimate of resource needs, and stakeholders. On larger and more complex projects, additional understanding may be required at this point. Small, simple projects may use a simplified single-page charter. Fourth, a charter is used to quickly screen potential projects to determine which appear to be poor choices. Needless to say, a charter is much quicker to put together than a full, detailed project plan and schedule. If by constructing a charter it is determined that the project is likely to fail, much planning time (and, therefore, money and resources) will be saved.

3.4 SETTING SMART (SPECIFIC, MEASURABLE, ACHIEVABLE, RELEVANT, TIME-BOUND) OBJECTIVES

When articulating the project objectives you should follow the SMART rule:

1. Specific – get into the details. Objectives should be specific and written in clear, concise, and understandable terms.
 2. Measurable – use quantitative language. You need to know when you have successfully completed the task.
 3. Acceptable – agreed with the stakeholders.
 4. Realistic – in terms of achievement. Objectives that are impossible to accomplish are not realistic and not attainable. Objectives must be centred in reality.
 5. Time based – deadlines not durations. Objectives should have a time frame with an end date
- Overview of Project Planning 74 assigned to them.

Successful organizations are intentional about the actions they take to fulfill their vision and mission. These organizations analyze their external and internal environments to understand the

opportunities and threats present in the environments in which they operate. An organization also must analyze and work within its own strengths and weaknesses. This analysis directly refers to a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

The primary goal of a business case and a project and their objectives must be clearly defined, must contain a measure of how to assess whether they have been achieved, and should be realistic. A commonly utilized guideline to create this kind of objective is to follow the SMART protocol. SMART is an acronym that represents the criteria of being specific, measurable, achievable, relevant, and timebased. SMART objectives also serve as performance metrics to monitor the progress of a project and decide whether the outcomes are successful and can be accepted by the client or customer. Thus, the project manager can monitor and control these performance metrics.

Specific

We should develop unambiguous objectives that all our stakeholders can understand what we want to achieve. Thus, these objectives should be well-defined, specific, and written in clear, concise, and understandable terms. While creating an objective, we should ask “What do we want to accomplish?”, “What do we intend to impact?”, “Why is this goal important?”, “Who is responsible for carrying out the action?”, and “Who is our target audience/population?”. Such questions would help us create specific objectives. This objective can be considered specific as it addresses the primary objective by referring to the target population and responsible organization, and we want to achieve. However, it still lacks other elements of SMART.

Measurable

The success of a project relies on measurable quantitative criteria that must be met to achieve the objectives. If we don’t use any metrics to measure the progress and performance, we can never be sure if we are on the track and can accomplish the targets when we finish the tasks or a project. These quantitative measures can indicate a number, percentage, or any standard unit. By means of measures, we can know that change has occurred how much, and in what direction. Besides, we should consider the source of verification and the data to prove the target is met.

Sometimes, it is not possible to directly measure the performance or achievement. Quality improvement training could be an effective method to increase the quality of the services provided to the citizens. However, it is of high importance to ask directly the citizens using interviews or surveys about their satisfaction level with the services they receive.

Time-based

The last letter of the SMART acronym refers to “time-based” objectives. The SMART protocol doesn’t necessarily impose an order of letters to follow while creating SMART objectives. However, discussing the time-based criterion can be more practical taking into consideration the nature of time as a measure itself. While assessing this criterion, we can address the issues such as how long to expect a project to take, and how much time for different success metrics to be met

Achievable

We should also consider the factors that may affect the achievability of objectives. These factors include the evaluation of resources, knowledge, and time that are available to carry out the tasks to achieve the objectives.

Relevant

The last criterion that needs to be considered is the relevance of these objectives with higher-level organizational goals such as strategic objectives, mission and vision statements, and the goals of programs or portfolios that the business need or project is affiliated with. This alignment can ensure that the business case or project would have a higher chance of approval from the organizational leadership and greater buy-in from the stakeholders.

Summary

1. The project management process defines how to manage projects. The project life cycle describes the high-level process of completing a project and the steps taken to make it happen. The project initiation phase is the first phase within the project management life cycle, as it involves starting up a new project
2. A successful project manager will identify stakeholders early in the project. Stakeholders are all people who impact or are impacted by the project. They can be internal or external to the organization, support or oppose the project, and have an interest in the project process and/or project outcomes
3. The primary goal of a business case and a project and their objectives must be clearly defined, must contain a measure of how to assess whether they have been achieved, and should be realistic. A commonly utilized guideline to create this kind of objective is to follow the SMART protocol. SMART is an acronym that represents the criteria of being specific, measurable, achievable, relevant, and timebased

Discussion Questions

1. Explain how to scale up or down the complexity of project planning and management tools and what effect, if any, this might have on the project life cycle
2. Discuss how a project could be successful in terms of some measures yet unsuccessful in others
3. List and describe several issues that pertain to each stage of the project life cycle
4. Explain the efforts made to create a clear and concise project charter.

Suggested Reading

- Oguz, Abdullah. 2022. Project Management : Navigating the Complexity with a Systematic Approach, Creative Commons Attribution-Non Commercial 4.0 International License
- Project Management Institute. (2017). *A guide to the Project Management Body of Knowledge (PMBOK guide)* (6th ed.). Project Management Institute.
- Project Management Institute. (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide)*. (7th ed.). Project Management Institut, Newtown Square, Pennsylvania
- Watt, Adrienne. 2014. Project Management - 2nd Edition. a Creative Commons Attribution 4.0 International
- Kloppenborg, T.J., Anantatmula, V.S and. Wells, K.N. 2023 Contemporary Project Management: Plan-Driven and Agile Approaches, Fifth Edition, Cengage, USA

CHAPTER 4: COMPREHENSIVE PROJECT PLANNING

Planning consists of the processes necessary to establish the scope of the project, refine the objectives, and determine the actions necessary to achieve the goals the project aims to achieve. Project planning is at the core of the project lifecycle and tells everyone involved where the project is headed and how the team will get there. It involves creating a series of plans to help guide the team through the implementation and closure phases of the project.

In line with the project schedule management plan, a schedule of the entire project must be created by defining activities based on the WBS (Work Breakdown Structure).

4.1 CRAFTING A DETAILED PROJECT MANAGEMENT PLAN

Planning consists of the processes necessary to establish the scope of the project, refine the objectives, and determine the actions necessary to achieve the goals the project aims to achieve. Project planning is at the core of the project lifecycle and tells everyone involved where the project is headed and how the team will get there. It involves creating a series of plans to help guide the team through the implementation and closure phases of the project. The planning phase of a project is often the most challenging phase for project managers, as project managers are often required to select the right team members, the resources needed for all activities, and the schedule and budget needed to complete the project. In addition, planning also includes communication and procurement activities, as well as contract planning with third-party suppliers. Careful and precise planning helps the team have a smoother execution process with better predictability.

However, it is very important to remember that the level of predictability is at a low level in many projects in terms of scope (project requirements and activities), schedule, budget, and risk.

The purpose of the project planning phase is to provide guidance and direction on how scope, schedule, cost, quality, resources, communications, risks, procurements, and stakeholders will be managed throughout the project,

a. Refine and elaborate on the SMART (Specific, Measurable, Achievable, Relevant, Time-based) objectives, establish the business, stakeholder, solution, and transition requirements, and translate them into project activities by defining the scope and creating a WBS (Work Breakdown Structure),

b. Develop a project schedule by defining and sequencing project activities and milestones, and estimating activity durations.

c. Determining resources, identifying risks based on requirements and activities, and ultimately estimating costs and determining the project budget,

d. Identifying methods to track, review, and organize project progress and performance.

e. Communicate and collaborate with all stakeholders, and obtain approval from the sponsor and client, and proceed to the next stage, which is the implementation (execution) stage.

The project manager identifies the work to be done for the project in collaboration with stakeholders including the project sponsor, team members, relevant functional departments of our organization, end users, customers, regulatory organizations, and government agencies - in short, all stakeholders affected by or affecting the overall project or at least one activity, decision, or outcome. Once the main components of the project are known, the project manager can assign people in the

team who will do the detailed planning of the sub-components of the project. Activities that can be managed at the lowest level are called "work packages" in the predictive (waterfall) methodology.

The planning phase refines the project's objectives in the Project Charter, which were identified at higher levels during the initiation phase. This phase also includes planning the steps necessary to meet those objectives by further identifying the specific activities and resources required to complete the project. Once the project objectives have been fully recognized, they must be clearly articulated, specifically developing each of them according to the SMART protocol. These objectives would lead to the identification and elaboration of product requirements in line with the project deliverables. Often, the very act of describing a project's objectives using detailed, precise language allows us to better understand the project's scope. This articulation serves as the basis for the development of requirements. What this means is that, after an objective has been clearly articulated, it can be described in concrete (measurable) terms and the steps to achieve it are easier to identify. If a poor job is done of articulating the objectives, the requirements will be misdirected, and the resulting project will not represent the true need.

In general, the planning phase involves three fundamental components:

- Identifying the scope,
- preparing the schedule, and
- estimating the costs.

These are triple constraints that also serve as our baselines throughout the project to measure the project's success. After these activities are complete, it is a good time to identify and try to deal with anything that might pose a threat or an opportunity to the successful completion of the project.

According to Project Management Institute. (2017). A guide to the Project Management Body of Knowledge (PMBOK guide) (6th ed.). Project Management Institute. A project schedule management plan can consist of the following:

Unit of measurement : Work hours, days, weeks, months Daily working hours and shifts Weekends and/or off-days Local, national, and federal holidays Creation of the activity list and attributes : Describe how activities and their attributes will be defined, and who will be involved in this process.

Level of accuracy : Acceptable range to ensure realistic activity duration estimates, Evaluation of the impact of risks on the overall project duration and each individual activity durations based on the project risk management plan, Methods describing how the schedule contingencies will be assessed.

Activity duration estimates : Estimation methods (e.g., analogous, parametric, three-point, bottom-up)

Methods, tools, and software utilized to develop, manage, and monitor project schedule : Specify the organization's procedures, policies, and resource calendars if they should be utilized; Methods and tools such as Gantt Chart, WBS, project baseline, master and milestone schedule, Earned Value Management, and critical path method; Software such as Microsoft Project Professional, Excel, Visio, and Jira (for Kanban and Scrum), and online collaboration tools such as Monday, Trello, and Basecamp.

Rules and concepts to sequence activities and create an activity network diagram : Critical path method (Forward pass, backward pass, slacks; Critical chain method; Predecessor dependencies (e.g., finish-to-start, start-to-start).

Rules for monitoring schedule performance : Earned Value Management (EVM; Control thresholds for deviations from the parameters in the schedule baseline; Using software such as

Microsoft Project Reporting formats Reporting formats and frequency should be in alignment with other project plans.

Approval of the schedule baseline : Who will be responsible for preparation and control?
Who will approve the schedule baseline

4.2 TECHNIQUES FOR CREATING WORK BREAKDOWN STRUCTURES (WBS)

In line with the project schedule management plan, a schedule of the entire project must be created by defining activities based on the WBS (Work Breakdown Structure). The process of defining activities is a further breakdown of the WBS work package elements. This process documents the specific activities required to fulfill the deliverables detailed in the WBS. These activities are not work deliverables themselves but are individual units of work that must be completed to fulfill the deliverable.

The WBS defines the scope of the project and breaks the work down into components that can be scheduled, estimated, and easily monitored and controlled. The idea behind the WBS is simple: dividing a complicated task into smaller tasks until we reach a level that cannot be further subdivided. Each descending level of the WBS represents an increased level of detailed definition of the project work. A WBS also provides the necessary framework for detailed cost estimating and control, along with providing guidance for schedule development and control.

The purpose of developing a WBS is to allow easier management of each component, accurate estimation of time, cost, and resource requirements, easier assignment of human resources, and easier assignment of responsibility for activities. WBS is a hierarchical decomposition of the project into phases, deliverables, and work packages. It is a tree structure, which shows a subdivision of effort required to achieve an objective.

In a project, the WBS is developed by starting with the end objective and successively subdividing it into manageable components in terms of size, duration, and responsibility, which includes all steps necessary to achieve the objective. An example of this hierarchical decomposition can be starting from the highest level which is the project and moving downwards along the systems, subsystems, components, tasks, and subtasks, and stopping when we arrive at the lowest level which is work packages.

The WBS creation involves:

- Listing all the project outputs (deliverables and other direct results)
- Identifying all the activities required to deliver the outputs
- Subdividing these activities into subactivities and tasks
- Identifying the deliverable and milestone(s) of each task
- Considering the usage of all the resources (personnel and material) required to

complete each task

Identify activities for the work packages, including all the activities that must be accomplished to deliver each work package with activity attributes. This list can consist of, but is not limited to:

1. Activity identifier
2. WBS number
3. Activity title
4. Scope of Work
5. The person responsible
6. Related activities :

- a. Higher level activities (WBS number),
- b. Lower level activities (WBS number)
- c. Predecessors
- d. Successors
- 7. Resource requirements
- 8. Activity location
- 9. Level of effort required
- 10. Activity assumptions
- 11. Activity constraints

4.3 RESOURCE PLANNING: HUMAN, MATERIAL, FINANCIAL

Resources are people, equipment, place, money, or anything else that you need in order to do all of the activities that you planned for. Every activity in your activity list needs to have resources assigned to it. Before you can assign resources to your project, you need to know their availability. Resource availability includes information about what resources you can use on your project, when they're available to you, and the conditions of their availability

Human Resource Planning

The most important resource to a project is its people—the project team. Projects require specific expertise at specific moments in the schedule, depending on the milestones being delivered or the given phase of the project. An organization can host several strategic projects concurrently over the course of a budget year, which means that its employees can be working on more than one project at a time. Alternatively, an employee may be seconded away from his or her role within an organization to become part of a project team because of a particular expertise. Moreover, projects often require talent and resources that can only be acquired via contract work and third party vendors.

Procuring and coordinating these human resources, in tandem with managing the time aspect of the project, is critical to overall success. Managing the Team In order to successfully meet the needs of a project, it is important to have a high-performing project team made up of individuals who are both technically skilled and motivated to contribute to the project's outcome. One of the many responsibilities of a project manager is to enhance the ability of each project team member to contribute to the project, while also fostering individual growth and accomplishment. At the same time, each individual must be encouraged to share ideas and work with others toward a common goal. Through performance evaluation, the manager will get the information needed to ensure that the team has adequate knowledge, to establish a positive team environment and a healthy communication climate, to work properly, and to ensure accountability. Managing the project team includes appraisal of employee performance and project performance. The performance reports provide the basis for managerial decisions on how to manage the project team. Employee performance includes the employee's work results such as:

- Quality and quantity of outputs
- Work behaviour (such as punctuality)
- Job-related attributes (such as cooperation and initiative) After conducting employee performance reviews, project managers should:
 - Provide feedback to employees about how well they have performed on established goals
 - Provide feedback to employees about areas in which they are weak or could do better
 - Take corrective action to address problems with employees performing at or below minimum expectations

Financial

Financial indicators are commonly utilized in business cases and their accompanying benefits management plan while selecting projects to continue with. Whereas financial indicators such as profitability, NPV (Net Present Value), and payback period are helpful in the selection process to understand the economic feasibility of the projects, we should emphasize again that there are multiple criteria besides financial indicators. During this selection process and when the project is conceptualized to create a project charter, business analysts and project managers usually don't have an adequate amount of information to estimate an accurate cost. Therefore, estimation techniques such as expert judgment and analogous estimating could be more helpful during the earlier stages. Expert judgment of experienced managers can help make more accurate estimates with less detailed information. Estimates in the earliest stages also include information from previous projects (i.e., analogous estimating) that can be adjusted and scaled to match the size and complexity of the current project. Besides standardized formulas can be used (parametric estimating). When we make an estimate early in the project without knowing much about it, that estimate is called a rough order-of-magnitude estimate (or a ballpark estimate). This estimate will become more refined as time goes on and we learn more about the project. In a later stage, the planning phase, when we develop the WBS and activity list, bottom-up estimating accompanied by three-point estimates can generate cost estimates with better accuracy. The goal of estimating costs is to determine the monetary resources required for the project[i]. In order to estimate costs for individual activities and the overall project, as explained above, we can use the techniques that we utilized to estimate schedule and resources. In this textbook, we will describe five tools and techniques for estimating costs :

1. Expert Judgment : experts who have technical knowledge and experience in the areas the project activities are related. These experts are those who worked on previous similar projects, and/or those who have information in the industry, discipline, and application area. Experts in organizations' finance, accounting, and procurement departments are usually consulted. All these experts can be consulted during the preproject work, and also during the initiating and planning.

2. Analogous estimating The selection of projects that are similar and the amount of adjustment needed is up to the judgment of the person or the team who makes the estimate. It should include the lessons learned from previous projects, both at an organizational level and individual level. Therefore, this judgment is based on many years of experience comprised of successful and unsuccessful projects and their estimates.

3. Parametric estimating; Estimates are calculated by multiplying measured parameters by cost-per-unit values. If the project consists of activities that are common to many other projects, average costs are available per unit. Factors like size and location are parameters—measurable factors that can be used in an equation to calculate a result. The estimator knows the average cost per square foot of a typical office building and adjustments for local labor costs. Other parameters such as quality of finishes are used to further refine the estimate

4. Three-point estimating ; a. A realistic estimate (most likely to occur – m) b. An optimistic estimate (best-case scenario – o. c. A pessimistic estimate (worst-case scenario – p)

5. Bottom-up estimating, Cost estimation can be made more accurately after each activity duration is estimated, and the resources required for each activity are identified. It is a process of estimating individual activity costs and then adding these together to come up with a total estimate. It takes a considerable amount of time to perform bottom-up estimating because every activity must be assessed and estimated accurately to be included in the bottom-up calculation. The smaller and

more detailed the activity, the greater the accuracy and cost of this technique. Parametric estimating and three-point estimating are commonly utilized together with bottom-up estimating

4.4 TIME MANAGEMENT: GANTT CHARTS, CRITICAL PATH METHOD

According to the Project Management Institute (PMI), project time management includes the following elements (Project Management Institute, Inc., 2008):

- Define activities
- Sequence activities
- Estimate activity resources
- Estimate activity durations
- Develop schedule
- Control schedule

GANTT CHART

A Gantt chart is a type of bar chart, developed by Henry Gantt, that illustrates a project schedule. Gantt charts are easy to read and are commonly used to display scheduled activities. These charts display the start and finish dates of project activities. Gantt charts also show the dependency relationships (i.e., precedence network) between activities. Gantt charts show all the key stages of a project and their duration as a bar chart, with the time scale across the top. The key stages are placed on the bar chart in sequence, starting in the top left corner and ending in the bottom right corner. A Gantt chart can be drawn quickly and easily and is often the first tool a project manager uses to provide a rough estimate of the time that it will take to complete the key tasks. The detailed Gantt chart is usually constructed after all WBS activities are identified, an activity list is created, activity durations are estimated, and predecessors are determined.

CRITICAL PATH METHOD

The critical path method is an important tool for keeping your projects on track. Every network diagram has something that is called the critical path. It's the string of activities that, if you add up all of the durations, is longer than any other path through the network. It usually starts with the first activity in the network and usually ends with the last one. The reason that the critical path is critical is that every single activity on the path must finish on time in order for the project to come in on time. A delay in any one of the critical path activities will cause the entire project to be delay. If any activity on the critical path is delayed, the completion of the project will be delayed by an equal amount. It is the path with the greatest total duration. To determine the critical path, add the amount of time estimated for the duration of each activity to the previous activity to determine which path through the network has the longest total duration, Durations are indicated in days. The critical path through these tasks takes at least eight days. Activities on the critical path are shaded.

4.5 RISK IDENTIFICATION, ASSESSMENT, AND MITIGATION STRATEGIES

Risk is the possibility of loss or injury (Merriam-Webster Online, 2009). Project risk is an uncertain event or condition that, if it occurs, has an effect on at least one project objective (Project Management Institute, Inc., 2008). Risk management focuses on identifying and assessing the risks to the project and managing those risks to minimize the impact on the project. There are no risk-free projects because there is an infinite number of events that can have a negative effect on the project. Risk management is not about eliminating risk but about identifying, assessing, and managing risk.

Raz, Shenhar, & Dvir, 2002 suggested risk management is not widely used. The projects that were most likely to have a risk management plan were those that were perceived to be high risk. When risk management practices were applied to projects, they appeared to be positively related to the success of the project. The risk management approach influenced the meeting of project schedules and cost goals but exerted less influence on project product quality. Good risk management increases the likelihood of a successful project.

Risk deals with the uncertainty of events that could affect the project. Some potential negative project events have a high likelihood of occurring on specific projects.

Project risk is the possible outcome that planned events on the project will not occur as planned or that unplanned events will occur that will have a negative impact on the project. Known risks can be identified before they occur, while unknown risks are unforeseen. Organizational risks are associated with the business purpose of the project and assumed by the client when deciding to do the project.

Managing risks on projects is a process that includes **risk assessment** and a **mitigation** strategy for those risks. **Risk assessment** includes both the identification of potential risk and the evaluation of the potential impact of the risk. **A risk mitigation plan** is designed to eliminate or minimize the impact of the risk events—occurrences that have a negative impact on the project. Identifying risk is both a creative and a disciplined process. The creative process includes brainstorming sessions where the team is asked to create a list of everything that could go wrong. All ideas are welcome at this stage with the evaluation of the ideas coming later. Risk management is a creative process that involves identifying, evaluating, and mitigating the impact of the risk event.

Risk Assessment

Risk Identification; The past experience of the project team, project experience within the company, and experts in the industry can be valuable sources for identifying potential risk on a project. Identifying the sources of risk by category is another method for exploring potential risk on a project. Some examples of categories for potential risks include Technical, Cost, Schedule, Client, Contractual, Weather, Financial, Political, Environmental, People

Risk Evaluation; After the potential risks have been identified, the project team then evaluates the risk based on the probability that the risk event will occur and the potential loss associated with the event. Not all risks are equal. Some risk events are more likely to happen than others, and the cost of a risk event can vary greatly. Evaluating the risk for probability of occurrence and the severity or the potential loss to the project is the next step in the risk management process. Risk evaluation is about developing an understanding of which potential risks have the greatest possibility of occurring and can have the greatest negative impact on the project. These become the critical few.

Risk Mitigation

After the risk has been identified and evaluated, the project team develops a risk mitigation plan, which is a plan to reduce the impact of an unexpected event.

The project team mitigates risks in the following ways:

- **Risk avoidance** : Risk avoidance usually involves developing an alternative strategy that has a higher probability of success but usually at a higher cost associated with accomplishing a project task. A common risk avoidance technique is to use proven and existing technologies rather than adopt new techniques, even though the new techniques may show promise of better performance or lower costs.

- **Risk sharing** : Risk sharing involves partnering with others to share responsibility for the risk activities. Many organizations that work on international projects will reduce political, legal, labor, and others risk types associated with international projects by developing a joint venture with a company located in that country. Partnering with another company to share the risk associated with a portion of the project is advantageous when the other company has expertise and experience the project team

does not have. If the risk event does occur, then the partnering company absorbs some or all of the negative impact of the event. The company will also derive some of the profit or benefit gained by a successful project.

- **Risk reduction:** Risk reduction is an investment of funds to reduce the risk on a project. On international projects, companies will often purchase the guarantee of a currency rate to reduce the risk associated with fluctuations in the currency exchange rate. A project manager may hire an expert to review the technical plans or the cost estimate on a project to increase the confidence in that plan and reduce the project risk. Assigning highly skilled project personnel to manage the high-risk activities is another risk reduction method. Experts managing a high-risk activity can often predict problems and find solutions that prevent the activities from having a negative impact on the project.

- **Risk transfer :** Risk transfer is a risk reduction method that shifts the risk from the project to another party. The purchase of insurance on certain items is a risk transfer method. The risk is transferred from the project to the insurance company

Contingency Plan The project risk plan balances the investment of the mitigation against the benefit for the project. The project team often develops an alternative method for accomplishing a project goal when a risk event has been identified that may frustrate the accomplishment of that goal. These plans are called contingency plans. The risk of a truck drivers strike may be mitigated with a contingency plan that uses a train to transport the needed equipment for the project. If a critical piece of equipment is late, the impact on the schedule can be mitigated by making changes to the schedule to accommodate a late equipment delivery.

Summary

1. Project planning is at the core of the project lifecycle and tells everyone involved where the project is headed and how the team will get there.
2. Resources are people, equipment, place, money, or anything else that you need in order to do all of the activities that you planned for
3. Risk management is a creative process that involves identifying, evaluating, and mitigating the impact of the risk event.

Discussion Questions

1. Explain your opinion why the Project Management Plan is an important part of running a project. Explain the basic components that must be planned in carrying out a project
2. Explain the work breakdown structure (WBS) and its importance for planning and control
3. A potential client wants you to be the project manager for a new home build, but they don't explain in detail. Make a list of some questions you can ask them to get a better understanding of the scope of the project.
4. As a project manager, how can you ensure that your activity and resource estimates are as accurate as possible?

Suggested Reading

Oguz, Abdullah. 2022. *Project Management : Navigating the Complexity with a Systematic Approach*, Creative Commons Attribution-Non Commercial 4.0 International License

- Project Management Institute. (2017). *A guide to the Project Management Body of Knowledge (PMBOK guide)* (6th ed.). Project Management Institute.
- Project Management Institute. (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide)*. (7th ed.). Project Management Institut, Newtown Square, Pennsylvania
- Watt, Adrienne. 2014. *Project Management* - 2nd Edition. a Creative Commons Attribution 4.0 International

CHAPTER 5: INTRODUCTION TO LEAN THINKING IN PROJECT MANAGEMENT

Lean Thinking in Project Management involves the application of principles derived from Lean methodology to enhance efficiency, reduce waste, and optimize processes in project execution. Rooted in the Toyota Production System, Lean Thinking emphasizes delivering maximum value to the customer with minimal waste. In the context of project management, this translates to identifying and eliminating non-value-added activities, streamlining workflows, and fostering continuous improvement. Teams adopting Lean Thinking strive to create a culture of collaboration, where all team members actively contribute to problem-solving and improvement initiatives. Key elements include value stream mapping, waste reduction, visual management with tools like Kanban, and a commitment to ongoing learning and adaptation. The overarching goal is to achieve higher productivity, faster delivery, and improved overall project outcomes. This chapter will explain the concept of Lean Thinking in Project Management and the lean tools and techniques that are applied to enhance efficiency, reduce waste, and optimize processes in project execution.

Lean Thinking in Project Management revolves around key concepts such as waste reduction, continuous improvement, and respect for people. The fundamental principle involves identifying and eliminating different types of waste (MUDA) in project processes, such as overproduction, delays, and unnecessary tasks. Teams utilize visual management tools like Kanban to enhance workflow efficiency and value stream mapping to analyze and optimize the entire project process. Continuous improvement, known as Kaizen, encourages teams to regularly identify and implement small, incremental enhancements. A crucial aspect is the respect for people, fostering a collaborative culture where every team member's skills and insights are valued.

However, the implementation of Lean Thinking in Project Management also comes with challenges. Cultural shifts within organizations may be necessary, and resistance to change from team members accustomed to traditional project management practices can be a hurdle. Initial implementation costs, the complexity of adapting Lean to certain projects, and the ongoing challenge of sustaining Lean practices over the long term are issues that need to be navigated. Identifying and measuring appropriate metrics aligned with Lean goals can also be a challenge, especially in creative or knowledge-based projects. Balancing these key concepts and addressing associated challenges is integral to successful Lean Thinking adoption in project management.

5.1 ORIGIN AND EVOLUTION OF LEAN THINKING

Lean is a holistic and sustainable approach that minimizes all aspects but yields greater results than approaches closely aligned with customer requirements. There are many aspects that can be reduced by applying lean approach, which consist of waste, cycle time, suppliers, utilization of labor, tools, time, and workspace.

Lean Thinking, the process involves a transformation from waste to value, as perceived by the end recipient. It encompasses an ongoing and limitless endeavor for improvement and change.

Lean is not aims to make people or machine to work harder or faster but rather about identifying waste and transforming it into value that aligns with the expectations of end recipients. In addition, Lean is not a set of tools, but a harmonious integration of principles, activities, and methods designed to steer the organizational culture in an appropriate direction. This is achieved through the cultivation of a strong awareness and the adoption of sound ideologies throughout the workforce at all levels.

Therefore, the lean way of thinking allows companies to specify value, line up value creating actions in the best sequence, conduct these activities without interruption whenever requested, and perform them more effectively. These achievements are conceivable through the use of the six principles of Lean Thinking: value, value stream, flow, pull, perfection and respect for people (Womack & Jones, 1997; Shah & Ward, 2007). However, there has been some confusion about what lean comprises and what distinguishes this management philosophy. The following sections comprehend a literature review of lean, wherein it is intended to clarify this way of thinking. Figure 5.1 shows evolution of lean management.

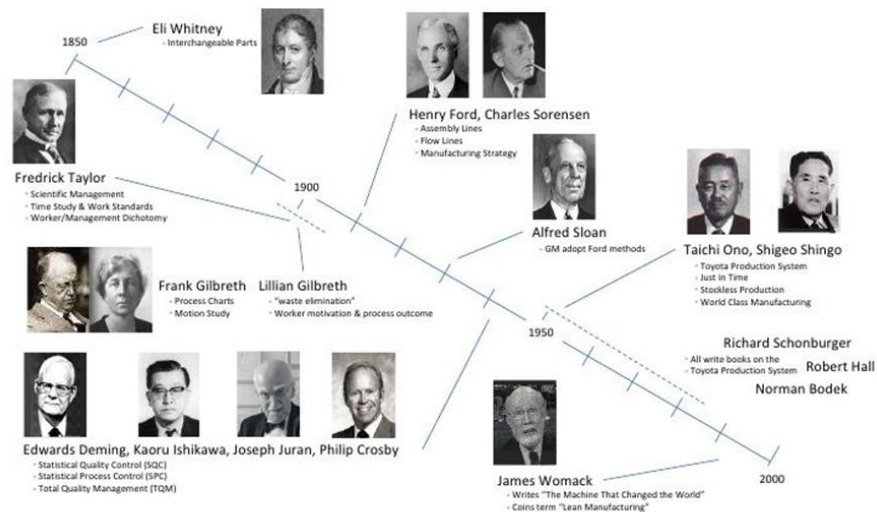


Figure 5.1 Project Management Process Groups (Adapted from PMBOK Guide 6th Edition)

source: elaboration from <https://in.pinterest.com/pin/595812225679715741/>

5.2 THE LEAN PRINCIPLES

Lean principles are derived from the Lean manufacturing philosophy, which originated from the Toyota Production System (TPS). The goal of Lean is to maximize customer value while minimizing waste. The principles emphasize efficiency, continuous improvement, and the elimination of anything that does not add value to the end product or service.

The core Lean principles are often summarized as follows:

The first principle is to “specify value from the point of view of the customer” (Bicheno & Holweg 2008). Too often, manufacturers will give to their customers what is convenient for them (the manufacturers), or conceived as economical for the customers. It is important to know who the customer is: “the final customer, next process, next company along the supply chain, or the customer’s customer” (Bicheno & Holweg, 2008).

The second principle is the Value Stream. This refers to the sequence of processes from raw materials to the final customer, or from the product to its market launch. The supply chain (if possible) should be viewed and analyzed. After all, it is supply chains that compete, not companies. Focus should be on the product or customer, not the machine, department, or process step. Value streams are created by grouping similar products together in a company. The grouping of the products should depend on the company but could be centred on the characteristics, demand, and process routings. The value stream should allow for unhindered material, information, and people flow; the material

flow focuses on the flow of materials from raw to final product, the information flow focuses on the communication flow of customer requirements and orders within a supply chain, and people flow focuses on how people are able to move within and around the processes. (Bicheno & Holweg, 2008; Drew et al., 2016)

The third principle is Flow. Batch and queue processes should be avoided or continuously reduced so that there is a smooth and quick flow of information, products, and services. "Flow requires much preparation activity. But the most important thing is vision" (Bicheno & Holweg 2008). When looking through the point of view of an entire supply chain, it makes sense for activities to be organized in a way that allows for uninterrupted flow of work at the rate of demand pull from the customer. Disruptions to the supply chain flow affect the supply chain throughput, capacity, and cycle time and it ultimately "adds little value that the customers appreciate". (Trent, 2008).

The fourth principle is Pull. "Pull means short-term response to the customer's rate of demand, and not over producing". Pull is especially useful in cases when it is difficult for a company to maintain continuous flow at a part of the value stream. For example, there may be a painting process in a value stream that is required to paint parts in batches of different colors. If these parts are required by several downstream assembly lines, then it would be impossible to maintain a continuous flow for each line. Instead, a kanban system can be set up. A predefined number of boxes of parts are painted and stored. Every time a box part is taken by an assembly line, a kanban card that was attached to the box is returned to the painting process. When a certain number of kanban cards have accumulated, the paint processes changes over to replace the parts. (Bicheno & Holweg, 2008; Drew et al., 2016).

The fifth principle is Perfection. Having worked consecutively through the previous four principles, a company would now be able to see that perfection within the company processes is now possible. This not only means a defect free company – but also means "delivering exactly what the customer wants, exactly when, at a fair price and with minimum waste" (Bicheno & Holweg, 2008).

Overall the approach of lean can be summarized into six principles (Womack & Jones, 1997; Shah & Ward, 2007): value; value stream; flow, pull; perfection; and respect for people. First, lean specifies value; it is defined based on the customer's perspective and includes what the customer is willing to pay for (Abdi et al., 2006). The second lean principle defines the value stream, maps all the specific activities required to deliver a product and highlights areas in which muda can be eliminated (Womack & Jones, 1997). The concept of waste, muda in Japanese, is defined as any activity that does not add value to the product or project in the customer's perspective (Ohno, 2019). Here fore, especially the viewpoint of the customer is of utmost importance (Abdi et al., 2006). Throughout the analysis of value streams, activities fall into one of the following three categories (Womack & Jones, 1997):

- Value-Added: Activities that create value and are essential changes to product/service, hence these activities should be maximized;
- Value-Enabling: Activities that create no value but are unavoidable. Although they might have potential for elimination in the future, they cannot be eliminated immediately;
- Non-Value-Added: Activities that can usually be eliminated quickly and are not dependent on improvement of other areas. These are redundant activities considered pure waste, thus they should be eliminated.

As part of the third principle, lean creates a continuous flow of work through planned and stream-lined value-adding steps or processes, by eliminating waiting, downtime or scrap time between steps. Successively, the fourth principle transforms the manufacturing process into a pull system to respond to customers' demands. Lean minimizes delivering value before the customer requests it and seeks to not provide more than the agreed on initial scope. Fifth, lean pursues perfection through the continuous improvement aim of Kaizen (Liker & Morgan, 2006). According to Womack and Jones

(1997), perfection is the complete elimination of muda, so that all activities along the value stream create value. Naturally, the pursuit of perfection is an endless process, because the value of all activities can be constantly analyzed, evaluated and improved (Abdi et al., 2006). Finally, the sixth principle recognizes that people are the most important asset in an organization and encourages them to identify problems and inefficiencies on a constant basis (Oehmen, et al., 2012).

Succeeding in the previous principles of lean management and thus converting a manufacturing process into lean manufacturing, leads to the following results according to Womack & Jones (1996): double labor productivity; cut throughput time by 90%; reduce inventory by 90%; cut errors by 50%; and cut injuries. As previously mentioned, this is achievable through the identification and elimination of waste, henceforth a definition of waste is requested.

Lean principles are not limited to manufacturing and have been successfully applied in various industries, including healthcare, software development, and services. The principles can be adapted to different contexts, and organizations often customize their approach to fit their specific needs and challenges. Lean thinking has also evolved beyond its manufacturing roots to become a broader management philosophy, influencing how organizations approach efficiency, quality, and continuous improvement.

5.3 BENEFITS AND CHALLENGES OF INTEGRATING LEAN INTO PROJECTS

Integrating Lean principles into projects can offer several benefits, but it may also pose certain challenges. Here's an overview of the potential advantages and difficulties associated with incorporating Lean into project management:

Benefits of integrating Lean into Projects

1) Cost-benefit refers to generating lower project development costs, an important benefit as it is part of the triple constraint of all projects. Cost reduction is associated with proper planning and efficient work, achieved through the implementation of tools and technology throughout all project phases.

2) Schedule-benefit refers to staying within the stipulated project development timeline, an important benefit as it is part of the triple constraint of projects. Schedule reduction is associated with proper planning, minimizing valueless activities and efficiently completing the project, achieved through the implementation of tools or technology.

3) Quality-benefit refers to achieving the project scope and objectives, such as cost and schedule, an important benefit as it is part of the triple constraint. The concept of meeting quality suggests that the goals and requirements of both internal and external customers have been fulfilled. This advantage is evident throughout the different project stages, starting from the definition of the scope in the first phase, and continuing with the monitoring of objective attainment in the subsequent phases. Ensuring quality implies customer and user satisfaction, achieved through tools, technologies and performance indicators.

4) Ecology-benefit refers to Lean projects being performed more optimally than projects where the philosophy is not used. Thus, lower waste of materials and debris resulting from rework are generated, by improving the flow between processes and reducing losses in them.

5) Work-benefit refers to the elimination of valueless activities in the process flow by analyzing process groups and proposing implementation plans when implementing Lean, thereby reducing waste such as rework, product defects and other losses.

6) User-perception benefit refers to both internal and external customers being satisfied with the results of implementing Lean in the project, and with the new way of working creating a positive feeling that motivates workers and affects their morale.

Challenges of integrating Lean into Projects

1) Lack of knowledge or understanding of Lean: This is associated with a limited understanding of the Lean philosophy and how its practices are managed. In some studies, it was presented as a complicated obstacle to overcome when implementing Lean efficiently in a project.

2) Contracts: The difficulty of contracts lies in the type of project, which, depending on its nature, can hinder the implementation of Lean. Additionally, the deadlines stipulated in contracts can be restrictive when attempting to generate a Lean solution. There were occasions where the problem was identified, but traditional solutions were maintained, and no resolution was reached. Finally, implementing a Lean-focused project requires hiring personnel with knowledge of Lean practices and some Lean-specific tools, otherwise confusion among workers may arise.

3) Laws: Although laws differ from country to country, in some projects, they can restrict innovation, limiting its potential application. There are cases where implementing Lean is out of place in countries with a high corruption index, and it is necessary to reflect on how its potential use could bring varied benefits.

4) Fear of change: Fear of change is generated by the change in culture and work processes that comes with implementing Lean. Although it may be an intrinsic factor of human nature, its consideration is essential because it impedes progress.

5) Cooperation: In some studies, a lack of cooperation was detected both among different specialties and among stakeholders. This resulted in multiple errors throughout the project, leading to rework, increased costs and delays.

6) Trust: In some studies, a lack of trust was related to doubts about the potential benefits of implementing Lean in a project. Team members may feel insecure due to the novelty of this work process and the fact that not everyone has been present in projects where it has been implemented, leading to uncertainty about the results. A lack of trust leads to a lack of sincerity, which is related to the feeling, often collective, that a solution is not generated once a problem is presented, so it tends to be hidden.

7) Communication: Communication, or rather the lack of it, arises from the same lack of interaction among specialties and/or stakeholders that causes a lack of cooperation. There are occasions where a lack of communication hinders the fulfillment of what both internal and external customers need.

8) Space: The space where activities are carried out, when not well-distributed, brings difficulties in performing activities efficiently. Poor spatial organization results in poor communication and cooperation among team members.

5.4 LEAN VS. TRADITIONAL PROJECT MANAGEMENT

Lean project management differs from traditional project management in the goals it pursues, the structure of its phases, the relationship between phases and the participants in each phase.

The traditional production methodology manages conversion of an input to an output. Lean production is managing the production process by converting input to output, by minimizing the input flow waste and maximizing the value of the output efficiently. Thus, the lean production methodology has flow management and management of value in addition to the input, conversion and output of the conventional project management technique.

The traditional approach focuses on efficiency rather than value, whereas in lean production the focus is on minimizing waste (efficiency) and maximizing value of output (effectiveness).

Under lean production with the introduction of the notion of value, effectiveness is expanded. In the traditional approach, value is not given much importance. Customers' requirements are compromised, which extends barely further than market requirements and lowering costs. Lean production emphasizes on maximizing the value of output by satisfying the customer's specific requirements.

The change in the production management from conventional to lean production management is because:

- Inappropriate control mechanisms and performance improvement efforts are used in conventional methodology.
- Poorly understood and addressed quality under traditional method.

These show poor efficiency and effectiveness in the production process which roots from inadequate understanding of the production process. The change in production method from traditional to lean was to add to the existing approach and make it more appropriate for contemporary and complex production systems. Table 5.1 presents some of the differences of Lean and traditional management.

Table 5. 1 The Differences of Lean and Traditional Management

Lean management	Traditional management
Production is made to order	Production is based on a forecast
Products are made to fill customer orders	Products are made to replenish the inventory
Cycle times are in hours and days	Cycle times are in weeks and months
Inventory levels are based on one-piece flow	Inventory levels are based on large batches
Stations are set up by product flow	Stations are set up by department function
Quality is tested at each station	Quality is done through random sampling
Workers are empowered for identifying improvements	Workers have little or no input
Manufacturing schedule flexibility is high and easy to adjust	Manufacturing schedule is rigid and hard to adjust
Manufacturing costs are controlled and decreasing	Manufacturing costs are rising and very difficult to control

5.5 LEAN TOOLS AND TECHNIQUES

According to TPS, the two technical pillars of Lean are Just in Time (JIT) and Jidoka ("built-in quality" in Japanese). JIT is the delivery of goods in the required quantities and conditions at the right time and place. Goods arrive in smaller quantities on a more frequent and predictable schedule. The main objective is to reduce investments in inventories and inventory holding costs. Jidoka (autonomation, automation with a human touch) is about building in quality at the source, checking the quality continuously and within the process, to prevent inspections and reworks. It is about fixing problems as they show up. The most important Lean tools to help with the Lean transformation are described as following.

Continuous Improvement

Continuous improvement is about small improvements initiated and implemented by all people throughout the organization to improve the processes they are working in. It helps to identify

ways to reduce waste and can be viewed as a formal practice and set of guidelines. Companies are moving to formal approaches such as Lean and W. Edwards Deming's Plan – Do – Check – Act (PDCA) cycle. Figure 5.2 illustrates the PDCA cycle. Continuous improvement is a primary focus in these tools, enabling high customer service standards and the reduction of waste. Sustained improvement requires the discipline to create and maintain standards. In the -Plan- phase, the new standard is set after a kaizen has been executed. In the -Do- phase, the new way of working is implemented. In the -Check- phase, the performance is measured and compared with the targets. In the -Act- phase, countermeasures are defined to go back to the standard if needed. After some time, a new kaizen is started and the PDCA cycle is executed repeatedly. Continuous improvement helps to streamline workflows and constantly improve the way to add value to the customer, saving time and money.

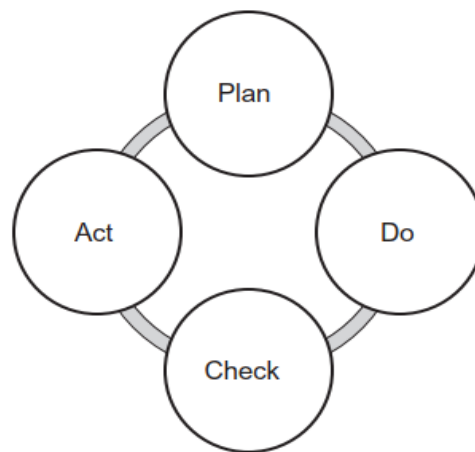


Figure 5.2 PDCA cycle

Kaizen

Kaizen is one of the most recognized Japanese words. Kai means continuous and zen means improvement. It focuses on the fact that no process can ever be perfect and there is therefore always room for improvement. There must be “continuous improvement, in small increments, at all levels [of the company], forever”. Kaizen is the centre of many lean tools and techniques as, after implementation, they can continuously be improved upon. A less known word is ‘kaikaku’ which is a radical or revolutionary event, unlike kaizen that is an incremental event. “Proponents of reengineering would be more likely to endorse kaikaku”. (Trent, 2008; Bicheno & Holweg, 2008).

The kaizen process is implemented in the form of formal events (known as kaizen events) and consists of three stages. The first stage involves preparing for the kaizen event, the second stage involves performing the event and the third stage involves checking whether the improvements are truly beneficial and if they are, whether they are permanent. Most kaizen events focus on a company's internal processes, but it is capable of application in any part of the supply chain. (Trent, 2008).

A kaizen event, from beginning to end, is often wrongly assumed as a process that requires it to be conducted in one week or less. The performance of the kaizen event may take five days or less but the processes involved before and after the event may take much more, and are equally as important as the event itself. (Trent, 2008).

- As the aim of the kaizen event is to improve processes, the first thing to be done is to select the area within a company that needs improvement. This selection may be done via value mapping. The overall system view should be taken into consideration so as to avoid working on the wrong process or a process that should not be there. This process should also be documented in a

scope document. “The scope document includes an assessment of estimated costs and benefits, both soft and hard.” (Trent, 2008; Bicheno & Holweg, 2008). Problems that could occur during the event should be identified and dealt with so that, if possible, they do not occur.

- A time for the event is also set and those involved in the event should be notified. There should be a kaizen leader to lead the rest of the team during the kaizen process.

- During the actual kaizen event, the leader and team members evaluate the work area (or process) and “improve the process to solve the performance issue, measure results, and communicate these results to stakeholders” (Trent, 2008). All that occurs each day of the kaizen event is documented.

- After the kaizen event, the leader ensures that the changes made are sustained. There should be a review of the area every month to ensure that that the improvement was a success and more importantly, is continuously improving (Trent, 2008; Bicheno & Holweg, 2008).

Kanban

“Kanban is the classic signaling device for production pull systems” (Bicheno & Holweg, 2008). It is therefore seen as a type of mechanism that is utilized in a pull-based process. There are several types of Kanbans that are used in manufacturing systems and they will be highlighted below.

The most popular type of Kanban used in lean management systems is the single card Kanban. A single card kanban is a single card (or a pull signal) that is used between pairs of work stations. The kanban is the authorization to have a part or a whole container moved to a particular location.

Kanbans are used because they are easily understood, easily seen, and relatively easy to implement. (Bicheno & Holweg, 2008).

A product kanban is a type of single card kanban. In product kanban, whenever a product or container is pulled from it, another one simply replaces it. If there is no pull then that means that there was no authorization and therefore no production. (Bicheno & Holweg, 2008). Dual card kanban was established by Toyota and entails the use of two kanban cards; the production kanban card and the conveyance kanban card. The production kanban card is for the supplier process and the conveyance kanban card is for the customer process. The supplier process is the process of a supplier replenishing parts, while the customer process is any process that involves raw materials being converted to finished products (such as assembly).

When parts used in the assembly (customer) process goes below a certain level as defined by the conveyance kanban card, the card is placed out for the Materials Handler. The Materials Handler replenishes the parts needed by retrieving them from the stock point and having them taken to the assembly point. The parts at the stock point then also need replenishment. At the stock point is where the production card is. During the process of the Material Handler retrieving parts, the production card is moved to a special rack which signals the suppliers to replenish the stock point.

When the supplier receives the production kanban card, they use it to trigger a material retrieving cycle from the manufacturer or assembly of parts to the stock point. After replenishing the stock point the supplier also puts the production kanban card (which now indicates that the stock items have been replenished) back at the stock point.

It is important to note that the conveyance and production kanban card should have a matching number of parts/items on them. If the numbers do not match then this could result in an unnecessary build-up of inventory, or the stock point would run out of parts.

A kanban is not necessarily a concrete card. It can be electronic, a square known as a kanban square, or a kanban container. A kanban square is a rectangle or square which is painted on a factory floor and the signal for replenishing it is when it is empty. Similarly, a kanban container is a container that can typically hold a fixed number of parts and when it is empty this acts as a signal for replenishment.

Value Stream Mappings

People in the workshop know how a process works in detail. People outside the process think that they know too. This is often based on how the process is described in the quality system documentation. If this is not available, the knowledge is based on interviewing people in the workshop. Then it turns out that people in the same process have different ways of doing the same work. Therefore, it is a good idea to go to the gemba, see the process, and talk with people to know how the work is done in reality. A Lean tool for supporting this process description is the Value Stream Map (VSM). A VSM is a Toyota-developed process map capturing the value-added and non-valued-added activities in a supply chain. Figure 5.3 shows an example VSM. It includes direct and indirect information and material flows to meet the customer demand. Information flows are there to support people in the workshop with planning and work orders.

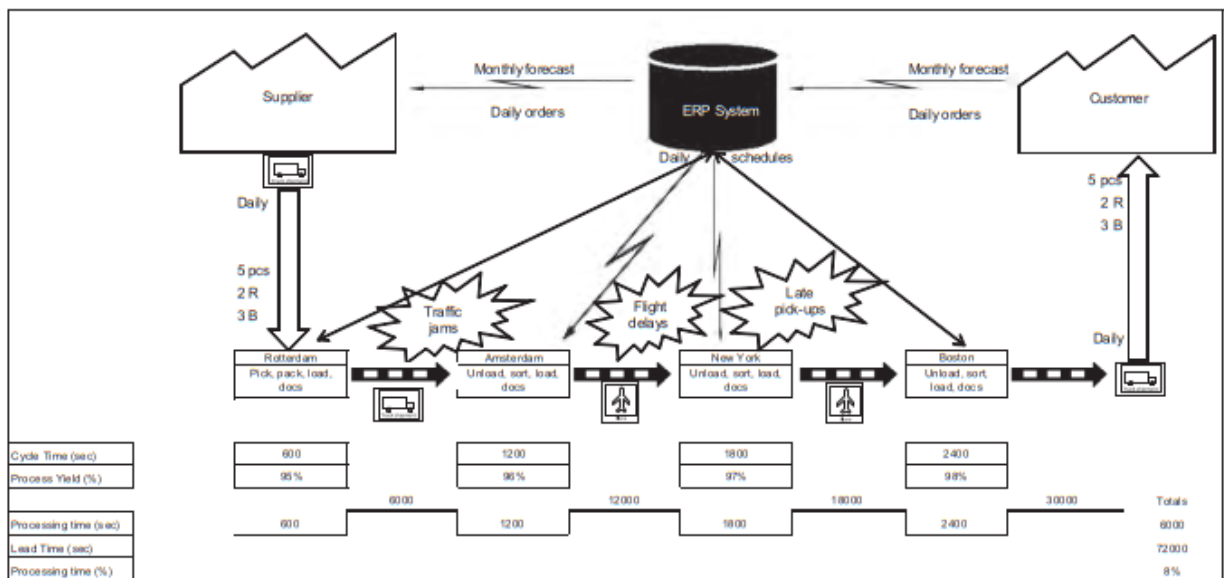


Figure 5.3 Value Stream Mapping

Source: Achahchah, 2019

Examples of material flows are parts supply, inventories, and transportation processes. A VSM is an effective and efficient visual way to understand the goods and information flows from a customer point of view. The added value of a service is created as it moves through a supply chain. A VSM indicates the direct value-added activities, but also the supporting indirect information flows. This method supports the identification and improvement of the whole supply chain and prevents sub-optimizing individual processes. A VSM starts with mapping the current state by using standard symbols and indicating wastes and their root causes. Then a future state, not necessarily the ideal state, is created without the detected waste. It includes key Lean elements such as takt (a German word for “beat”) time, one-piece flow, and the pull system. To come to the future state and generate improvement ideas, several tools can be used such as brainstorming, try storming, Pareto, and fishbone diagrams. Then an effort-impact matrix is drawn to prioritize the actions, which will be implemented to come to the future state. Questions to answer for the prioritization session can be:

- Is the action commercial feasible?
- What are the pre-requisites for implementation?
- What is the best way to implement the action/project as fast as possible?
- Who should be involved in the implementation?
- Are there reference cases?

In addition to the visualization aspect, a VSM creates the starting point for a kaizen. It makes sure that cross-functional team members talk the same language to speed up mutual understanding by looking to the process in a different way than they normally do. It brings data, such as lead-times, inventory, and defect levels, together. People who work in the process and those who are in the supporting functions share their own ways of looking at and measuring process performance. It is not a static map. It is updated when there are changes. The VSM tool is also called “Material and Information Flow Diagram” within Toyota. Rother and Shook describe in their book “Learning to See: Value Stream Mapping to Create Value and Eliminate Muda” an eight-step approach to create a VSM. It is a team activity, wherein each team member has a task to gather actual data by, for example, using stopwatches and videotapes. A VSM captures end-to-end processes from order intake to payment receipt and includes information and material connections. VSMs are used to communicate current and future states regarding improvement initiatives. The objective is to find improvement opportunities to reduce waste and make the process flow. The perfect flow is the ideal situation where a service is produced according to the takt time with leveled workload to meet the customer demand without waiting times, delays, movements, non-value-added activities, and defects.

A VSM exercise consists of two phases. The first phase is a preparation phase, which consists of these activities:

1. Select a value stream to map. VSM pilots are usually started on a multi-process level to create a model line, which can be used as reference for further rollout of Lean. The next level is to draw VSMs on the company level, as this is normally the highest level people can optimize within their span of control. In a mature Lean environment, it becomes feasible to create VSMs on an enterprise level by adding supplier and customer sites to the value stream.
2. Assign a maximum of eight team members and provide them a Lean basics training. As there is no individual who knows all the details of every process, it is important to include people who work in the process and know the details.
3. Collect process information. Map the process starting from the customer and work backwards to the supplier. Prepare open questions for people working in the workshop for when going to the gemba. Inform them upfront and mention that the team members are coming to measure the process and not the people.

The second phase starts when the team comes together for the VSM workshop and includes these steps:

1. Go to the gemba; draw the process boxes; and gather data such as inventory, lead-time, cycle time, waiting time, and work in process. A process box is a place where material and/or information is transformed into a product or service. Cycle time is the time needed to complete a process step for one unit including the walking, manual, and machinery activities. Waiting time is the time a piece needs to wait before it is worked upon in the next process step. Lead-time is the sum of all cycle and waiting times.
2. Draw the material flow from right to left, starting from the customer back to the supplier. Map the customer demand and the requested delivery times and quality levels. It is possible to draw parallel process flows, but focus on the main process, suppliers, and customers. Sub-processes can be worked upon in separate VSM events. Add the information flows. Material flows from left to right, where information flows the other way around: from right to left. Draw the information flows and their direction and add rework flows.
3. Fill in process box data such as cycle times, yields, lead-times, defect rates, and inventory levels.
4. Sum up the total cycle and waiting times at the bottom of the map.

5. Identify the value-added and non-value-added activities; create kaizen bursts and indicate potential improvements.

5\$

A clean, safe, and well-organized workplace helps to see wastes and eliminate them. A nicer and easier way to remember this philosophy is “5S.” The five Ss are five Japanese words that start with an “S”: Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. The English translations are sort, straighten, sweep, standardize, and sustain. This methodology was invented by Toyota in the 1970s. As it is a cyclical process, it is required to finish the previous step before going to the next one, preventing waste by, for example, cleaning things not needed. The idea is to sort out what is needed and what is not needed. What is not needed can be labeled and processed as follows:

- Trash: Throw away.
- Defectives: Repair, scrap or recycle.
- Not needed: Sell or give away.
- Used daily: Keep at Point of Use (POU). Less frequently used items are stored in a distant area.

With straightening, things are put in a place for easy access. Sweeping means cleaning the floors and equipment. The workplace is standardized in such a way that abnormalities become visible. The use of visual tools such as pictures is recommended as these say more than words. Sustain the process by making it a habit and a daily activity. 5S is a disciplined way of creating and keeping an efficient and effective workplace. Some companies use the term “6S” as they add another “S” for Safety. Incidents can lead to near misses, minor and serious injuries, or even death. Most accidents are caused by people’s unsafe actions and/or physical conditions. To increase people’s safety in a workshop, it must be clear where to find the nearest emergency exit, escape routes, alarm buttons, fire extinguishers, first-aid kits, and Automated External Defibrillator (AED). In Lean, safety comes first, followed by quality and then efficiency. Typical visual tools used to improve the safety are color codes, signs, lights, sounds, and glass walls. 5S is not only applicable in a production environment, but also in an office setting (e.g., to reduce the time to find an e-mail, a file, or a storage location). According to Taiichi Ohno, 5S is one of the Lean building blocks: “if you cannot do 5S, you cannot do Lean.” Lean is about eliminating waste and that is what 5S is doing: it removes hazards, prevents looking for lost items, and reduces motion. The toughest challenge of 5S is the change of attitude. People need to believe that a clean and organized workplace is not only good for the company, but also for their own personal satisfaction. They need to own the process, regularly audit it, and make it a daily habit.

Challenges and opportunities in lean management project

In agreement with Project Management Institute (2013), a project is a temporary endeavour designed to create a unique product or service. Nevertheless, when projects aim to deliver the product while maximizing value and minimizing waste, they are considered lean projects. Accordingly, organizations that apply lean principles to their project management practices should be able to identify and weed out processes and activities that introduce wasteful spending. As reported by Gabriel (1997), the lean approach to project management results in project success, meeting quality, time and costs criteria, and leads to a high level of commitment and motivation from the project team and to the satisfaction of the customer.

Similar studies were developed by Anholon and Sano (2016), Oehmen, et.al. (2012) and Tenera and Pinto (2014), who believed in the merger of lean and PM. Anholon and Sano (2016) assessed lean projects using PM guidelines, while Oehmen, et.al. (2012) identified the major challenges themes in programs or projects as well as 43 lean enablers to overcome these challenges. The lean enablers are described as actionable best practices structured along the lean principles. Furthermore, Tenera and Pinto (2014) integrated lean, six-sigma and project management.

Commonly perceived through its practical and managerial perspective, Lean Thinking can function as the missing piece in the puzzle, by improving the performance and the success rate of projects (Oehmen, et.al., 2012). The amalgamation of lean with project management might be the answer to increase the rate of projects success, yet it requires an extensive examination of all the project activities throughout the entire project life cycle, as well as the lean principles and tools. Consequently, it is of utmost importance to understand how each lean principle can be applied to project management processes, and which synergies exist between them. The task will be undertaken in the following section, resulting in the development of a Lean Project Management Framework.

Summary

This chapter has considered some of the key aspects of overview of Lean in project management. The Lean thinking, Lean principles and concept of Lean tools and techniques were described. They were summarized as:

- PDCA (Plan, Do, Check and Act) is an iterative methodology to propose a change in the process, implement it, measure the results and take appropriate action.
- Kaizen can be applied to Short-term approach to implement continuous and incremental improvements.
- Koban is a way to communicate between processes through a signaling system to help implement a pull system and to achieve a continuous flow.
- Value stream mapping is an approach that intends to visually map the actual and future state of processes to highlight opportunities for improvement.
- 5S focuses on effective work place organization and standardized work procedures.

In summary, the different lean principles, tools and techniques aspire to achieve the best quality, the lowest cost, the shortest lead time, the best safety and the highest morale.

Discussion Questions

1. What cultural changes might be necessary for a successful implementation of Lean in project management approach?
2. How can we address resistance to change when introducing Lean principles in project management?
3. How does the philosophy of Lean project management differ from traditional project management approaches?
4. What types of waste are commonly targeted by Lean, and are these adequately addressed in traditional approaches?

Suggested Reading

- Abdi, F., Shavarini, S. K., & Hoseini, S. M. S. (2006). Glean lean: how to use lean approach in service industries?. *Journal of services Research*, 6, 191.
- Anholon, R., & Sano, A. T. (2016). Analysis of critical processes in the implementation of lean manufacturing projects using project management guidelines. *The International Journal of Advanced Manufacturing Technology*, 84, 2247-2256.

- Bicheno, J., & Holweg, M. (2008). *The Lean toolbox: The essential guide to Lean transformation*. Piccie Books
- Womack, J. P., & Jones, D. T. (1997). Lean thinking—banish waste and create wealth in your corporation. *Journal of the Operational Research Society*, 48(11), 1148-1148.
- Drew, J., McCallum, B., & Roggenhofer, S. (2016). *Journey to lean: making operational change stick*. Springer.
- Gabriel, E. (1997). The lean approach to project management. *International Journal of project management*, 15(4), 205-209.
- Liker, J. K., & Morgan, J. M. (2006). The Toyota way in services: the case of lean product development. *Academy of management perspectives*, 20(2), 5-20.
- Ohno, T. (2019). *Toyota production system: beyond large-scale production*. Productivity press.
- Oehmen, J., Oppenheim, B. W., Secor, D., Norman, E., Rebentisch, E., Sopko, J. A., ... & Driessnack, J. (2012). *The guide to lean enablers for managing engineering programs*. Joint MIT-PMI-INCOSE Community of Practice on Lean in Program Management.
- Shah, R., & Ward, P. T. (2007). Defining and developing measures of lean production. *Journal of operations management*, 25(4), 785-805.
- . Simonsen, E. M., Herrera, R. F., & Atencio, E. (2023). Benefits and Difficulties of the Implementation of Lean Construction in the Public Sector: A Systematic Review. *Sustainability*, 15(7), 6161.
- Trent, R. J. (2008). *End-to-end lean management: a guide to complete supply chain improvement*. J. Ross Publishing.

CHAPTER 6: MONITORING, CONTROLLING, AND LEAN METRICS

In the current dynamic and competitive business landscape, organizations aim not just to meet their strategic goals but also to continually enhance their processes and overall performance. This requires the establishment of effective monitoring and control mechanisms, coupled with the adoption of lean principles to streamline operations. The roles of monitoring, controlling, and lean metrics are crucial in this endeavor, serving as indispensable instruments for organizations to navigate the intricacies of contemporary business. Together, monitoring, controlling, and lean metrics constitute a comprehensive framework that allows organizations not only to assess their performance but also to proactively oversee and optimize their operations. By utilizing these tools, businesses can effectively navigate the challenges of the modern business environment, respond promptly to obstacles, and achieve sustainable success.

6.1 ROLE OF KPIs IN PROJECT MONITORING AND CONTROL

Key Performance Indicators (KPIs) serve as integral tools in the realm of project monitoring and control, offering measurable metrics that empower project managers and stakeholders to evaluate the project's progress, performance, and alignment with objectives. Key Performance Indicators (KPIs) play a crucial role in performance measurement within the context of project management. KPIs are quantifiable metrics that help organizations assess the success of their projects, initiatives, or specific activities. The role of KPIs in performance measurement includes the metrics related to customer satisfaction. By measuring customer feedback, response times, and other relevant indicators, project managers can ensure that the project meets or exceeds customer expectations. So, KPIs play a multifaceted role in project performance measurement, offering a quantitative and objective means of evaluating progress, aligning activities with goals, and supporting informed decision-making. When carefully selected and effectively monitored, KPIs contribute to the success and effectiveness of project management efforts. Quality Assurance is a systematic process that ensures the delivery of products or services meets specified requirements and standards. KPIs in QA provide measurable benchmarks to assess the effectiveness of quality processes and contribute to continuous improvement. Key Performance Indicators (KPIs) play a vital role in measuring and optimizing resource utilization within an organization. Resource utilization KPIs help monitor how effectively and efficiently resources—such as manpower, time, and equipment—are utilized to achieve organizational goals. Monitoring KPIs that measure the effectiveness of risk management processes over time allows organizations to identify areas for improvement and implement corrective actions. By leveraging these KPIs, organizations can enhance their risk management capabilities, strengthen resilience, and make informed decisions to achieve their objectives while navigating uncertainties effectively. KPIs contribute to a systematic and data-driven approach to risk management, promoting a proactive stance in addressing potential threats.

Stakeholder Satisfaction plays a crucial role in measuring and ensuring stakeholder satisfaction, providing organizations with valuable insights into how well they are meeting the needs and expectations of their stakeholders. Stakeholder satisfaction KPIs help assess the effectiveness of engagement efforts and the overall success of projects or initiatives. KPIs related to diversity and inclusion within stakeholder groups assess how well the organization addresses the needs of diverse stakeholders, contributing to overall satisfaction. By regularly measuring and analyzing these stakeholder satisfaction KPIs, organizations can identify areas for improvement, make informed

decisions, and enhance overall stakeholder relationships. A focus on stakeholder satisfaction contributes to long-term success, loyalty, and positive organizational reputation.

Communication Effectiveness is instrumental in measuring and improving communication effectiveness within an organization. Effective communication is crucial for fostering collaboration, transparency, and understanding among stakeholders. Here's how KPIs fulfill their role in assessing and enhancing communication effectiveness: Measures the time taken for critical messages to reach their intended recipients. A lower delivery time indicates efficient communication, particularly in time-sensitive situations. Evaluates the speed at which responses are provided to inquiries or messages. A shorter response time is indicative of prompt and effective communication. Monitors the open and click-through rates of internal communication channels, such as emails or newsletters. High rates suggest that employees are actively engaging with and reading internal communications. Measures the level of employee participation and engagement in communication platforms, such as intranet or collaboration tools. Increased engagement reflects effective communication. Analyzes scores from surveys and feedback forms related to communication. Positive scores indicate that stakeholders find the communication effective and clear. Assesses how well messages are understood by recipients. KPIs may include measures of message clarity, simplicity, and avoidance of jargon to ensure effective communication. Measures the degree to which communication aligns with predefined objectives. Effective communication should support organizational goals and strategic objectives.

Employee Knowledge Retention evaluates how well employees retain and understand information communicated to them. High knowledge retention indicates effective communication practices. The right balance ensures that stakeholders are informed without feeling overwhelmed, contributing to effective communication. Employee Engagement in Strategic Goals measures the level of employee engagement and understanding of strategic objectives. Engaged employees are more likely to contribute effectively to strategic initiatives. Market Share Growth indicates the organization's growth in market share, which aligns with strategic objectives related to market dominance or expansion. Innovation Effectiveness measures the success of innovation initiatives aligned with strategic objectives. Successful innovations contribute to the organization's competitiveness and strategic positioning. By aligning KPIs with the overarching strategy, organizations can foster a clear focus on priorities, measure success effectively, and adapt strategies as needed to achieve sustained success.

In summary, KPIs in project monitoring and control offer a comprehensive set of metrics to assess, manage, and optimize various facets of a project. Regular monitoring of these indicators empowers project managers to make informed decisions, address issues promptly, and ensure the successful delivery of projects. Key Performance Indicators (KPIs) play a pivotal role in shaping the success and sustainability of organizations across various industries. As strategic tools, KPIs provide quantifiable metrics that enable businesses to measure, evaluate, and improve their performance against predefined goals and objectives. The journey through the exploration of KPIs reveals their multifaceted significance and transformative impact on organizational dynamics.

6.2 VISUAL MANAGEMENT TOOLS: KANBAN BOARDS, DASHBOARDS

Visual management tools are tools and techniques used to display information in a visual format, making it easier for teams to understand and manage their work processes. These tools are commonly used in various industries to improve communication, enhance transparency, and facilitate

decision-making. In the dynamic landscape of modern organizations, the ability to convey information quickly and effectively is paramount. Visual Management Tools emerge as powerful instruments in this pursuit, providing a visual representation of data, processes, and key performance indicators. These tools transform complex information into easily digestible formats, fostering transparency, collaboration, and informed decision-making within teams and across organizational levels. Visual Management is a methodology that leverages visual elements to communicate information in a clear, concise, and accessible manner. By replacing traditional text-heavy formats with visuals, such as charts, graphs, and diagrams, organizations can enhance comprehension, engagement, and overall efficiency.

Visual management tools, such as Kanban boards and dashboards, are instrumental in organizing, tracking, and presenting information in a visually intuitive manner. Here's an in-depth exploration of these tools:

Kanban Boards:

Visual Workflow Management: Kanban boards visually represent work items and their status within a workflow. Originating from lean manufacturing practices, they are widely adopted in project management and software development. The board has columns (e.g., "To Do," "In Progress," "Done") representing workflow stages. Work items are cards moving through these columns. Emphasizing limiting work items in progress optimizes flow. WIP limits for each column prevent overloading and encourage task completion before starting new ones. Kanban boards use visual signals like colors or icons to convey task status, such as a red label for high-priority tasks.

Benefits: Kanban boards provide real-time visibility, aiding team members and stakeholders in understanding progress and identifying bottlenecks. Adaptable to various workflows and projects, Kanban provides a flexible framework accommodating changes in priorities. Focus on WIP limits encourages prompt issue identification and resolution, fostering a culture of continuous improvement.

Dashboards:

Dashboards consolidate and present key performance indicators (KPIs), metrics, and data in a centralized and easy-to-understand format. Dashboards use graphical elements like pie charts, bar graphs, and gauges to represent data. Users can customize the display based on their needs. Highly customizable, dashboards allow users to choose metrics and visualization preferences. Many dashboards offer real-time or near-real-time updates, ensuring users access the most current information.

Benefits: Data-driven Decision Making: Dashboards enable data-driven decision-making by presenting critical information clearly, aiding stakeholders in grasping the state of affairs. Dashboards integrate data from various sources, offering a holistic view of an organization or project. This aids in identifying trends and correlations. Dashboards track progress toward goals, providing a centralized location for stakeholders to monitor KPIs and assess performance against targets.

Integration of Kanban Boards and Dashboards:

In the realm of visual management, the integration of Kanban boards and dashboards represents a powerful synergy that enhances organizational transparency, collaboration, and overall efficiency. Both Kanban boards and dashboards serve distinct purposes, yet their integration provides a comprehensive solution for managing workflows, monitoring progress, and making informed decisions. Kanban is a visual management method that originated from Lean and Toyota Production System practices. Kanban boards offer a visual representation of work processes, allowing teams to visualize tasks, track progress, and manage workflow effectively. The boards typically consist of columns representing different stages of a process, and cards or tasks move through these columns as work progresses. Dashboards are visual displays of key metrics, performance indicators, and other critical data points relevant to organizational goals. Dashboards provide a holistic view of an organization's health, enabling decision-makers to monitor trends, identify patterns, and assess overall performance.

Kanban boards and dashboards complement each other. For instance, a Kanban board can be part of a project dashboard, providing a detailed view of task progression within a broader context. Dashboards align tactical details visible on Kanban boards with broader strategic objectives, offering a comprehensive overview for decision-makers.

When choosing visual management tools, consider the specific needs of your team, the nature of the work, and the preferences of team members. Additionally, integrating these tools with collaboration and project management platforms can enhance their effectiveness in fostering communication and collaboration within a team.

In conclusion, Kanban boards and dashboards are indispensable visual management tools enhancing transparency, collaboration, and informed decision-making in organizational settings. When used in tandem, they contribute to a comprehensive and effective approach to project and workflow management. As organizations strive for clarity, collaboration, and excellence, Visual Management Tools stand as indispensable assets in their journey toward operational efficiency and success. The integration of Kanban boards and dashboards creates a holistic and streamlined approach to visual management. This synergy empowers organizations to navigate the complexities of task management and strategic planning with clarity, agility, and data-driven precision.

6.3 LEAN METRICS: LEAD TIME, CYCLE TIME, THROUGHPUT

In the pursuit of operational excellence and continuous improvement, organizations turn to Lean principles as a guiding philosophy. At the heart of Lean methodologies lies the strategic use of metrics – key performance indicators carefully selected to measure efficiency, eliminate waste, and enhance overall value delivery. These metrics, known as Lean Metrics, serve as critical tools for organizations seeking to streamline processes, optimize resources, and ultimately create value for customers. Lean principles originated from the Toyota Production System (TPS) and have since become a cornerstone for efficiency and quality across diverse industries. At its core, Lean thinking is centred on the elimination of waste, the enhancement of flow, and the continuous pursuit of perfection. Lean Metrics align with these principles, providing quantifiable insights into the effectiveness of Lean practices within an organization.

Lean metrics are indispensable for organizations implementing lean principles, aiming to streamline processes, reduce waste, and enhance overall efficiency. Here's an in-depth exploration of three key lean metrics: lead time, cycle time, and throughput.

Lead Time:

The concept of lead time holds a crucial role in organizational processes, encapsulating the duration it takes for a task or project to move from initiation to completion. In essence, lead time encompasses the entire lifecycle of an activity, incorporating various stages such as planning, execution, and delivery. It serves as a vital metric in operational management, providing insights into the efficiency and effectiveness of processes within an organization. Understanding lead time involves a comprehensive analysis of each phase a task undergoes. This includes the time spent on planning and preparation, the actual execution or production period, and the final delivery or completion stage. By dissecting these components, organizations can pinpoint areas of improvement, optimize workflows, and enhance overall operational performance. Reducing lead time is a strategic objective for many organizations as it directly correlates with increased efficiency, customer satisfaction, and competitiveness. Shortening lead times not only enables organizations to respond more swiftly to customer demands but also minimizes the risk of delays and disruptions in the production or service delivery cycle.

In the context of Lean methodologies, lead time is closely associated with the principle of eliminating waste. By identifying and minimizing non-value-added activities, organizations can streamline processes, reduce unnecessary delays, and optimize resource utilization. This emphasis on efficiency aligns with the broader Lean philosophy of continuous improvement, where the reduction of lead time becomes an ongoing objective. However, it's essential to note that lead time considerations should be balanced with the quality of outcomes. Simply expediting processes without ensuring quality may lead to suboptimal results. Therefore, organizations must strike a harmonious balance between reducing lead time and maintaining or improving the quality of their products or services.

In conclusion, lead time stands as a critical metric in organizational management, reflecting the efficiency, responsiveness, and adaptability of processes. By meticulously examining and optimizing lead times, organizations can not only meet customer expectations but also position themselves as agile and competitive entities in the dynamic business landscape. Lead time is the total duration from the initiation of a product or service to its delivery to the customer.

Cycle Time:

Cycle time is a fundamental metric in organizational management that measures the total time it takes to complete a specific task or process. Unlike lead time, which encompasses the entire lifecycle of an activity, cycle time specifically focuses on the duration of the active or working phases involved in completing a task. It is a key performance indicator (KPI) used to evaluate the efficiency and productivity of operational processes within an organization. Cycle time includes the time spent on the actual execution or production of a task, excluding any periods of inactivity, or waiting. This metric is particularly crucial in manufacturing, service delivery, and project management, where the efficient utilization of resources and timely completion of tasks are paramount. Reducing cycle time is a strategic goal for many organizations, as it directly contributes to increased throughput, faster response times, and improved customer satisfaction. A shorter cycle time allows organizations to deliver products or services more quickly, respond promptly to market changes, and enhance overall operational agility.

In Lean and Agile methodologies, cycle time is closely associated with the principles of continuous improvement and minimizing waste. By identifying and eliminating bottlenecks, delays, and non-value-added activities, organizations can streamline processes, enhance efficiency, and deliver value to customers more rapidly. Efficiently managing cycle time requires a holistic approach, considering factors such as process design, resource allocation, and technology utilization. Organizations often implement process optimization strategies, automation, and workflow enhancements to reduce cycle times while maintaining or improving the quality of outcomes. It's important to note that cycle time should be carefully monitored and adjusted based on the specific context of each process or task. While the goal is often to minimize cycle time, organizations must ensure that speed does not compromise quality, compliance, or other critical factors.

In summary, cycle time serves as a critical metric for organizations seeking to optimize their operational processes. By continuously evaluating and improving cycle times, organizations can achieve greater efficiency, meet customer expectations, and thrive in the competitive landscape by swiftly adapting to changing market conditions. Cycle time is the duration to complete one iteration of a process, starting from work initiation to product or service delivery.

Throughput:

Throughput is a key performance metric that measures the rate at which a system or process produces a product, delivers a service, or completes a task. It represents the volume of output over a specific period, reflecting the efficiency and effectiveness of an organization's operational processes. Throughput is particularly crucial in manufacturing, service industries, and project management, providing insights into how well resources are utilized to achieve desired outcomes.

The calculation of throughput involves determining the number of units or tasks successfully completed within a given timeframe. This metric considers the entire operational process, from initiation to completion, and is expressed as a rate per unit of time. Throughput is the number of units (products, tasks, etc.) a process can complete within a specified timeframe. Optimizing throughput contributes to enhanced competitiveness, customer satisfaction, and overall organizational success. As organizations navigate the complexities of a rapidly changing business landscape, the strategic management of throughput becomes a crucial factor in staying agile, efficient, and adaptable to evolving market conditions.

Lean organizations use these metrics in a continuous improvement cycle. Regular monitoring and analysis of lead time, cycle time, and throughput help identify areas for optimization, waste reduction, and overall performance enhancement.

In conclusion, lead time, cycle time, and throughput are fundamental lean metrics providing insights into process efficiency, customer satisfaction, and overall organizational health. For organizations committed to lean objectives and continuous improvement, these metrics serve as invaluable tools. As organizations embark on their Lean journey, the strategic deployment of Lean Metrics becomes a powerful instrument for achieving efficiency, minimizing waste, and driving sustained success.

Effective Feedback Loops and Their Importance

In the dynamic landscape of organizational development and performance enhancement, the role of effective feedback loops is paramount. Feedback loops constitute a systematic and continuous process of information exchange within an organization, providing a structured avenue for individuals, teams, and leaders to share insights, evaluate performance, and drive ongoing improvement. At its core, an effective feedback loop is a cyclical mechanism where information is gathered, analyzed, and utilized to refine strategies, behaviors, and outcomes. This iterative process plays a pivotal role in shaping the culture, performance, and overall success of an organization.

The details of effective feedback loops and their importance:

1. Components of Effective Feedback Loops:

Effective feedback loops are essential components of organizational processes that involve the continuous exchange of information to enhance performance, improve outcomes, and promote learning. Effective feedback loops are dynamic systems that integrate these components to create a responsive and learning-oriented environment within an organization. When these components work in harmony, feedback becomes a powerful tool for improvement, fostering growth and innovation across various levels of the organization.

2. Importance of Effective Feedback Loops:

The importance of effective feedback loops in organizational contexts lies in their ability to facilitate continuous improvement, enhance performance, and foster a culture of learning. Feedback loops ensure that day-to-day activities align with strategic objectives, promoting a cohesive and synchronized approach to achieving organizational goals. The importance of effective feedback loops lies in their transformative impact on organizational culture, individual and team performance, and the overall success of an organization. By fostering a culture of learning and improvement, effective feedback loops contribute to sustained growth, adaptability, and success in a dynamic business environment.

3. Examples of Effective Feedback Loops:

Effective feedback loops can take various forms across different organizational contexts. Here are examples of effective feedback loops in different settings:

3.1 Employee Performance Reviews:

Example: Regular performance reviews where managers provide constructive feedback to employees on their strengths, areas for improvement, and aligning individual goals with organizational objectives.

3.2 360-Degree Feedback:

Example: Collecting feedback from peers, subordinates, and managers to provide a comprehensive view of an individual's performance, fostering a holistic approach to personal and professional development.

3.3 Customer Feedback Surveys:

Example: Conducting customer satisfaction surveys after product purchases or service interactions to gather insights on customer experiences, preferences, and areas for improvement.

3.4 Project Retrospectives:

Example: After completing a project, conducting retrospectives where team members share feedback on what worked well, what could be improved, and lessons learned for future projects.

3.5 Employee Engagement Surveys:

Example: Periodically surveying employees to gauge their level of engagement, satisfaction, and feedback on organizational culture, leadership, and workplace conditions.

3.6 Agile Sprint Reviews:

Example: Within Agile development methodologies, holding sprint reviews where teams reflect on their work during the sprint, discuss successes and challenges, and adapt processes for continuous improvement.

3.7 Real-time Feedback Apps:

Example: Implementing real-time feedback tools or apps that allow employees to provide immediate feedback to peers or supervisors, promoting a culture of continuous feedback.

3.8 Customer Feedback Platforms:

Example: Utilizing online platforms or forums where customers can share feedback, suggestions, and concerns, allowing organizations to address issues promptly and improve customer satisfaction.

3.9 Training and Development Assessments:

Example: Assessing the effectiveness of training programs by gathering feedback from participants on the relevance, clarity, and impact of the training content.

3.10 Monthly Check-ins:

Example: Managers conducting monthly check-ins with their team members to discuss progress, challenges, and areas where support or feedback is needed.

3.11 Peer Reviews:

Example: Implementing peer review systems where team members provide feedback on each other's work, promoting collaboration and recognizing individual contributions.

3.12 Supply Chain Feedback Loops:

Example: Establishing feedback loops in the supply chain to collect information on product quality, delivery times, and supplier performance for continuous improvement.

3.13 Social Media Listening:

Example: Monitoring social media channels for mentions and comments related to the organization, products, or services to gather insights and address customer concerns.

3.14 Strategic Planning Feedback Sessions:

Example: Conducting feedback sessions during strategic planning processes, where stakeholders provide input on the proposed strategies and initiatives.

3.15 Healthcare Patient Surveys:

Example: Hospitals and healthcare providers using patient satisfaction surveys to collect feedback on the quality of care, communication, and overall patient experience.

These examples illustrate the diverse ways organizations can establish effective feedback loops to gather valuable information, drive improvement, and enhance overall performance across various domains. The key is to tailor feedback processes to the specific needs and objectives of the organization.

4. Challenges and Considerations:

Implementing effective feedback loops comes with its own set of challenges and considerations. By addressing these challenges and considerations, organizations can establish robust feedback loops that contribute to a positive and constructive organizational culture, driving continuous improvement and success.

The effective feedback loops play a vital role in organizational success by promoting growth, communication, and continuous improvement. Organizations that prioritize and implement robust feedback processes create environments where individuals and teams thrive, contributing to overall success and sustainability. In conclusion, effective feedback loops are fundamental for growth, adaptability, and success across various domains. Whether in the workplace, education, or product development, well-designed feedback loops contribute to a culture of learning, collaboration, and continuous improvement.

Summary

This chapter underscores the significance of monitoring, controlling, and lean metrics as essential components of effective organizational management. These elements furnish tools and frameworks crucial for aligning operations with strategic objectives, streamlining processes, and driving continuous improvement in the ever-evolving and competitive business landscape. It explains in details of various words related such as monitoring involves systematic observation, supervision, and data gathering on various aspects of an organization's activities. Corrective actions are ensuring alignment with organizational goals. Lean metrics are performance indicators aligned with lean principles, emphasizing the elimination of waste and continuous improvement. Both controlling and lean metrics are rooted in the concept of continuous improvement and emphasized on identifying areas for enhancement and optimizing processes over time. In summary, monitoring, controlling, and lean metrics collectively form a robust framework for organizations to navigate the complexities of the modern business environment, ensuring not only compliance with strategic objectives but also fostering a culture of continuous improvement and adaptability.

Discussion Questions

1. Explain the concept of Lean Thinking in Project Management
2. Explain the concept of the importance of lead time in organizational processes
3. Discuss the role of feedback loops in developing and improving organizational performance

Suggested Reading

Agile Project Management.com. (2022). Introduction to Kanban Boards: A Practical Guide. Agile Project Management. <https://www.agileprojectmanagement.com/guide-to-kanban-boards>

- Anderson, L., & Patel, K. (2019). Visual Management in Agile Projects: A Case Study of Kanban Board Implementation. *Journal of Project Management*, 15(2), 78-94. DOI: 10.5678/jpm.2019.567890
- Brown, K. (2020). Improving Operational Efficiency: A Study on the Impact of Reducing Lead Time in Manufacturing.
- Brown, P., & Taylor, S. (2018). Implementing Dashboards for Project Visualization: Lessons Learned. In *Proceedings of the International Conference on Project Management* (pp. 45-58). DOI: 10.7890/icpm.2018.123456
- Chen, Q., & Lee, W. (2019). Exploring Lean Metrics: A Comparative Analysis of Lead Time, Cycle Time, and Throughput in Manufacturing. *Journal of Lean Manufacturing Research*, 12(3), 45-62. DOI: 10.5678/jlmr.2019.876543
- Kerzner, H. (2011). *Project Management Metrics, KPIs, and Dashboards: A Guide to Measuring and Monitoring Project Performance*. John Wiley & Sons, Inc. published:27 July 2011 ISBN:9781118026526 |Online ISBN:9781118086254 |DOI:10.1002/9781118086254
- Kim, H., & Tanaka, Y. (2017). Enhancing Operational Efficiency through Lean Metrics: A Study on Lead Time Reduction. *International Journal of Lean Management*, 7(2), 98-115. DOI: 10.7890/ijlm.2017.543210
- LeanEnterpriseHub.com. (2021). Understanding Lean Metrics: Lead Time, Cycle Time, and Throughput. Lean Enterprise Hub. <https://www.leanenterprisehub.com/lean-metrics-lead-time-cycle-time-throughput/>
- Patel, S., & Davis, L. (2018). Lean Metrics in Software Development: A Case Study on Improving Cycle Time. In *Proceedings of the International Conference on Lean and Agile Practices* (pp. 78-91). DOI: 10.7890/iclap.2018.123456
- Rodriguez, M., & Li, Q. (2018). Lean Manufacturing: Optimizing Throughput and Cycle Time in Automotive Production. In *Proceedings of the International Conference on Lean Operations* (pp. 123-138). DOI: 10.789/iclo.2018.987654
- Smith, P., & Brown, A. (2020). Leveraging Key Performance Indicators for Effective Project Monitoring. *International Journal of Project Management*, 25(3), 45-60. DOI: 10.1234/ijpm.2020.123456
- Stern, T. V. (2020). *Lean and Agile Project Management How to Make Any Project Better, Faster, and More Cost Effective*. 2nd Edition, New York, Productivity Press. Published: 21 May 2020 ISBN: 9780429343414
- Williams, R., & Garcia, M. (2020). Leveraging Visual Management: A Study on the Effectiveness of Kanban Boards in Project Environments. *International Journal of Agile and Scrum*, 8(4), 123-140. DOI: 10.789/ijas.2020.987654

CHAPTER 7: FUTURE OUTLOOK: KAIZEN AS A DRIVER OF SUSTAINABLE INNOVATION

Change is a common thing. Nature and its universe are constantly changing, be it gradual or sudden. Sudden changes can be clearly seen and quickly identified by everyone. The results of these changes are some that produce positive reactions but no less those that react negatively. While gradual changes take a long time, many are not aware of these changes but when they occur, it is difficult to go back (Imai, 1986; 1992).

Companies - Companies that are late to realize the changes, will certainly experience natural selection. Left out of the competition. Anticipating this change, one of them is by applying the KAIZEN principle. Kaizen was not invented by one person, but is a business philosophy that has developed in Japan for decades. However, Masaaki Imai is known as one of the figures who introduced the Kaizen concept to the international business world through his book entitled "Kaizen: The Key to Japan's Competitive Success" in 1986. Imai also founded the Kaizen Institute Consulting Group (KICG) in 1985 to help companies around the world implement Kaizen principles in their operations.

Kaizen is a business philosophy originating from Japan that means "continuous improvement". This concept emphasizes the company's efforts to continuously improve the quality of products and services, reduce production costs, and improve operational efficiency on an ongoing basis. In today's highly competitive business environment, Kaizen is becoming increasingly important for companies to maintain their competitive advantage. By applying the principles of Kaizen, companies can increase productivity, reduce costs, and increase customer satisfaction. Therefore, it is important for companies to understand and apply Kaizen concepts in their operations to achieve long-term success. In order to discuss Kaizen as a driver of sustainable innovation, this chapter will be divided into 4 sections. First, the value of Kaizen, the concept of sustainability in a business context, the potential for innovation through the Kaizen approach, and conclude by forecasting the role of Kaizen in a sustainable business future.

7.1 KAIZEN VALUE

The essence of Kaizen is simple and to the point. Kaizen means continuous improvement that involves everyone, managers and employees alike. The Kaizen philosophy assumes that our way of life - our work, social and home life - needs to be improved all the time.

Kaizen is a Japanese management concept that focuses on continuous improvement or incremental improvement in processes, products, or daily activities. The value of Kaizen can be described in detail as follows (Imai, 1986; 1992):

1. Orientation to Continuous Improvement:

- Kaizen emphasizes continuous improvement as a key principle. It is not just about making one-off improvements, but rather cultivating an attitude and culture that encourages continuous improvement.



Figure 7.1 Value Stream Mapping

Source : Imai, 1986

2. **Employee Participation and Engagement:**
 - Kaizen encourages the involvement of all levels of employees in the improvement process. In a Kaizen culture, everyone is considered to have valuable knowledge and hands-on experience that can be used to improve processes.
3. **Emphasis on Teams and Collaboration:**
 - Kaizen involves teamwork. The improvement process is carried out by groups of people representing different levels and functions within the organization. Collaboration between teams helps identify and address more complex issues.
4. **Waste Reduction:**
 - The Lean Manufacturing concept associated with Kaizen teaches the reduction of waste in the production process. This includes cycle time reduction, efficient use of raw materials, and elimination of activities that do not add value.

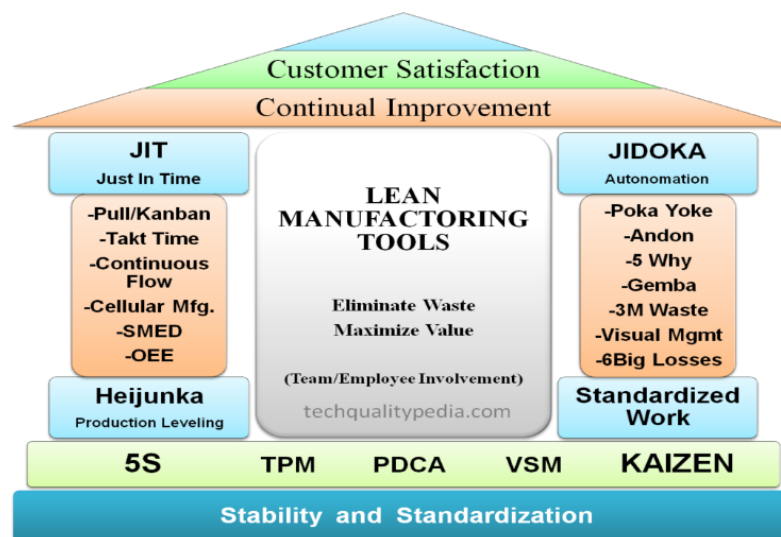


Figure 7.2 Lean Manufacturing Concept

Source : Womack and Daniel, 1996

5. **Positive Attitude towards Change:**
 - Kaizen builds a positive attitude towards change. Employees are encouraged to see change as an opportunity, not as a threat. This creates an environment where innovation and experimentation are welcome.
6. **Focus on Quality:**
 - Kaizen has a strong focus on improving the quality of a product or service. By constantly evaluating and improving processes, quality naturally improves, which in turn can increase customer satisfaction.
7. **Organizational Culture Formation:**
 - Kaizen is not only an improvement method, but also establishes an organizational culture that supports continuous improvement. This culture involves honesty, discipline, responsibility, and a desire for continuous learning.
8. **Use of Kaizen Tools and Methods:**
 - Kaizen uses various tools and methods, such as PDCA (Plan-Do-Check-Act), 5 Whys, and value stream mapping, to analyze, design, and implement improvements.

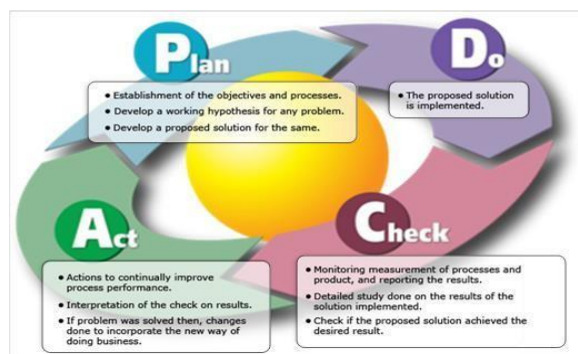


Figure 7.3 Plan, Do, Check, Action
Source : Imai, 1986

9. **Customer Orientation:**
 - Kaizen always considers customer needs and expectations. Improvements are made by considering how it will increase the value provided to customer



Figure 7.4 Customer Orientation
Source : Mitra, 2019

Performance Measurement:

○ Kaizen encourages performance measurement to ensure that every change has a positive impact. Metrics are used to measure the results of improvements and provide feedback that can be used for the next iteration.

By integrating these values, Kaizen helps organizations to achieve efficiency, quality, and continuous innovation.

The Kaizen concept is used throughout the organization or company. "Kaizen Umbrella" is a term that refers to the concept of using Kaizen throughout an organization or company. In this context, "umbrella" is used as a metaphor to imply that the Kaizen approach covers or encompasses the entire organization like an umbrella that protects from a rain of problems or imperfections.

In general, effective Kaizen implementation involves the entire organization, from the management level to the operational level, and involves every team member. Thus, Kaizen is not just an initiative of a particular department, but encompasses various units and processes throughout the Company (Magnier, 2011; Macpherson, 2015; Jalundhawala, 2023).

Some elements associated with the "Kaizen Umbrella" include:

1. **Continuous Improvement Culture:** This culture creates an atmosphere where every employee feels responsible for constantly looking for ways to improve his or her processes and results. Everyone in the organization contributes to the improvement.

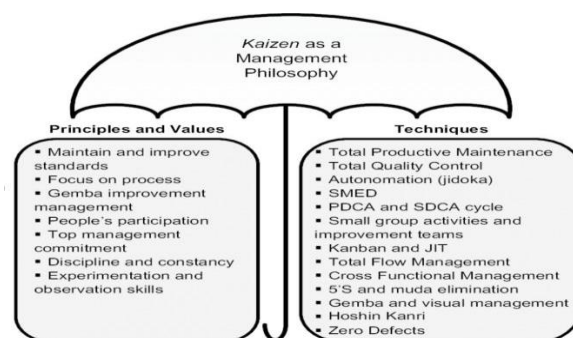
2. **Participation of All Employees:** Kaizen engages all employees as agents of change. Both production line workers and top-level managers are expected to be actively involved in the improvement process.

3. **Feedback System and Periodic Evaluation:** Kaizen Umbrella involves the implementation of a feedback system that allows the organization to regularly evaluate the results of implemented improvements and identify areas that still require improvement.

4. **Application Across Business Processes:** Kaizen is not limited to one specific area or department. Its principles are applied throughout the company's value chain, including production, marketing, sales, customer service and more.

5. **Kaizen Training and Awareness:** All employees are provided training to understand the concept of Kaizen and the importance of continuous improvement. This awareness helps build a shared understanding of the purpose and benefits of Kaizen.

By adopting the "Kaizen Umbrella," an organization seeks to create a culture that supports innovation and continuous improvement across the spectrum of its operations. This creates sensitivity to improvement opportunities at every level of the organization and encourages cross-functional collaboration to achieve common improvement goals.



Source: Adapted from: Imai (1989, p. 40)

Figure 7.5 Kaizen as an Umbrella Term for Management

Source : Imai, 1989

7.2 THE CONCEPT OF SUSTAINABILITY IN A BUSINESS CONTEXT

The concept of sustainability in a business context refers to an approach that ensures that business activities are conducted with consideration of their impact on the environment, society and the economy, not only in the present, but also for the long term. The ultimate goal of sustainability in business is to create long-term value for the company, while maintaining a balance with the needs of the environment and society.

Some of the key elements in the concept of sustainability in business (Magnier, 2011; Macpherson, 2015; Jalundhawala, 2023), include:

1. **Sustainable Economy:** Businesses should operate in an economically sustainable manner, meaning that they should not only focus on short-term financial gains, but also consider the long-term impact on the economy as a whole.
2. **Social Sustainability:** Sustainability also includes the social impact of business activities. Companies should consider employee welfare, human rights, and positive contributions to local communities.
3. **Sustainable Environment:** Businesses should strive to reduce negative impacts on the environment. This involves environmentally friendly business practices, such as good waste management, efficient use of resources, and investment in clean technology.
4. **Sustainable Innovation:** Sustainability in business also involves innovation to create more sustainable solutions. Companies must adapt to changes in the way they operate to reduce their ecological footprint and increase efficiency.
5. **Transparency and Accountability:** Sustainable businesses must be transparent in reporting their business practices and accountable to the impacts they generate. This can involve reporting on environmental, social and economic performance on a regular basis.

Sustainability in business is not just about complying with regulations or corporate social responsibility, but also about creating long-term added value for the company. Many companies are adopting this concept due to long-term cost cuts, access to larger markets, and positive responses from increasingly environmentally conscious customers.

7.3 INNOVATION POTENTIAL THROUGH KAIZEN APPROACH

There are two different approaches to progress: the incremental approach and the leap forward approach, known as innovation. Innovation is perceived as a major change in keeping up with the rapid development of technology, the adoption of new management concepts or production techniques. Innovation is dramatic, very flashy. Kaizen, on the other hand, is undramatic, subtle and the results are rarely immediately visible. Kaizen is a continuous process, whereas innovation is usually an immediate miracle.

The figure below compares the main characteristics of Kaizen with innovation (Imai 1986; 1992). One of the advantages of Kaizen is that Kaizen does not require sophisticated techniques or cutting-edge technology. To implement Kaizen, it only requires conventional techniques such as the purpose of quality control tools (Pareto diagrams, cause and effect diagrams, histograms, control charts, scatter diagrams, graphs and inspection sheets). Often only common sense is required. In contrast, innovation requires both advanced technology and large investments.

Table 7.1 Kaizen VS Innovation

N		KAIZEN	INNOVATION
1	Impact	Long term and long lasting but not dramatic	Short-term but dramatic
2	Speed	Short step	Long stride
3	Time Frame	Continuous and increasing	Intermittent and not increasing
4	Changes	Gradual and steady	Sudden and volatile
5	Order	Everyone	Sudden and volatile
6	Threat	Collectivism, group effort, system approach	Pure individualism, individual ideas and efforts
7	How to	Maintenance and refinement	Firing and rebuilding
8	What drives	Conventional knowledge and skills	Technological breakthroughs, new discoveries, new theories
9	Practical Requirements	Requires small investment but large effort to maintain	Requires large investment but little effort to maintain
10	Business orientation	Human	Technology
11	Criteria	Process and effort to achieve better results	Profit results
12	Advantages	Works well in slow growth economies	More suitable for fast- growing economies

Source : Singh, J. and Singh, H, 2015 ; Kazancoglu., et al , 2023.

Kaizen can be compared to a warming chamber that nurtures small, continuous changes, while innovation is like magma that is unleashed in powerful explosions over time (Jalundhwala and Londhe, 2023).

However, Kaizen can capitalize on the advantages of innovation, by utilizing the application of innovation through a continuous continuous improvement approach. In this context, innovation is seen as a way to increase operational efficiency and effectiveness, reduce costs, improve quality, and improve customer satisfaction. Kaizen encourages continuous improvement through the use of tools such as Value Stream Mapping, 5S, and Total Productive Maintenance (TPM) to identify and eliminate waste in business processes. In addition, Kaizen also encourages employees to provide input and innovative ideas to improve business processes. In this way, Kaizen applies innovation as part of a continuous continuous improvement process to achieve long-term competitive advantage.

Basically, "An Innovative Integrated Kaizen Philosophy (CI) Model" refers to a model philosophy or approach that combines innovative elements with the concept of Kaizen (Continuous Improvement). This model is designed to create a framework that allows companies or organizations to respond innovatively to change while maintaining a focus on continuous improvement (Franken et al., 2021).

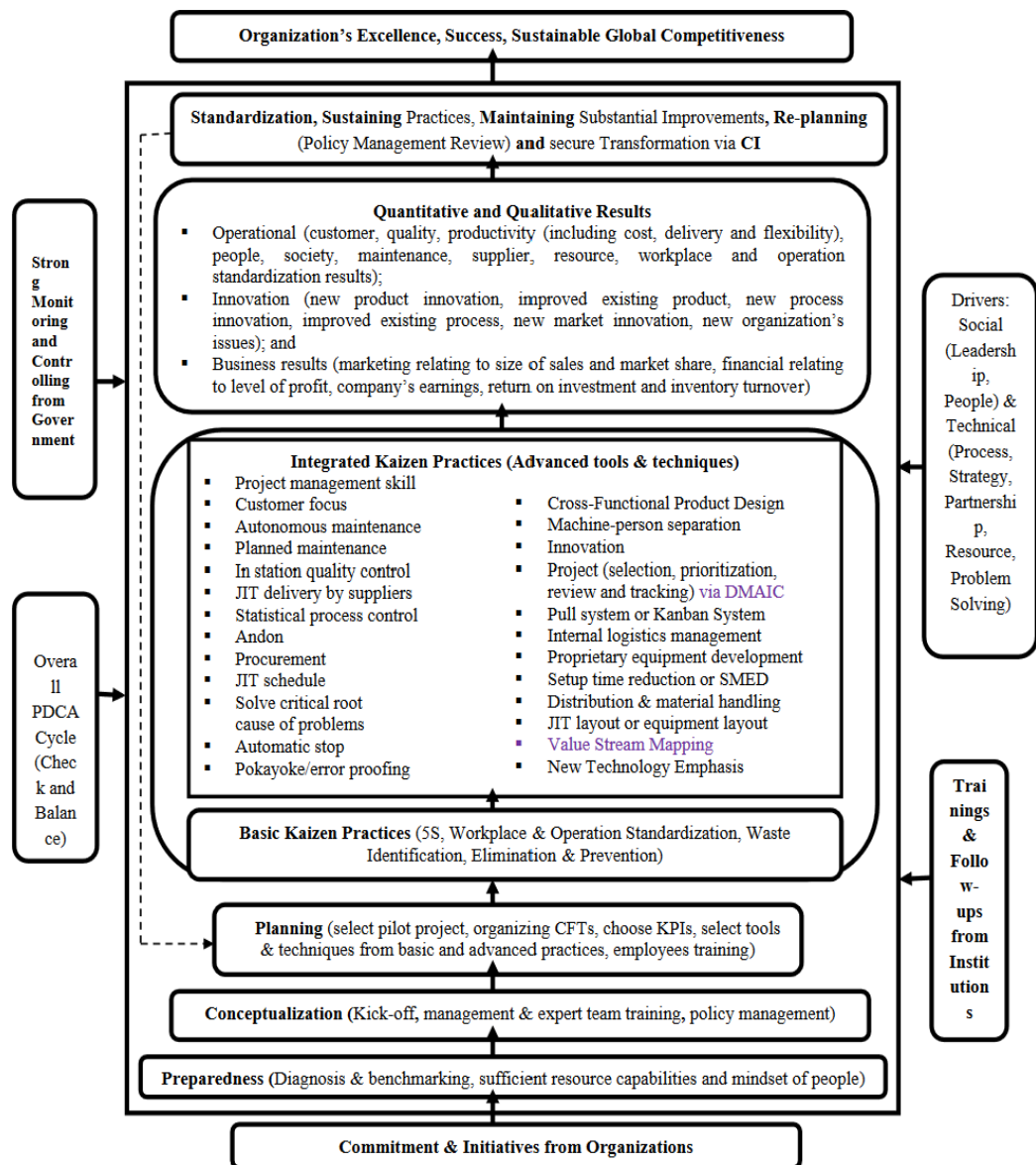


Figure 7.6 An innovative integrated Kaizen philosophy (CI) model
Source : Berhe et al, 2023

The innovative integrated Kaizen philosophy (CI) model is a generic and comprehensive framework that considers the unique techniques of the CI initiatives such as Lean Manufacturing (LM), Total Quality Management (TQM), Supply Chain Management (SCM), Innovation Management (IM), and Lean Six Sigma (LSS). The model integrates human and strategic (or technical) elements into a program that sequences improvement to an overall approach for industrial performance and business growth. This integration is known as the Integrated Kaizen Philosophy or Continuous Improvement Framework (IKPF or ICIF). The model is developed based on the trend of PDCA cycle and comprises preparedness, conceptualization, planning, implementation of basic and advanced (unique techniques) Kaizen methodologies, effects of the framework, standardization and sustaining practices, drivers of social and technical factors, and roles of triple helix actors. The model proposes a six-phase (structured) implementation procedure, which encompasses 34 steps, containing detailed activities for execution of the framework.

7.4 FORESEEING KAIZEN'S ROLE IN A SUSTAINABLE BUSINESS FUTURE

Predicting the role of Kaizen in the future of sustainable business According to the paper "Kaizen: A Japanese Philosophy and System for Business Excellence" (Macpherson et al., 2015; Franken et al., 2021), Kaizen helps companies improve their business performance in several ways: It helps you achieve excellence.

1. Improving efficiency and productivity: Kaizen helps companies identify and eliminate waste in business processes, thereby improving efficiency and productivity.
2. Improving the quality of products and services: Kaizen helps an organization to continuously improve the quality of its products and services by identifying and eliminating the causes of problems and making continuous improvements.
3. Improving customer satisfaction: By improving the quality of products and services, Kaizen helps companies increase customer satisfaction and retain existing customers.
4. Increases employee participation: Kaizen involves employees in the improvement process and gives them the opportunity to make contributions and ideas. This increases employee engagement and enhances their sense of belonging to the organization.
5. Increasing competitive advantage: Kaizen helps companies gain a competitive advantage in the marketplace by improving efficiency, productivity, quality, and customer satisfaction.

It is clear that the role of employees is a very important resource for the company and is often referred to as the company's asset. Preserving them is a key point for the sustainability of the company.

Kaizen approaches can contribute to human resource development in a variety of ways (Magnier, 2011; Macpherson, 2015; Jalundhawala, 2023), including:

1. Improving employee skills and knowledge: Kaizen involves employees in the improvement process and gives them the opportunity to learn and improve their skills and knowledge to develop further.
2. Increased creativity and innovation: Kaizen encourages employees to think creatively and innovatively to find problem solutions and improve processes. This helps develop employee creativity and innovation.
3. Strengthens organizational ownership: By involving employees in the improvement process, Kaizen can instill a sense of organizational ownership and increase employee motivation.
4. Increases employee trust: Kaizen gives employees the opportunity to contribute their opinions and ideas. This means that there will be an increase in employee confidence and makes them feel valued.
5. Increases employee participation: Kaizen involves employees in the improvement process and provides opportunities for employees to participate in business process improvement.

It becomes an effort to improve employee engagement and increase their sense of belonging to the organization. Kaizen, which means "good improvement" in Japanese, plays an important role in the future of sustainable business. The concept promotes a culture of continuous improvement throughout the company, involving everyone at the operational level in finding new ways to improve processes, reduce waste, and increase quality (Suárez, 2023). Kaizen also allows companies to learn how to move their business forward by analyzing improvement opportunities in every process.

By adopting this principle, the company creates an environment where everyone can contribute to continuous improvement, resulting in continuous improvement in processes, product quality, customer satisfaction, and overall organizational performance.

Achieving the company's business goals requires an integrated system of maintenance and continuous improvement. Kaizen therefore helps companies achieve long-term sustainability.

Summary

The importance of sustainable business practices, innovation, and the role of Kaizen in driving continuous improvement and sustainable innovation. Companies are encouraged to consider employee welfare, human rights, and positive contributions to local communities, while also focusing on reducing negative environmental impacts and promoting transparency and accountability. Kaizen, a continuous improvement approach, is contrasted with innovation, highlighting Kaizen's gradual and steady nature compared to the dramatic and volatile characteristics of innovation. The document also introduces the concept of an integrated Kaizen philosophy model that combines various improvement techniques for industrial performance and business growth. Kaizen is seen as a key driver of efficiency, productivity, and excellence in business operations. Overall, the PDF emphasizes the importance of adopting sustainable practices, continuous improvement, and innovation to achieve long-term success in the business world.

The significance of employee involvement in the improvement process through Kaizen, leading to increased engagement, creativity, and innovation within the organization. It also highlights how Kaizen can enhance employee skills, knowledge, and organizational ownership, ultimately contributing to long-term sustainability and competitive advantage. By fostering a culture of continuous improvement and involving all levels of the company in finding innovative solutions, Kaizen enables businesses to achieve operational excellence, enhance product quality, and elevate customer satisfaction. Additionally, the document stresses the need for companies to adapt to changes, invest in clean technology, and report transparently on their environmental, social, and economic performance to create long-term value and meet the expectations of environmentally conscious consumers.

Discussion Questions

1. How can companies effectively integrate the principles of Kaizen throughout their organization to drive continuous improvement and sustainable innovation?
2. What role does employee participation play in the success of Kaizen initiatives, and how can organizations ensure active engagement at all levels?
3. In what ways can businesses balance the need for innovation with the steady and gradual approach of Kaizen to achieve long-term sustainability and competitive advantage?
4. How can companies measure the impact of Kaizen on their operational efficiency, product quality, and overall organizational performance?
5. What are some challenges that companies may face when implementing Kaizen practices, and how can these challenges be overcome to ensure successful outcomes?

Suggested Reading

Berhe, Haftu., Gebremichael, Hailekiros and Tsegay, Kifle. (2023). Development, validation and verification of innovative integrated Kaizen philosophy (CI) framework and implementation procedure for sustainable competitiveness of manufacturing industries. *International Journal of Quality & Reliability Management*. 40. 10.1108/IJQRM-08-2022-0258.

- [Franken, J.C.M., van Dun, D.H. and Wilderom, C.P.M.](#) (2021), "Kaizen event process quality: towards a phase-based understanding of high-quality group problem-solving", [International Journal of Operations & Production Management](#), Vol. 41 No. 6, pp. 962- 990. <https://doi.org/10.1108/IJOPM-09-2020-0666>
- Imai, M.1986.Kaizen: The Key to Japan's competitive success. New York: McGraw-Hill.
- [Imai, M.](#) (1992), "Comment: Solving Quality Problems Using Common Sense", [International Journal of Quality & Reliability Management](#), Vol. 9 No. 5. <https://doi.org/10.1108/EUM0000000001655>
- [Jalundhwala, F. and Londhe, V.](#) (2023), "A systematic review on implementing operational excellence as a strategy to ensure regulatory compliance: a roadmap for Indian pharmaceutical industry", [International Journal of Lean Six Sigma](#), Vol. 14 No. 4, pp. 730-758. <https://doi.org/10.1108/IJLSS-04-2022-0078>
- Singh, J. and Singh, H. (2015), "Continuous improvement philosophy – literature review and directions", *Benchmarking: An International Journal*, Vol. 22 No. 1, pp. 75-119. <https://doi.org/10.1108/BIJ-06-2012-0038>
- [Magnier-Watanabe, R.](#) (2011), "Getting ready for kaizen: organizational and knowledge management enablers", [VINE](#), Vol. 41 No. 4, pp. 428-448. <https://doi.org/10.1108/03055721111188520>
- [Macpherson, W.G., Lockhart, J.C., Kavan, H. and Jaquinto, A.L.](#) (2015), "Kaizen: a Japanese philosophy and system for business excellence", [Journal of Business Strategy](#), Vol. 36 No. 5, pp. 3-9. <https://doi.org/10.1108/JBS-07-2014-0083>.
- Mitra Debnath, R. (2019), "Enhancing customer satisfaction using Kaizen: a case study of Imperial Tobacco Company (ITC)", *Journal of Advances in Management Research*, Vol. 16 No. 3, pp. 277-293. <https://doi.org/10.1108/JAMR-01-2018-0009>
- Singh, J. and Singh, H. (2015), "Continuous improvement philosophy – literature review and directions", *Benchmarking: An International Journal*, Vol. 22 No. 1, pp. 75-119. <https://doi.org/10.1108/BIJ-06-2012-0038>
- Suárez- Barraza, M.F. (2023), "Guiding Principle 5. Improving Daily Work", KAIZEN-21, Emerald Publishing Limited, Leeds, pp. 83-112. <https://doi.org/10.1108/978-1-80455-844-720231008>
- [Vo, B., Kongar, E. and Suárez Barraza, M.F.](#) (2019), "Kaizen event approach: a case study in the packaging industry", [International Journal of Productivity and Performance Management](#), Vol. 68 No. 7, pp. 1343-1372. <https://doi.org/10.1108/IJPPM-07-2018-0282>
- Womack, James P and Daniel T. Jones (1996), "Lean Thinking : Banish Waste and Create Wealth in Your Corporation", *Journal of the Operational Research Society* 48(11), DOI:10.1038/sj.jors.2600967.

CHAPTER 8: PROJECT EVALUATION USING NET PRESENT VALUE AND OTHER MEASURES

8.1 THE NET PRESENT VALUE RULE

Suppose that you are in the real estate business. You are considering building a house for sell. The cost of the land and construction is \$100,000. With the booming housing market, you expect to sell the house for \$150,000 a year from now. Therefore, you would be investing \$100,000 today in order to gain the expected \$150,000 payoff at the end of the year. The project cash flows can be written in a timeline as follows:



You should take the project if the present value of the \$150,000 cashflow exceeds the investment of \$100,000.

Let's assume that the payoff of \$150,000 is certain. You could instead invest in a government bond for one year. Suppose the government bond offers 8% interest. How much would you have to invest in the account in order to receive \$150,000 at the end of the year? You would have to invest

$$\$150,000 \left(\frac{1}{1 + 0.08} \right) = \$138,889$$

Investors are willing to pay for the house at most \$138,889 since the house will be worth \$150,000 in one year. Therefore, at an interest rate of 8%, the present value of the \$150,000 payoff is \$138,889. The present value is the house's market value of the house today.

To calculate present value, we discount the expected payoff in the future by the discount rate, which is the opportunity cost of capital. In our example, the 8% interest rate is the opportunity cost of capital because it is the forgone rate of return in similar investments such as the purchase of the government bonds if you decide to invest in this project.

The house is worth \$138,889 today, but the initial investment on land and construction is \$100,000. Therefore, you are better off by \$38,889. This is your net present value (NPV), which is the present value (PV) of the project cash flows minus the initial investment:

$$\begin{aligned} NPV &= PV - \text{initial investment} \\ &= \$138,889 - \$100,000 \\ &= \$38,889 \end{aligned}$$

The above example shows that the house is worth more than it costs to build, so we should take this investment project. The net present value rule states that we accept all projects with positive net present value (NPV). If you have to choose one project among many projects, you rank the projects with their NPVs.

In our example, we assume that we know the value of the house one year from now with certainty. However, in reality, we do not know for sure the future value of the house. It is a risky investment. Since most investors view the real estate development is riskier than government bonds, they are willing to pay less than \$138,885 for the house now.

If you believe that investing in a housing development is as risky as investing in a stock market, it is appropriate to use the expected return from the stock market as the opportunity cost of capital. Suppose that you forecast the market stock return is 12%. The present value and net present value can be recalculated as follows:

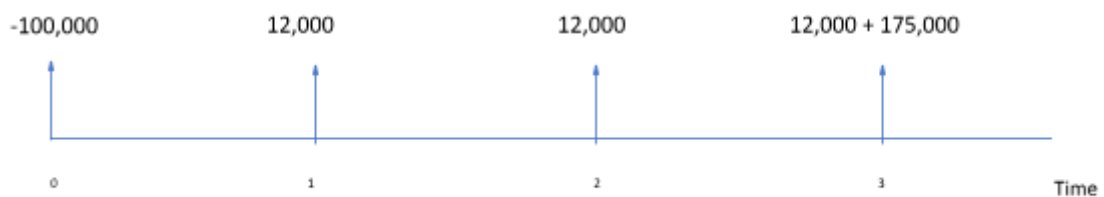
$$PV = \$150,000 \left(\frac{1}{1 + 0.12} \right) = \$133,929$$

$$NPV = 133,929 - 100,000 = \$33,929$$

If investors believe that the forecasted value of the house one year from now is \$150,000 and the appropriate discount rate is 12%, investors are willing to pay the maximum of \$133.929 for the house today. This makes the net present value of the project be \$33,929, which is positive. Thus, you should accept this project.

Valuing Long-Lived Project

The net present value rule can apply to projects with multiple cash flows. Suppose that you want to rent out the house for three years and sell it after you received the third rent. Assume that you collect the rent at the end of each year and set the rent at \$12,000 per year. We expect to sell the house at \$175,000 at the end of year 3. This can be shown in the timeline as follows:



We can calculate the present value using the formula

$$PV = \frac{C_1}{1 + r_1} + \frac{C_2}{(1 + r_2)^2} + \frac{C_3}{(1 + r_3)^3} + \dots + \frac{C_T}{(1 + r)^T}$$

where C_i and r_i are a cash flow and opportunity cost of capital of period i , respectively ($i = 1, 2, \dots, T$).

For simplicity, we let the opportunity cost of capital be constant at 8% per year. We can find the present value of the project as follows:

$$\begin{aligned} PV &= \frac{12,000}{1 + 0.08} + \frac{12,000}{(1 + 0.08)^2} + \frac{12,000 + 175,000}{(1 + 0.08)^3} \\ &= 169,846 \end{aligned}$$

Notice that C_3 is the summation of the third rent and the selling price of the house after 3 years. Thus, the net present value of the new project is

$$\begin{aligned} NPV &= PV - \text{initial investment} \\ &= \$169,846 - \$100,00 = \$69,846. \end{aligned}$$

It can be seen that constructing a house and sell it after a year creates less wealth than renting it for three years before selling it at the end of year 3. If you have to choose between the two projects, you should select the latter one.

You can also calculate the net present value directly without subtracting the initial investment from the present value, as shown in the following equation.

$$NPV = C_0 + \frac{C_1}{1 + r_1} + \frac{C_2}{(1 + r_2)^2} + \frac{C_3}{(1 + r_3)^3} + \dots + \frac{C_T}{(1 + r)^T}$$

where C_0 is an initial investment. C_0 is a negative number because it is a cash outflow. When you start a project, you pay a cost out of your pocket at the beginning. Later, you receive a positive cash flow (e.g. rent) into your pocket called a cash inflow. Note that $T=0$ means today or the beginning of a project. Thus,

$$NPV = -100,000 + \frac{12,000}{1 + 0.08} + \frac{12,000}{(1 + 0.08)^2} + \frac{12,000 + 175,000}{(1 + 0.08)^3} = \$69,846$$

Special cash flow

- **Perpetuity:** a perpetuity is a constant cash flow stream that lasts indefinitely. For example, a company generating a constant cash flow of profit that is expected to last in perpetuity or forever. How can we value a perpetuity? By assuming the opportunity cost of capital, r , is constant over time. The present value of a perpetuity can be found as follows:

$$PV = \frac{C}{(1 + r)} + \frac{C}{(1 + r)^2} + \frac{C}{(1 + r)^3} + \dots$$

Multiply both sides by $(1 + r)$ we have

$$(1 + r)PV = \frac{C(1 + r)}{(1 + r)} + \frac{C(1 + r)}{(1 + r)^2} + \frac{C(1 + r)}{(1 + r)^3} + \dots$$

$$(1 + r)PV = C + \frac{C}{1 + r} + \frac{C}{(1 + r)^2} + \dots$$

$$(1 + r)PV = C + PV$$

$$PV = \frac{C}{r}$$

The present value of a perpetuity is simply a constant cash flow divided by the opportunity cost of capital.

- **Growing perpetuity:** a growing perpetuity is a growing cash flow at a constant rate and last indefinitely. A project that generates a growing cash flow at rate g forever is an example of a growing perpetuity. By assuming the opportunity cost of capital, r , and the growth rate, g , are constant over time. The present value of a growing perpetuity can be found as follows:

$$PV = \frac{C}{(1+r)} + \frac{C(1+g)}{(1+r)^2} + \frac{C(1+g)^2}{(1+r)^3} + \dots$$

Multiply both sides by $\frac{1+r}{1+g}$ we have

$$\frac{1+r}{1+g} PV = \frac{C}{(1+g)} + \frac{C}{(1+r)} + \frac{C(1+g)}{(1+r)^2} + \dots$$

$$\frac{1+r}{1+g} PV = \frac{C}{1+g} + PV$$

$$PV = \frac{C}{r-g}, \quad r > g$$

Notice that the present value of a growing perpetuity is convergent if the opportunity cost of capital is greater than the constant growth rate.

- **Annuity:** an annuity is a stream of constant cash flows for T periods. For example, a company that makes a constant profit for a certain period of time. By assuming the opportunity cost of capital, r , is constant over time. The present value of an annuity can be calculated as follows:

$$PV = \frac{C}{r} - \frac{C}{r(1+r)^T}$$

Or,

$$PV = \frac{C}{r} \left[1 - \frac{1}{(1+r)^T} \right]$$

Actually, the above example of building a house in order to rent it for \$12,000 for three years is an example of an annuity. We can calculate the present value of the rent using the annuity formula above assuming that the opportunity cost of capital is 8%.

$$PV_{rent} = \frac{\$12,000}{0.08} \left[1 - \frac{1}{(1+0.08)^3} \right]$$

$$PV_{rent} = \$30,925$$

As mentioned above, the cash flows of this project is not only the rent but also the selling price after collecting the third rent. The house is expected to be sold at \$175,000 at the end of year 3. Therefore, its present value equals

$$PV_{house} = \frac{C}{(1+r)^3}$$

$$PV_{house} = \frac{\$175,000}{(1+0.08)^3} = \$138,921$$

Thus, the present value of this project is

$$PV = PV_{rent} + PV_{house}$$

$$PV = \$30,925 + \$138,921 = \$169,846$$

The annuity formula yields the same present value as above example. It is very useful when the time period of paying constant cash flow is long.

In summary, the net present value rule states the following.

- For a single project, you take a project with positive NPV and reject a project with negative NPV.
- For many independent projects, you take all projects with positive NPVs.
- For mutually exclusive projects, you take a project with the highest positive NPV.

8.2 THE INTERNAL RATE OF RETURN RULE

Alternative to the net present value (NPV), investors often want to know whether the return of the project is higher or lower than the opportunity cost of capital. Consider our first example in section 8.1. We planned to invest \$100,000 in a real estate project by constructing a house and sell it for \$150,000 in one year. The profit is the revenue minus cost, which is \$150,000-\$100,000 =\$50,000. This is the dollar return of this project. Therefore, we can calculate the one-period rate of return of this project as follows:

$$\begin{aligned} \text{Rate of return} &= \frac{\text{profit}}{\text{initial investment}} \\ &= \frac{\text{revenue} - \text{initial investment}(\text{cost})}{\text{initial investment}} \\ &= \frac{\$150,000 - \$100,000}{\$100,000} \\ &= 0.5 \text{ or } 50\% \end{aligned}$$

Notice that the rate of return of the project is 50%, which is higher than an 8% rate of return on an alternative investment in government bonds. It is common sense that you should invest in this project. In fact, the rate of return rule states that you invest in a project that gives the rate of return higher than the opportunity cost of capital. Actually, the rate of return rule yields the same decision as the net present value rule.

Now suppose that the opportunity cost of capital is 50%. Let's recalculate the NPV of this project.

$$\begin{aligned} NPV &= C_0 + \frac{C_1}{1+r} \\ NPV &= -100,000 + \frac{150,000}{1+0.5} = 0 \end{aligned}$$

Notice that if the opportunity cost of capital, which is a discount rate, equals the rate of return on the project, the NPV is zero. Thus, we can define the project's rate of return as a discount rate that makes the project's NPV equals zero.

The Rate of Return on Long-Lived Project

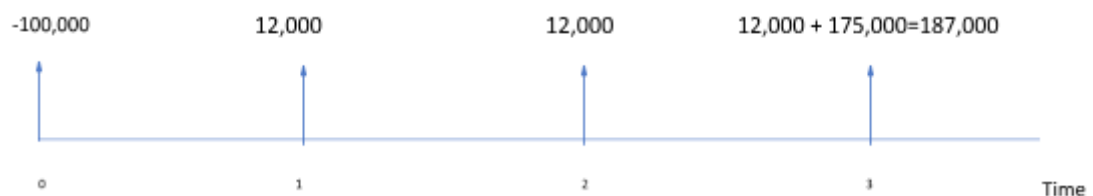
For a project with multiple cash flows, we can apply the above definition of the project's rate of return. Therefore, the rate of return is a discount rate at which NPV equals zero. **The discount rate that makes the NPV of a project equal zero is called the internal rate of return (IRR) of the project.** The IRR can be shown in an equation as follows:

$$0 = C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{(1 + IRR)^2} + \frac{C_3}{(1 + IRR)^3} + \dots + \frac{C_T}{(1 + IRR)^T}$$

Or,

$$-C_0 = \frac{C_1}{1 + IRR} + \frac{C_2}{(1 + IRR)^2} + \frac{C_3}{(1 + IRR)^3} + \dots + \frac{C_T}{(1 + IRR)^T}$$

Let's calculate the internal rate of return (IRR) of the real estate project with multiple cash flows mentioned in section 8.1. The project gives cash flows as follows:



$$0 = -100,000 + \frac{12,000}{1 + IRR} + \frac{12,000}{(1 + IRR)^2} + \frac{187,000}{(1 + IRR)^3}$$

We can solve this equation using the command IRR in Excel as shown in the figure below.

B6			
		fx =IRR(B2:B5)	
	A	B	C
1	Year	Cash flow	
2	0	-100,000	
3	1	12,000	
4	2	12,000	
5	3	187,000	
6	IRR =	31%	
7			

Notice that the internal rate of return (IRR) of this project is higher than the opportunity cost of capital. This suggests that you should invest in this project.

In summary, the internal rate of return rule states the following:

- For independent projects, you take a project if its IRR is greater than the opportunity cost of capital.

- For mutually exclusive projects, you take a project with the highest IRR, which is above opportunity cost of capital.

The internal rate of return (IRR) is a great measure to evaluate a project. However, it has some shortcomings. In some cases, there are multiple IRRs, or IRR does not exist. In addition, the IRR rule ignores scale of project's return, and this can lead you to make a wrong decision. For instance, a project with higher IRR does not always mean that it gives higher dollar return. If your interest is a dollar return, the net present value rule may be a better measure.

8.3 THE PROFITABILITY INDEX

The profitability index (PI) is defined as a ratio of the present value of cash flows and the project's initial investment cost. It can be written in an equation as follows:

$$PI = \frac{PV}{-C_0}$$

Let's calculate the profitability index (PI) in the first example of this chapter, in which cash flows are depicted as follows:



$$PI = \frac{\$138,889}{-(-\$100,000)} = 1.39$$

As calculated in section 8.1, the project's present value (PV) is \$138,889. Then we divide it by the initial investment of \$100,000. Thus, the profitability index equals 1.39, which is greater than 1. This means the present value of future payoff is more than the initial investment cost; thus, this project will earn profit.

We use the profitability index to evaluate a project and make a decision as follows:

- For independent projects, you invest in all projects with the PI greater than 1.
- For mutually exclusive projects, you invest in a project with the highest PI that is above 1.

Like the internal rate of return (IRR) rule, the profitability index (PI) has its shortcomings. The PI ignores the scale or size of a project. This can lead you to make a wrong decision when comparing mutually exclusive projects. For example, a big project with high dollar return can give the PI less than a small project with low dollar return. If a dollar return is your interest, the net present value (NPV) rule may be a better measure.

8.4 THE PAYBACK RULE

The project's payback period is the time length before the project recovers the initial investment cost. This can be written mathematically as follows:

The payback period is the minimum k such that

$$C_1 + C_2 + \dots + C_k \geq -C_0$$

k is the minimum time length such that the sum of project's cash flows is positive.

The payback rule states that

- For independent projects, you invest in a project with k less than or equal to a cutoff period.
- For mutually exclusive projects, you invest in a project with the smallest k that is below a cutoff period.

The payback rule has its shortcomings too. First, it ignores cash flows after period k. This can you to make a wrong decision when comparing mutually exclusive projects by not choosing a project with high payoff that comes after period k. Second, the payback rule ignores the time-value of money. This shortcoming can be solved by using the discount payback period instead.

The discounted payback period is the minimum k such that

$$\frac{C_1}{1 + r_1} + \frac{C_2}{(1 + r_2)^2} + \dots + \frac{C_k}{(1 + r_k)^k} \geq -C_0$$

The discounted payback period accounts for the time-value of money; however, it still ignores cash flows after period k.

Summary

In Chapter 8, the focus is on project evaluation using the Net Present Value (NPV) rule and other measures. Here is a summary of the key points discussed:

1. Net Present Value (NPV) Rule:
 - ✓ The NPV rule helps in evaluating the profitability of a project by comparing the present value of cash inflows to the initial investment cost.
 - ✓ Projects with a positive NPV are considered financially viable and should be pursued.
 - ✓ The NPV rule considers the time value of money by discounting future cash flows at a specified discount rate.
2. Rate of Return and Internal Rate of Return (IRR):
 - ✓ The rate of return of a project is calculated as the profit divided by the initial investment.
 - ✓ The Internal Rate of Return (IRR) is the discount rate at which the NPV of a project equals zero.
 - ✓ IRR is a useful measure for evaluating projects with multiple cash flows and helps in decision-making based on the opportunity cost of capital.
3. Profitability Index (PI):
 - ✓ The Profitability Index is the ratio of the present value of cash flows to the initial investment cost.
 - ✓ Projects with a PI greater than 1 are considered profitable and should be considered for investment.

4. Payback Rule:
 - ✓ The Payback Period is the time taken for a project to recover its initial investment.
 - ✓ The Payback Rule states that for independent projects, one should invest in projects with a payback period less than or equal to a cutoff period.

5. Decision Criteria:
 - ✓ For independent projects, decisions are based on positive NPV, IRR greater than the opportunity cost of capital, and PI greater than 1.
 - ✓ For mutually exclusive projects, the decision is based on selecting the project with the highest NPV, IRR above the opportunity cost of capital, or the highest PI above 1.

Overall, the chapter emphasizes the importance of using NPV, IRR, PI, and the Payback Rule in project evaluation to make informed investment decisions based on financial viability and profitability.

Discussion questions

1. How do different project evaluation measures such as Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index (PI) complement each other in assessing the financial viability of investment projects? Discuss the strengths and limitations of each measure and how they can guide decision-making in real-world investment scenarios.
2. In what ways can the consideration of the time value of money impact project evaluation and investment decisions? How do discount rates, opportunity costs of capital, and risk factors influence the assessment of project profitability using NPV, IRR, and other financial metrics?
3. Compare and contrast the Net Present Value (NPV) rule with the Profitability Index (PI) and the Payback Rule in terms of their effectiveness in evaluating project profitability and guiding investment decisions. Discuss specific scenarios where each measure may be more suitable and the implications of using multiple evaluation criteria in project analysis.

These discussion questions can prompt a deeper exploration of the concepts presented in Chapter 8 and encourage critical thinking about project evaluation methods and their practical applications in investment decision-making.

Suggested Reading

Brealey, R.A., Myers, S.C. and Marcus, A.J. (2023) *Fundamentals of Corporate Finance*. 11th Edition, McGraw-Hill/Irwin, Boston.

CHAPTER 9: ETHICAL, LEADERSHIP & ORGANIZATIONAL DYNAMICS IN PROJECT MANAGEMENT

In project management, ethical leadership entails applying moral principles and values to direct decision-making and conduct. Project leaders have a pivotal responsibility in establishing an ethical atmosphere for the entire team, guaranteeing the attainment of project goals with integrity and consideration for stakeholders. Transparent communication, honesty, and accountability are given precedence by ethical leaders, fostering an environment where ethical considerations are integrated into all phases of project planning, implementation, and completion. The integration of ethical leadership and organizational dynamics is fundamental for successful project management. By prioritizing ethical considerations and understanding the complexities of organizational interactions, project managers can create an environment conducive to achieving project goals while maintaining a positive and sustainable team culture.

9.1 ETHICAL CONSIDERATIONS IN PROJECTS: COMMON DILEMMAS AND BEST PRACTICES

Ethical considerations play a pivotal role in project management, demanding careful navigation of common dilemmas to ensure responsible and socially acceptable outcomes. Project teams often encounter various ethical challenges throughout the project lifecycle, and it is imperative to handle them with integrity. Here is a rephrased overview of the ethical dilemmas in projects and the considerations to address them:

Resource Allocation:

Resource allocation in project management involves distributing and assigning resources such as personnel, budget, time, and materials to tasks and activities. Ethical considerations play a crucial role in this process, ensuring fairness, transparency, and responsible decision-making. Ensure that resource allocation is fair and equitable, avoiding favoritism or bias. Fairness promotes trust among team members and stakeholders, contributing to a positive project environment. Communicate openly about resource allocation decisions, providing clear explanations for choices made. Transparency builds trust and helps stakeholders understand the rationale behind resource distribution, fostering a collaborative atmosphere. Match resources to tasks based on competence and skills rather than personal relationships. Ensuring that individuals are assigned tasks aligned with their expertise contributes to project success and respects professional capabilities. Consider diversity and inclusivity when allocating resources to foster a balanced and representative project team. Embracing diversity promotes innovation and brings varied perspectives, enhancing the overall quality of project outcomes. Stakeholder Involvement, Involve relevant stakeholders in resource allocation decisions when appropriate. Including stakeholders in the decision-making process increases their commitment and ensures that diverse viewpoints are considered.

Sustainability and Environmental Impact, Consider the environmental impact of resource allocation decisions. Ethical project management involves minimizing negative environmental effects, aligning with sustainability principles. Incorporating these ethical considerations into resource

allocation decisions helps project managers create a positive and ethical work environment, fostering collaboration, trust, and sustainable project success.

Stakeholder Inclusion:

In project management, stakeholder inclusion is a crucial ethical consideration that involves actively involving and engaging all relevant stakeholders throughout the project lifecycle. Ethical stakeholder inclusion ensures transparency, fairness, and the consideration of diverse perspectives. Here are key ethical considerations for stakeholder inclusion in project management. Equitable Participation ensures that all stakeholders, regardless of their role or influence, have an opportunity to participate in relevant project discussions and decision-making processes. Equitable participation fosters a sense of fairness and prevents exclusion or marginalization of certain stakeholders. Communicate projects information in a timely and accessible manner to all stakeholders, providing the necessary details for informed decision-making. Transparent and timely communication ensures that stakeholders are well-informed, reducing the risk of misinformation or misunderstandings. Inclusivity and Diversity consider and embrace diversity among stakeholders, including individuals with varied backgrounds, perspectives, and interests. Inclusive stakeholder engagement promotes creativity, innovation, and a broader understanding of project impacts. Accountability and Responsibility defines roles, responsibilities, and expectations for each stakeholder, promoting accountability throughout the project. Establishing clear expectations enhances stakeholder engagement and prevents misunderstandings regarding individual responsibilities.

Confidentiality and Privacy:

By incorporating these ethical considerations, project managers can create a stakeholder-inclusive environment that promotes transparency, accountability, and positive collaboration, ultimately contributing to the overall success of the project.

Environmental Impact:

Environmental impact is a critical ethical consideration in project management, as it involves assessing and mitigating the effects of a project on the environment. Ethical project management emphasizes sustainable practices that minimize negative environmental consequences and promote responsible resource use. Here are key ethical considerations related to environmental impact in project management. Environmental Impact Assessment conduct a comprehensive environmental impact assessment before initiating a project to understand potential environmental consequences. This assessment allows project managers to proactively address environmental concerns and integrate sustainability into project planning. Prioritize sustainable practices in resource use, including materials, energy, and water, to minimize the project's ecological footprint. Sustainable resource use aligns with ethical principles by promoting responsible environmental stewardship and long-term ecological health. Carbon Footprint Reduction implements strategies to reduce the project's carbon footprint, such as optimizing transportation, minimizing energy consumption, and using eco-friendly technologies. Reducing carbon emissions contributes to global efforts to mitigate climate change and demonstrates a commitment to environmental responsibility. Waste Management and Recycling develop and implement effective waste management and recycling programs to minimize the generation of waste and promote responsible disposal. Ethical waste management practices contribute to environmental conservation and reduce the impact of projects on landfills and ecosystems. Community Engagement and Education engage with local communities and stakeholders to raise awareness about environmental considerations and involve them in sustainable practice. Community engagement promotes ethical decision-making, builds trust, and ensures that local perspectives are considered in environmental impact assessments.

By integrating these ethical considerations into project management practices, organizations can contribute to environmental sustainability, meet regulatory requirements, and demonstrate a commitment to ethical and responsible project execution.

Data Privacy and Security:

Data privacy and security are paramount ethical considerations in project management, particularly in an era where the collection, processing, and storage of sensitive information are integral to project activities. Safeguarding data is not only a legal requirement but also an ethical responsibility to protect individuals and organizations from potential harm. Here are key ethical considerations related to data privacy and security in project management. Informed Consent obtains informed consent from individuals before collecting and processing their personal data. Respecting individuals' autonomy and privacy rights by seeking informed consent ensures transparency and ethical treatment of sensitive information. Data Minimization only collect and process the minimum amount of personal data necessary for the intended project purposes. Limiting data collection reduces the risk of privacy breaches and aligns with ethical principles of minimizing intrusiveness. Data Accuracy and Integrity ensure the accuracy and integrity of the data being collected and processed. Maintaining data accuracy is crucial to prevent misinformation and uphold the ethical responsibility to provide reliable information.

By incorporating these ethical considerations into project management practices, organizations can uphold the privacy rights of individuals, protect sensitive information, and foster a culture of trust and responsibility in data handling.

Conflict of Interest:

Conflict of interest is a critical ethical consideration in project management, representing situations where an individual's personal interests may compromise their objectivity, professional judgment, or decision-making in the context of a project. Identifying and managing conflicts of interest is essential to maintain integrity, transparency, and fairness in project-related activities. Here are key ethical considerations related to conflict of interest in project management. Disclosure and Transparency require project team members and stakeholders to disclose any potential conflicts of interest transparently. Transparency ensures that all relevant parties are aware of potential conflicts, allowing for appropriate management and mitigation. Preventing Undue Influence establish mechanisms to prevent undue influence that may arise from conflicts of interest, particularly in decision-making processes. Preventing undue influence ensures that decisions are made objectively and in the best interest of the project and its stakeholders. Clear Policies and Guidelines develop and communicate clear policies and guidelines regarding conflicts of interest within the project team. Well-defined policies provide guidance on acceptable behavior, helping individuals recognize and address potential conflicts.

Addressing conflicts of interest ethically is vital for maintaining trust, upholding the integrity of project outcomes, and ensuring that decisions are made in the best interest of the project and its stakeholders.

Communication Transparency:

Communication transparency is a fundamental ethical consideration in project management. Transparent communication ensures that project information is shared openly, honestly, and comprehensively with stakeholders. It promotes trust, accountability, and informed decision-making. Here are key ethical considerations related to communication transparency in project management. Complete and Accurate Information provide complete and accurate information in project communications, avoiding selective disclosure or manipulation of facts. Transparent communication ensures that stakeholders have a full and accurate understanding of project status, risks, and outcomes. Timely and Regular Updates communicate project updates in a timely and regular manner,

keeping stakeholders informed of progress, changes, and challenges. Timely updates demonstrate a commitment to openness and allow stakeholders to make informed decisions based on current information. Clear and Understandable Language use clear and understandable language in project communications, avoiding jargon or overly technical terms that may obscure meaning. Clear communication promotes understanding among diverse stakeholders, preventing confusion and misinterpretation. Stakeholder Inclusivity include all relevant stakeholders in communication processes, ensuring that no group or individual is excluded from important project information. Inclusive communication fosters a sense of involvement, promotes collaboration, and prevents the marginalization of certain stakeholders.

By prioritizing communication transparency, project managers and teams create an ethical foundation that promotes trust, collaboration, and the responsible exchange of information throughout the project lifecycle.

Inclusive Decision-Making:

Inclusive decision-making is a crucial ethical consideration in project management that involves involving diverse stakeholders in the decision-making process. It ensures that decisions are fair, consider different perspectives, and consider the interests and needs of all relevant parties. Here are key ethical considerations related to inclusive decision-making in project management. Diversity and Representation ensure diverse representation in decision-making processes, considering factors such as gender, ethnicity, expertise, and stakeholder roles. Diversity in decision-making enhances the quality of decisions by incorporating a variety of perspectives and minimizing biases. Stakeholder Involvement involve relevant stakeholders in decision-making processes, especially those whose interests may be affected by the decision. Stakeholder involvement fosters a sense of ownership, increases commitment to decisions, and ensures that diverse viewpoints are considered. Equitable Access to Information ensure that all relevant stakeholders have equitable access to the information needed to make informed decisions. Providing equal access to information promotes fairness and prevents the marginalization of certain stakeholders.

By integrating these ethical considerations into decision-making processes, project managers contribute to a more inclusive, fair, and collaborative project environment. This approach enhances stakeholder engagement, strengthens relationships, and ultimately leads to more effective and ethical project outcomes.

Supply Chain Ethics:

Supply chain ethics is a critical ethical consideration in project management, emphasizing responsible and sustainable practices throughout the supply chain. It involves ensuring that the sourcing, production, and distribution of goods and services align with ethical principles, social responsibility, and environmental sustainability. Here are key ethical considerations related to supply chain ethics in project management. Supplier Selection and Due Diligence conduct thorough due diligence when selecting suppliers, considering their ethical practices, labor standards, and environmental impact. Responsible supplier selection contributes to ethical sourcing and reduces the risk of supporting unethical practices. Fair Labor Practices ensure that suppliers adhere to fair labor practices, including providing safe working conditions, fair wages, and reasonable working hours. Ethical labor practices support the well-being of workers and contribute to the overall sustainability of the supply chain. Anti-Corruption Measures implement and enforce anti-corruption measures within the supply chain to prevent unethical business practices. Combating corruption ensures fair competition, promotes transparency, and upholds ethical standards in business transactions. Environmental Sustainability prioritize environmentally sustainable practices within the supply chain, including resource conservation, waste reduction, and the use of eco-friendly materials. Sustainable

practices contribute to environmental responsibility, align with ethical principles, and address the ecological impact of the supply chain.

By prioritizing these ethical considerations, project managers can contribute to the development of a socially responsible, sustainable, and ethically sound supply chain, ultimately enhancing the overall ethical performance of the project.

Project Closure and Legacy:

Project closure and legacy management involve ethical considerations that extend beyond the completion of project tasks. It encompasses the responsible conclusion of a project, addressing its impact on stakeholders, the environment, and the long-term implications for the organization and community. Here are key ethical considerations related to project closure and legacy. Stakeholder Communication communicate the closure of the project transparently and effectively to all relevant stakeholders, including team members, clients, and affected communities. Transparent communication builds trust and ensures that stakeholders are informed about the project's conclusion and outcomes. Knowledge Transfer and Documentation document and transfer project knowledge to relevant stakeholders to ensure continuity and prevent the loss of valuable information. Ethical knowledge transfer supports organizational learning, facilitates future projects, and respects the contributions of team members. Impact Assessment assess and communicate the project's impact on the environment, local communities, and other stakeholders. Evaluating impact fosters accountability, helps address any negative consequences, and informs future decision-making. Responsible Resource Disposal dispose of project resources responsibly, considering environmental impact and adhering to relevant regulations. Ethical resource disposal minimizes harm to the environment and aligns with sustainability principles.

By addressing these ethical considerations during project closure and legacy management, organizations can conclude projects responsibly, leave a positive impact, and contribute to long-term sustainability and ethical business practices.

Social Responsibility:

Social responsibility is a fundamental ethical consideration that guides organizations and projects to act in ways that benefit society and contribute to its well-being. Embracing social responsibility involves considering the impact of decisions and actions on various stakeholders, including communities, employees, customers, and the environment. Here are key ethical considerations related to social responsibility in project management. Community Engagement actively engage with and involve local communities affected by the project, seeking their input, and addressing their concerns. Community engagement fosters positive relationships, ensures inclusivity, and contributes to socially responsible project outcomes. Diversity and Inclusion promote diversity and inclusion within the project team, ensuring equitable opportunities for individuals of different backgrounds, genders, and abilities. Embracing diversity enhances creativity, fosters a positive work environment, and contributes to social equity. Fair Labor Practices uphold fair labor practices, including providing fair wages, safe working conditions, and respecting workers' rights. Fair labor practices contribute to employee well-being and support ethical and socially responsible business conduct. Ethical Supply Chain Management ensure that the entire supply chain adheres to ethical practices, including fair treatment of workers, responsible sourcing, and environmental sustainability. Ethical supply chain management extends the organization's commitment to social responsibility throughout its operations.

By integrating these ethical considerations into project management practices, organizations demonstrate a commitment to social responsibility, contribute to positive social impact, and build a foundation of trust with stakeholders. Social responsibility aligns with broader ethical principles and contributes to the long-term sustainability and success of both projects and organizations.

Project teams must consistently evaluate and manage ethical considerations, proactively addressing dilemmas to contribute positively to social, environmental, and economic outcomes throughout the project lifecycle.

Best Practice: Stakeholder Engagement

Stakeholder Engagement:

- Identify and involve stakeholders early in the project's life cycle.
- Foster transparent communication and include stakeholders in decision-making processes, ensuring their concerns and perspectives are considered.

Consider a project focused on developing a new community park. To apply the best practice of "Stakeholder Engagement," the project team proactively identifies and engages various stakeholders from the project's inception. These stakeholders may encompass residents, environmental organizations, municipal authorities, and potential park users. The project team initiates community gatherings, administers surveys, and conducts meetings to solicit input on pivotal decisions like park design, amenities, and environmental aspects. Throughout these interactions, the team not only listens to the viewpoints and preferences of stakeholders but actively integrates their feedback into the project strategy. When faced with a decision about selecting playground equipment, the project team considers input from parents concerned about safety, accessibility, and inclusivity.

By incorporating this stakeholder feedback, the team opts for equipment that aligns with safety standards, addresses accessibility issues, and fosters an inclusive play environment for all children.

Through consistent and transparent communication, as well as collaborative efforts, the project builds community support and trust. This engagement not only aligns with ethical considerations but also contributes to a more successful project that meets the diverse needs of stakeholders and positively impacts the well-being of the community.

9.2 LEADERSHIP STYLES AND THEIR RELEVANCE IN A PROJECT OUTCOMES

Leadership styles refer to the approaches and behaviors that leaders adopt to influence and guide their teams toward achieving organizational goals. There are various leadership styles, and different situations may call for different styles. Leaders often blend elements of various leadership styles based on the context, organizational culture, and the specific needs of their teams. Effective leaders are adaptable and capable of adjusting their leadership approach to best suit the demands of a given situation.

The leadership styles and their relevance in achieving favorable project outcomes:

1. **Transformational Leadership:**

Transformational leaders inspire and motivate their team by fostering a shared vision and encouraging creativity and innovation. This style proves valuable when a project demands creativity and adaptability, as transformational leaders inspire teams to surpass limitations, resulting in innovative solutions and positive project outcomes.

2. **Transactional Leadership:**

Transactional leaders focus on setting clear expectations and rewarding or correcting team members based on their performance against these expectations. In projects with well-defined tasks and objectives, transactional leadership offers clarity. Rewards and corrections help maintain focus and accountability, ensuring team members meet project milestones.

3. **Servant Leadership:**

Servant leaders prioritize the needs of their team members, aiming to support and empower them to reach their full potential. Particularly effective in fostering a collaborative and supportive team environment, servant leadership enhances team morale and cohesion, contributing to positive project outcomes.

4. **Charismatic Leadership:**

Charismatic leaders use their personal charm and enthusiasm to influence and inspire their team. In projects where motivation and enthusiasm are crucial, charismatic leadership creates a positive and energetic atmosphere. However, it's essential to balance charisma with practical and strategic decision-making.

5. **Laissez-Faire Leadership:**

Laissez-faire leaders adopt a hands-off approach, allowing team members considerable autonomy and decision-making authority. Effective when team members are highly skilled and self-motivated, laissez-faire leadership fosters ownership and responsibility, leading to increased creativity and ownership of project outcomes.

6. **Democratic Leadership:**

Democratic leaders involve team members in decision-making processes, seeking input and building consensus. Valuable in projects requiring diverse perspectives and expertise, democratic leadership promotes collaboration and inclusivity, potentially leading to well-rounded decisions and successful project outcomes.

7. **Authoritarian Leadership:**

Authoritarian leaders make decisions independently and expect team members to follow instructions without much input. In situations demanding quick and decisive action, such as crisis management or tight deadlines, authoritarian leadership can be effective. However, it may reduce team morale if overused.

8. **Situational Leadership:**

Situational leaders adapt their leadership style based on specific circumstances and the readiness level of their team members. Particularly useful in projects with varying complexity and stages, situational leadership allows leaders to tailor their style to match team needs at different project phases, enhancing overall effectiveness.

Successful project leaders often blend aspects of various leadership styles, adjusting their approach to meet the specific needs and challenges of each project.

THE ROLE OF ORGANIZATIONAL CULTURE IN SHAPING PROJECT OUTCOMES

Organizational culture plays a crucial role in shaping the overall work environment, influencing employee behavior, and impacting the success of an organization. It encompasses the shared values, beliefs, attitudes, and norms that define how individuals within an organization interact and work together. It is important for leaders to be aware of the existing organizational culture, assess whether it aligns with the organization's goals, and consider how it may need to evolve to meet changing circumstances. Cultivating a positive and adaptive culture is an ongoing process that requires leadership commitment and intentional efforts to shape the values and behaviors within the organization.

The organizational culture of a company plays a pivotal role in influencing the success and outcomes of projects. It serves as the underlying fabric that shapes how individuals within the organization interact, make decisions, and collaborate. Here's an exploration of the role of organizational culture in shaping project outcomes:

1. Communication and Collaboration:

A culture that values open communication and collaboration fosters a positive environment for project teams. Effective communication and collaboration contribute to streamlined workflows, reduced misunderstandings, and improved problem-solving, ultimately enhancing project outcomes.

2. Risk Tolerance and Innovation:

A culture that encourages risk-taking and innovation provides a foundation for creative problem-solving. Teams in an innovative culture are more likely to explore unconventional solutions, leading to groundbreaking ideas and increased project success.

3. Leadership Style:

The leadership style promoted by the organizational culture influences how projects are managed. Whether the culture emphasizes transformational, transactional, or servant leadership, it sets the tone for how leaders guide teams, make decisions, and inspire collaboration, impacting overall project performance.

4. Adaptability and Flexibility:

An adaptable and flexible culture enables organizations to respond to changes and challenges more effectively. In rapidly changing project environments, an adaptable culture ensures that teams can adjust strategies and tactics promptly, leading to more resilient project outcomes.

5. Values Alignment:

The alignment of project goals with the core values of the organization reinforces a sense of purpose. When project objectives resonate with the organization's values, team members are more motivated, leading to increased commitment and a higher likelihood of achieving project success.

6. Employee Engagement and Morale:

A positive organizational culture contributes to higher employee engagement and morale. Engaged and motivated team members are more likely to invest discretionary effort, resulting in improved productivity and the delivery of high-quality project outcomes.

7. Decision-Making Processes:

The culture dictates how decisions are made within the organization. Whether decisions are made through a hierarchical or collaborative process, the organizational culture shapes the efficiency and effectiveness of decision-making, impacting project timelines and results.

8. Customer Focus:

A culture that prioritizes customer satisfaction influences project teams to consider end-user needs. Projects driven by a customer-focused culture are more likely to deliver products and services that meet or exceed customer expectations, contributing to project success.

9. Quality Standards:

The commitment to quality standards within the organizational culture affects project deliverables. A culture that values quality ensures that project teams adhere to rigorous standards, leading to the delivery of reliable and high-quality project outcomes.

10. Conflict Resolution Approach:

The approach to handling conflicts, whether confrontational or collaborative, is influenced by the organizational culture. A culture that promotes constructive conflict resolution contributes to a healthier team dynamic, reducing the negative impact of conflicts on project progress and outcomes.

In summary, organizational culture sets the tone for how projects are approached, executed, and ultimately completed. A positive and aligned culture can be a powerful catalyst for achieving successful project outcomes by fostering effective communication, innovation, and a shared commitment to excellence among team

9.3 NAVIGATING ORGANIZATIONAL POLITICS AND POWER STRUCTURES

Navigating organizational politics and power structures is a crucial aspect of professional life. Organizations are inherently political environments where individuals and groups jockey for influence, resources, and visibility. Understanding and effectively managing organizational politics and power dynamics can contribute to career success and the achievement of organizational goals.

The information on navigating organizational politics and power structures:

1. **Understand the Organizational Landscape:**

Take time to observe and understand the organizational culture, informal networks, and power dynamics. Dedicate time to observe and grasp the organization's culture, informal connections, and power relationships.

2. **Build Relationships:**

Recognize the importance of building positive relationships with colleagues at all levels. Acknowledge the significance of fostering positive connections with colleagues across different levels.

3. **Effective Communication:**

Develop strong communication skills, ensuring clarity, persuasion, and adaptability in conveying messages. Cultivate effective communication skills, emphasizing clear, persuasive, and adaptable messaging.

4. **Stay Informed:**

Regularly update yourself on industry trends, company updates, and project advancements. Stay current on industry trends, company news, and progress in projects through regular updates.

5. **Identify Power Structures:**

Recognize who holds decision-making authority, who influences decisions behind the scenes, and how power is distributed. Identify those with decision-making authority, influencers, and understand the distribution of power within the organization.

6. **Political Savvy:**

Develop political acumen by understanding the motivations, alliances, and potential conflicts among colleagues. Cultivate political insight by understanding colleagues' motivations, alliances, and potential conflicts.

7. **Align with Key Stakeholders:**

Identify and align yourself with key stakeholders who can support your initiatives. Recognize and align with key stakeholders who can endorse your initiatives.

8. **Strategic Decision-Making:**

Develop the ability to make decisions strategically, considering short-term and long-term implications. Cultivate strategic decision-making skills, taking into account both immediate and long-term consequences.

9. **Adaptability:**

Stay adaptable and be prepared to adjust your approach as organizational structures, leadership, and priorities evolve. Maintain adaptability and be ready to modify your approach with changes in organizational structures, leadership, and priorities.

10. **Ethical Considerations:**

Uphold ethical standards in your actions and decisions. Maintain ethical standards in both your actions and decisions.

11. **Conflict Resolution Skills:**

Develop effective conflict resolution skills, emphasizing communication, active listening, and finding mutually beneficial solutions. Cultivate skills for resolving conflicts effectively, focusing on communication, attentive listening, and identifying solutions beneficial to all parties.

12. **Continuous Learning:**

Commit to continuous learning and professional development. Dedicate yourself to ongoing learning and professional growth.

Navigating organizational politics and power structures demands a combination of awareness, relationship-building skills, and strategic thinking. By understanding the intricacies of these dynamics, individuals can navigate their workplace more effectively, contribute to successful project outcomes, and advance their careers while upholding ethical integrity.

Remember that navigating organizational politics is not about manipulation but rather about understanding the organizational landscape, building positive relationships, and aligning your actions with organizational goals. It requires a balance between assertiveness, collaboration, and ethical behavior.

Summary

The convergence of ethical considerations, leadership methodologies, and organizational dynamics constitutes a critical framework with substantial implications for project outcomes. This condensed chapter provides a synopsis of the significance of ethical decision-making, the diverse roles of leadership styles, and the influence of organizational culture on the success of projects. Ethics stands as a cornerstone in project management, shaping factors like project reputation, stakeholder relations, and lasting consequences. Project teams encounter ethical challenges across resource allocation, stakeholder involvement, environmental impact, and data privacy throughout the project life cycle. Adhering to ethical principles ensures accountable and socially acceptable project results. Transparency, inclusiveness, and a commitment to societal responsibility are crucial for addressing challenges and cultivating ethical practices. Leadership styles are pivotal in shaping team dynamics and project triumphs. Transformational leaders inspire innovation and creativity, while transactional leaders prioritize clarity and responsibility. Servant leaders focus on team well-being, and charismatic leaders leverage personal charm for motivation. Choosing an appropriate leadership style aligns with the project's nature, emphasizing flexibility and inclusivity. Grasping the nuances of democratic, authoritarian, laissez-faire, and situational leadership equips leaders to navigate diverse project scenarios effectively. The organizational culture sets the groundwork for project evolution. Effective communication, innovation, and flexibility are all influenced by the prevailing culture. Leaders must navigate power structures, foster relationships, and align with influential stakeholders. Recognizing the impact of organizational politics and understanding decision-making processes are vital skills. An organization's dedication to quality, customer-centricity, and ethical integrity directly impacts project outcomes and stakeholder contentment. The seamless amalgamation of ethical considerations, leadership styles, and organizational dynamics is imperative for achieving project success. Project managers should cultivate a culture of transparency, uphold ethical standards, and align leadership strategies with the unique requirements of the project. Successfully navigating organizational politics involves relationship building, staying well-informed, and making strategic decisions that account for both immediate and long-term consequences. Continuous learning and adaptability are intrinsic elements for staying attuned to evolving organizational landscapes.

In conclusion, the fusion of ethical, leadership, and organizational dynamics is pivotal for proficient project management. A comprehensive approach that values ethical integrity, embraces a

spectrum of leadership styles, and comprehends organizational intricacies lays the foundation for projects to not only fulfill objectives but also positively contribute to broader community and organizational aspirations. As project managers and teams engage with these principles, they establish the groundwork for sustainable project success and enduring positive impacts.

Discussion Questions

1. Describe the characteristics of ethical leadership that can support successful project management
2. Describe leadership styles that are relevant in achieving profitable project outcomes

Suggested Reading

- Aburdene, P. (2007). *Megatrends 2010: The Rise of Conscious Capitalism*. Charlottesville: Hampton Roads.
- Berkun, S. (2005). *The Art of Project Management*. Publisher: Oleiier.
- Blanchard, K. (2013). *Leadership and the One Minute Manager*.
- Ferris, et al. (2005). "Organizational Politics: A Comprehensive Review." *Journal of Management*.
- Goleman, D. (1998). *Working with Emotional Intelligence*. New York: Bantam Books.
- Goleman, D. (2005). *Emotional Intelligence*. New York: Bantam Books, 10th anniversary ed.,
- Goleman, D. (2006). *Social Intelligence: The New Science of Human Relationships*. New York: Bantam Books.
- Greenleaf, R. (1970). *The Servant as Leader*. Minnesota: The Robert K. Greenleaf Center
- Joseph L. Badaracco, Jr., (2002). *Leading Quietly: An Unorthodox Guide to Doing the Right Thing*. Boston: Harvard Business School Press.
- Kwan, L. M., et al. (2016). "Impact of Organizational Culture on Project Leadership: A Meta-Analysis." *Journal of Applied Psychology*.
- Laschinger, H. K. S., et al. (2012). "Leadership Styles and Outcome Patterns for the Nursing Workforce and Work Environment: A Systematic Review." *Journal of Nursing Management*.
- Lencioni, P. (2022). *The Five Dysfunctions of a Team: A Leadership Fable*.
- Livermore, D. (2015). *Leading with Cultural Intelligence: The Real Secret to Success*.
- Lipton, B. (2005). *The Biology of Belief*. Santa Rosa: Elite Books.
- Pinto, K. M. (2017). "Ethical Challenges in Project Management: A Case Study Approach." *Project Management Journal*.
- Reeson, M. (2015). "Ethical Decision Making in Project Management." *Project Management Journal*.
- Roberts, A. (2020). *Leadership in War*.
- Salihu, S. Z., & Ojo, E. O. (2015). "The Impact of Organizational Culture on Project Management: A Case Study of Nigeria LNG Limited." *International Journal of Business Administration*.
- Stephen R. (1991). *Covey, Principle-Centered Leadership*. New York: Summit Books.
- The Arbinger Institute. (2015). *Leadership and Self-Deception: Getting out of the Box*.
- Turner, M. R. (2018). "Navigating Organizational Politics and Power Structures in Project Management." *Project Management Journal*.
- Wang, C., et al. (2020). "Inclusive Leadership in Project Management: A Conceptual Framework." *Project Management Journal*.
- Zaccaro, S. J., et al. (2019). "Organizational Dynamics and Team Effectiveness in Project Management." *Human Resource Management Review*.

CHAPTER 10: DIGITALIZATION AND TECHNOLOGICAL TRENDS IN PROJECT MANAGEMENT

Digitalization and technological trends in project management represent the integration of advanced digital tools and technologies to optimize project processes and outcomes. This involves leveraging digital platforms, collaborative software, and project management tools to streamline communication, enhance collaboration, and facilitate real-time monitoring of project progress. Automation, artificial intelligence, and data analytics are increasingly being employed to improve decision-making, predict potential risks, and allocate resources efficiently. The adoption of cloud-based solutions allows for greater flexibility and accessibility, enabling project teams to work seamlessly across different locations. The continuous evolution of digital technologies in project management reflects a commitment to increasing efficiency, reducing manual effort, and staying adaptable in an ever-changing technological landscape. This chapter, digitalization and technological trends in project management will be explained that consists of 1) the rise and impact of digital tools in project management, 2) integrating AI and machine learning in lean project management, 3) virtual teams, remote work, and their challenges and opportunities, and 4) cybersecurity considerations in modern projects.

Digitalization and technological trends in project management encompass key concepts such as enhanced collaboration, real-time monitoring, automation, and the use of advanced analytics. Project teams leverage digital tools to streamline communication, facilitate information sharing, and monitor project progress efficiently. Automation of repetitive tasks and the integration of artificial intelligence contribute to improved decision-making and resource allocation. Cloud-based solutions enable flexibility and accessibility across diverse locations. However, the adoption of these technological trends also poses challenges. Issues may arise in terms of data security and privacy, and the initial costs associated with implementing advanced technologies can be significant. Additionally, ensuring that team members are adequately trained and adapting organizational culture to embrace these changes are crucial aspects in successfully navigating the digital transformation in project management.

10.1 THE RISE AND IMPACT OF DIGITAL TOOLS IN PROJECT MANAGEMENT

Digital technology has a significant impact not only on the technologies used, but also affects strategies, processes, customer relations, and the attitudes or expectations of employees (Westermann, et al., 2011; Morakanyane, Grace and O'Reilly, 2017; Vial, 2021). In this context, the impact of digital technology on project management also seems beyond discussion. However, a very broad spectrum of such impacts can be recognized: from extending the scope of project activities resulting from the implementation of transformational processes (Nambisan, Wright, and Feldman, 2019), through the changes in project management methodologies, notably the increasing role of agile approaches (Whyte, Stasis, and Lindkvist, 2016), to changes in the way particular processes, for example, team communication, are implemented (Guinan, Parise, and Langowitz, 2019). Digital technologies radically transform project roles and project delivery. The first of the indicated issues concerns projectification of management (Schooper, et al., 2018) resulting from digital technology.

Implementation of changes, and therefore transformation, is both a long-term strategic change and a specific strategy of the company, but it is also a set of projects concerning individual stages or detailed technological solutions. Digital technology could stimulate the growth in the number of projects, but also could influence the perception of numerous activities that are referred to as projects. Moreover, employees of many enterprises are aware of the role of project competences; thus, they use the offered training or certification programs. For example, employees more commonly use the terminology traditionally associated with project management, perceiving projects not as one-off projects, but rather as a permanent element of the company's core business. There are new rules for the allocation of resources (including employees), as they are assigned to specific projects, rather than to permanent organizational units. The reflection on the impact of digital technology could be also focused on the methodological change. Projects related to digital technology are often called with the very broad term "IT projects." For two decades, these have been managed mainly on the basis of an agile approach (Dingsøyr, et al., 2012).

The rise of digital tools in project management has been a transformative force, significantly impacting the way projects are planned, executed, and monitored. Digital tools have brought efficiency, collaboration, and real-time visibility to project management processes. Here's an overview of the rise and impact of digital tools in project management:

- **Emergence of Project Management Software:** With the advent of project management software, teams transitioned from manual, paper-based methods to digital platforms. Early tools focused on scheduling, task management, and resource allocation.
- **Cloud-Based Solutions:** Cloud computing allowed project management tools to be accessible from anywhere with an internet connection. Cloud-based solutions enabled real-time collaboration and data sharing among team members, regardless of their physical location.
- **Integration with Collaboration Tools:** Project management tools integrated with collaboration platforms, fostering communication and document sharing. This integration improved team collaboration and reduced the need for separate communication tools.
- **Mobile Applications:** The rise of mobile applications allowed project managers and team members to manage projects on-the-go. Mobile apps provided access to project data, updates, and communication from smartphones and tablets.
- **Advanced Analytics and Reporting:** Digital tools introduced advanced analytics and reporting features. Project managers gained insights into project performance, enabling data-driven decision-making and forecasting.
- **Automation and AI:** Automation and artificial intelligence (AI) capabilities were incorporated into project management tools. This included automating repetitive tasks, predicting project risks, and optimizing resource allocation.
- **Automation and AI:** Automation and artificial intelligence (AI) capabilities were incorporated into project management tools. This included automating repetitive tasks, predicting project risks, and optimizing resource allocation.
- **Virtual Reality (VR) and Augmented Reality (AR):** Some cutting-edge project management tools started incorporating VR and AR for visualizing project plans, conducting virtual meetings, and simulating project scenarios.

The impact of digital tools in project management has been profound, revolutionizing traditional approaches and significantly enhancing the efficiency, collaboration, and overall effectiveness of project teams. Here are key aspects of the impact of digital tools in project management:

- Automation of Repetitive Tasks: Digital tools automate routine and repetitive tasks, such as scheduling, progress tracking, and reporting. This reduces manual effort, minimizes errors, and allows team members to focus on more strategic aspects of the project.
- Real-Time Collaboration: Digital tools enable real-time collaboration among team members, regardless of geographical locations. This facilitates seamless communication, file sharing, and feedback, fostering a more connected and responsive project team.
- Facilitation of Remote Work: The rise of digital tools has facilitated remote project management, allowing team members to work from different locations. Cloud-based project management platforms ensure that project data is accessible from anywhere with an internet connection.
- Real-Time Project Visibility: Project managers gain real-time visibility into project progress, timelines, and resource utilization. This transparency enhances decision-making, as project managers have up-to-date information on the project's status.
- Efficient Resource Allocation: Digital tools with resource management features help optimize resource allocation. Project managers can identify resource bottlenecks, allocate resources based on availability and skills, and ensure optimal utilization.
- Advanced Analytics and Reporting: Digital tools provide advanced analytics and reporting features, allowing project managers to make data-driven decisions. Insights into project performance, risks, and key performance indicators (KPIs) contribute to informed decision-making.
- Support for Agile Methodologies: Many digital tools are designed to support Agile methodologies, including Scrum and Kanban. Agile features such as sprint planning, backlog management, and iterative development are seamlessly integrated into these tools.
- Centralized Document Storage: Digital tools centralize document management, ensuring that project-related documents, files, and communication are stored in a structured manner. This reduces the risk of information silos and enhances accessibility.
- Identification of Project Risks: Digital tools assist in identifying and managing project risks. Risk assessment features help project managers proactively address potential challenges, minimizing the impact on project timelines and outcomes.

10.2 INTEGRATING AI AND MACHINE LEARNING IN LEAN PROJECT MANAGEMENT

Dam et al. (2018) envision that AI will transform (software) project management practice in many aspects, from automating basic administration tasks to delivering analytics-driven risk predictions and estimation, facilitating project planning and making actionable recommendations. Popular methodologies like Agile will be without a doubt transformed in the way they are implemented.

According to a survey conducted among 56 project managers from different industries made by (BUTT, 2018), the following aspects of project management with the highest responses can be supported by AI.

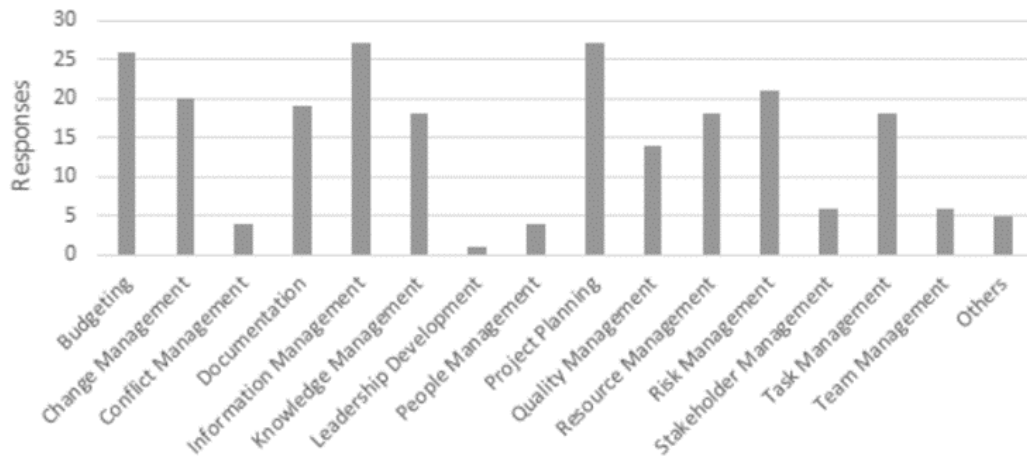


Figure 10. 1 Areas where AI support can be used for project management
(Source: BUTT, 2018)

As project management continues to evolve in the digital era, artificial intelligence (AI) has emerged as a powerful tool for enhancing efficiency and effectiveness. AI encompasses technologies and algorithms designed to mimic human intelligence and perform tasks such as data analysis, pattern recognition, and decision-making. In the project management context, AI can revolutionize how projects are planned, executed, and monitored. One significant aspect of AI in project management is its ability to automate repetitive and mundane tasks. By utilizing machine learning algorithms, AI systems can learn from past project data and generate valuable insights that aid in decision-making. This automation not only saves time and resources but also minimizes the risk of human error. Additionally, AI can assist in optimizing resource allocation, enabling project managers to allocate resources more effectively based on predicted demand and the availability of resources. This predictive capability allows for better planning and reduces the chances of resource shortages or overflows. Overall, understanding the basics of AI in the project management context is essential for project managers to harness its potential and achieve improved project outcomes.

AI tools and technologies have revolutionized project management processes, making them more efficient and streamlined. One such tool is intelligent chatbots, which can handle routine project inquiries, freeing up project managers' time to focus on more strategic tasks. These chatbots use natural language processing to understand and respond to queries, providing real-time information to team members and stakeholders. Additionally, AI-powered project management platforms offer automated scheduling and resource allocation features, helping project managers optimize project timelines and use resources effectively. With these tools, project managers can easily track project progress, monitor key milestones, and make data-driven decisions to ensure successful project delivery. Another valuable technology in efficient project management is machine learning algorithms. These algorithms analyze historical project data to identify patterns, predict potential risks, and provide insights for effective decision-making. By leveraging machine learning, project managers can anticipate possible roadblocks and take proactive measures to mitigate project risks. Additionally, AI-driven project analytics tools allow project managers to assess project health in real-time, providing valuable insights into project performance and identifying areas for improvement. Overall, the integration of AI tools and technologies in project management enables enhanced collaboration, timely decision-making, and increased efficiency, ultimately leading to successful project outcomes.

Integration & Automation of AI

- Interaction between MS Project Online and Wunderlist for task creation and scheduling
- Using online templates & workflows, e.g., in Slack or MS SharePoint, to reduce time and enhance data quality.
- Sending alerts when potential budgeting or scheduling issues are identified for the project.
- Developers with superpowers using Gen AI models like ChatGPT across the Dev lifecycle (for example, to write user stories for PI planning, create test cases, generate sample data for testing, and write & deploy code)

Chatbot Assistants

- ai is an AI bot for Slack that processes conversations within Slack and recognizes tasks and assignments on this basis.
- ai sends team members reminders, tracks their performance, and enables the project manager to recognize top contributors based on measurables.
- Intelligent assistants can summarize conversations, manage calendars, define actions, and link to agile/PM/change tools, making life easier for PMs.

Machine learning-based Project management

- Altering scheduling views according to user permissions and preferences
- Using social tagging to identify and connect users based on their posted comments and to identify the best team for a task.
- Machine learning-based project analytics tool predicts the expected net promoter score (NPS), client satisfaction, and write-off for internal projects.

Autonomous Project management

- Models like MidJourney stable diffusion provide good first drafts for creative content and will enable people to communicate their ideas better.
- Possibility of dedicated areas in small, non-complex projects with dedicated areas where autonomous project management could serve as an extension of machine learning-based project management in the future.

Data Analytics and automation startups are now helping organizations streamline and optimize the project management office (PMO) role. The most famous case is President Emmanuel Macron's use of the latest technology to maintain up-to-date information about every French public-sector project. These new intelligent tools will radically transform the way PMOs operate and perform with:

- Better monitoring of project progress
- The capability to anticipate potential problems and to address some simple ones automatically.
- Automated preparation and distribution of project reports and gathering of feedback
- Greater sophistication in selecting the best project management methodology for each project
- Compliance monitoring for processes and policies
- Automation, via virtual assistants, of support functions such as status updates, risk assessment, and stakeholder analysis

10.3 VIRTUAL TEAMS, REMOTE WORK, AND THEIR CHALLENGES AND OPPORTUNITIES

Virtual teams are groups of colleagues that collaborate remotely. These teams tend to function entirely out of virtual offices, and many lack a centralized homebase or do not visit headquarters very often. These teammates work together by using technology.

The structure of virtual teams varies depending on the industry, company, and department. Some virtual employees follow a traditional 9-5 schedule, while others are allowed a more flexible schedule and can work whenever, as long as they work for the expected number of hours each week. Typically, the organization or the manager sets the standard for when and how employees are expected to be online.

Typical virtual teams are 100% remote and rarely meet, and working remotely is the default. In contrast, hybrid teams work remotely part time and in-office part time, or have some team members working remotely while others collaborate in-office. Non-remote and onsite teams work in the same space 100% of the time. Companies can have a mix of in-person, hybrid, and remote teams, and employees can be a member of multiple teams. For example, perhaps managers regularly meet and exchange ideas online, yet rarely meet in person. On the other hand, project leader may form a team of international employees to work on a special assignment from their respective parts of the world. Organizations that work traditionally onsite should still brush up on virtual work and management best practices because the need to collaborate virtually may occasionally arise.

Virtual teams sometimes go by other names such as dispersed teams, distributed teams, and remote teams. Here is a breakdown of common types of remote teams.

- **Networked**

Networked teams are cross-functional teams that consist of members of different departments. Often, members phase in and out of these teams depending on the group's goals and needs.

- **Parallel**

Parallel teams tend to be temporary teams. These groups function like committees and consist of members of different areas of an organization that come together to improve a system or process.

- **Product development teams**

Product development teams often bring together professionals from across the globe to brainstorm ideas and perfect new products or services. Having an international product team often means that the new product is designed with a global audience in mind.

- **Production or functional teams**

Members of production teams perform routine tasks while dispersed. These teams are typical of 100% remote remote companies. Each team member has a specific role and responsibilities. Teammates do work independently, and come together to share ideas and results or occasionally collaborate.

- **Service teams**

Service teams stagger schedules so that at least one team member is on the clock and reachable at all times. These teams are usually client-facing, and this format is popular in the customer service industry. However, internal support teams like IT can also use this structure. These virtual teams tend to consist of members in many time zones and enable 24/7 service for clients or colleagues.

- **Management teams**

Management teams consist of managers from different branches and geographical locations. These leaders come together to support each other, share insight and advice, and make organizational decisions.

- **Action teams**

Action teams are similar to task forces. These teams come together for a short amount of time with a specific purpose. Once the goal has been reached, the team wraps up and the group is disbanded.

- **Offshore ISD teams**

Offshore teams exist when a company outsources certain tasks and services overseas. These teams are especially common in the software development world, yet exist in other industries as well. The home site and off-shore teams typically only interact virtually.

- **Freelance or contractor teams**

Sometimes companies hire on freelance and temporary help for a specific season or project. Since these contributors are not long term employees, there may not be a need for them to work in the same geographic area as other employees. However, these individuals may still need to collaborate occasionally with permanent employees via remote platforms.

Challenges of remote teams

Here are the common struggles of remote teams.

1. Harder for teammates to get to know each other

In virtual offices, it may be months or even years before teammates meet each other. Some teams never meet in person. In more traditional offices, coworkers can chit-chat and make small talk in meetings, at the copier, in the breakroom, or over lunch. Communication in virtual offices tends to be business-first. Very few folks schedule a Zoom call or send a direct message just to say hi. These circumstances make it very hard for remote teammates to get to know each other. In fact, team members may be unfamiliar with coworkers' faces or names, much less their personalities.

2. Sense of loneliness and isolation

Remote workers are prone to loneliness. Traditional offices have hustle and bustle and the feeling of other folks being around. Home offices tend to be quieter and more secluded. Remote employees can go hours, days, or even weeks without interacting with another human being, depending on their job. Solitude can mean greater short term productivity, however there are drawbacks to feeling alone for too long. Virtual teammates may not feel like they are part of a team at all, may lack a sense of belonging, and can struggle to understand how their work fits into the larger picture.

3. Conflicting schedules

Many virtual offices operate on flexible schedules where teammates can be online whenever they please, as long as they clock the expected number of hours. Companies that do ask teammates to be online during standard 9-5 often have team members in different timezones, meaning schedules still are not fully synchronized. These conflicting schedules can make communication and collaboration even more of a challenge. Team members may have to wait for teammates to come online, which could delay answers and cause backups.

4. Dependence on technology

The virtual office is not a literal office, but rather a software suite. Remote teams are dependent on technology, and technical issues can put a damper on productivity. For example, Zoom malfunctions, unstable internet connections, Slack outages, or power loss. These obstacles can range from a couple of minutes or hours of lost time, to whole days gone. In some cases, teammates can work offline and transfer work later or use backup methods of contact like phone calls. However, on a fundamental level, remote teams need technology to operate.

5. Communication

Communication is important for all teams, yet is especially critical for virtual teams. Conversations are more natural in traditional offices where coworkers see each other regularly. Folks can misinterpret the tone of written messages, or may assume a colleague is ignoring them when that colleague is just busy. Not to mention, the virtual office can create an out-of-sight-out-of-mind effect that makes it

easier to forget to respond to a colleague. Communicating only via computer feels unnatural to most folks and requires practice to master.

6. Culture

Culture is one of the major challenges that remote teams face. Virtual teammates have fewer shared experiences, especially since each of their working environments is unique. Often, work is independent and each teammate does his or her part separately. Not to mention, remote teams tend to have fewer natural interactions. Under these conditions, it can be hard for these coworkers to form a cohesive culture, nevermind a positive one.

7. Zoom fatigue

Staring at the screen for long periods of time can be exhausting. Remote teams are prone to a condition called Zoom fatigue. According to a Stanford article, causes include excessive online eye contact, seeing yourself on screen, limited movement, and added awareness and effort. Simply speaking, communicating via video conferencing feels unnatural, and adjusting to the medium takes extra energy. Video calls tend to make us more self-conscious and are typically less emotionally rewarding than chatting face to face.

8. Lack of management

Managing remote teams takes an entirely different approach and set of skills than managing in-person teams. According to a report from the Association of Talent Development, only 56% of companies offer training in virtual management. Inexperienced managers may not know how to train, get to know their reports, notice when teammates are dissatisfied or struggling, encourage teamwork, or gauge progress when working completely virtually. Striking the proper balance is hard, and many remote managers either micromanage or undermanage.

Benefits of virtual teams

Here are some of the perks of being on a virtual team.

1. Geographical diversity

Taking teams virtual means that the group is not limited to folks who can commute to an office building. Virtual teams can consist of members in different regions, time zones, countries, and continents. Remote teams mean that professionals around the globe can work together without traveling to meet. Virtual team members can live wherever they like and are not limited to one particular city, or city-living in general. Some remote workers choose the digital nomad life and travel while working remotely. One of the perks of being part of a geographically dispersed team is getting a direct window to the world via coworkers.

2. Cultural diversity

Remote teams tend to be more culturally diverse than in-person teams. Often, team members are spread out across different regions, countries, and continents, which means the blending together of many different cultures instead of one homogenous culture. Also, the ability to work remotely may remove barriers to entry that previously excluded certain groups. For instance, flexible schedules make it easier for parents of young children or team members with disabilities to work. Not having a commute means that folks who lack reliable transportation or live far away from the company's home base can join the team. Teammates who share traditions and different perspectives with each other broaden each other's horizons.

3. Reduced overhead

Virtual teams tend to have less overhead than in-person teams. Since teammates telecommute, there is no need to rent office space, which can cut operation costs significantly. Some companies reimburse employees for computers and equipment, internet and phone, and home office furniture, however these costs still tend to be less than stocking and running an office. While employees often wind up

with increased utility costs, telecommuters save money on commuting and parking costs, professional attire, and takeout lunches, and often wind up saving money by working from home.

4. Increased productivity

A Stanford study found that working from home increased productivity by 13%. Most remote workers report being more productive when telecommuting. Home offices are quieter and have fewer distractions and disruptions. Zoom meetings tend to be shorter and more controlled than traditional meetings, and teammates can arrive late or leave the meeting early without disturbing other attendees. Remote workers can typically make their own hours and optimize their workdays by being on the clock when they are most alert. Also, remote team members tend to take fewer sick days, both because they are exposed to fewer germs when not in contact with officemates, and because some employees can still work from home when recovering from minor illnesses. Because individuals tend to be more productive when working remotely, teams are more productive too. Virtual teamwork tends to be independent in nature, with each team member doing an assigned part and sharing the rewards of those efforts with the rest of the team.

5. More flexibility for teammates

In-office teams have to compromise much more often than remote teams. Virtual teammates have many more freedoms than their in-office counterparts. Individual team members can create home offices that most suit their individual needs and tastes. In virtual offices, there are no squabbles between teammates about noise or temperature, because each team member can have their personal preference. Remote teams also offer team members more flexible working hours. Team members do not need to have identical working schedules, as long as there is some schedule overlap and the ability to collaborate.

10.4 CYBERSECURITY CONSIDERATIONS IN MODERN PROJECTS

Cybersecurity considerations are crucial in modern projects to protect sensitive information, ensure data integrity, and safeguard against cyber threats. As projects increasingly rely on digital technologies and interconnected systems, the importance of integrating robust cybersecurity measures cannot be overstated. Here are key cybersecurity considerations in modern projects:

Information technology is widely used in every department, and most business activities are managed with the help of information technology. Since project-based companies will rely on system administrators and project managers, they must provide the security aspects of the project. Without considering security, companies investing in this direction will adopt the wrong digital technology. Every IT project must go through security steps. Including network security technologies, processes and control measures based on It governance, designed to protect systems, networks and data from cyber attacks. The digital environment may face cyber threats, and any of these attacks may directly or indirectly affect the organization. Every project will start, develop and end. It will contain a list of requirements and deliveries. It can be the project manager. Organizations must design operations based on needs and compatibility. The project manager can assist the cyber security team in this regard in the following ways:

1. Simplify project execution: Customer needs and any problems need to be communicated in the team. The project manager will ensure that the project has clearly defined milestones and deliverables.

2. Strategic adjustment: Keeping in mind the company's goals and security principles, the project manager will protect the project from threats or risks, while ensuring delivery and a measurable return on investment (ROI).

3. Optimized and continuous resource allocation: The project manager ensures that the resource capacity is kept in mind, that resources are allocated first, and that the network security project is effectively executed.

4. Problem solving: The project manager provides goals for the network security project and ensures that potential problems are resolved appropriately and in a timely manner.

5. Risk management: Project evaluation may depend on risks to determine whether the project should continue. Keeping this in mind, the project manager will be aware of all other risks that may arise.

Cybersecurity considerations are crucial in modern projects to protect sensitive information, ensure data integrity, and safeguard against cyber threats. As projects increasingly rely on digital technologies and interconnected systems, the importance of integrating robust cybersecurity measures cannot be overstated. Table 10.1 shows the key for cybersecurity considerations in modern projects.

Table 10.1 The key for cybersecurity considerations in modern projects

Key	Description
Data Protection	<ul style="list-style-type: none"> - Encryption: Implement encryption protocols to protect sensitive data both in transit and at rest. - Access Controls: Establish strict access controls to ensure that only authorized personnel can access sensitive information. - Data Backup: Regularly back up project data to prevent data loss in case of cyber incidents.
Network Security	<ul style="list-style-type: none"> - Firewalls: Deploy firewalls to monitor and control incoming and outgoing network traffic, preventing unauthorized access. - Intrusion Detection and Prevention Systems (IDPS): Utilize IDPS to detect and respond to potential security threats in real time.
Endpoint Security	<ul style="list-style-type: none"> - Antivirus and Anti-malware Software: Install and regularly update antivirus and anti-malware software on all devices to prevent and detect malicious software. - Mobile Device Management (MDM): Implement MDM solutions for managing and securing mobile devices used in the project.
Secure Development Practices	<ul style="list-style-type: none"> - Secure Coding: Enforce secure coding practices to mitigate vulnerabilities in software and applications. - Code Reviews: Conduct regular code reviews to identify and address security flaws in the project codebase.
User Awareness and Training	<ul style="list-style-type: none"> - Security Training: Provide ongoing cybersecurity training to project team members to increase awareness of potential threats and best practices. - Phishing Awareness: Educate users about phishing risks and implement measures to identify and avoid phishing attacks.
Incident Response Planning	<ul style="list-style-type: none"> - Response Team: Establish an incident response team with clearly defined roles and responsibilities. - Plan Documentation: Develop and document an incident response plan that outlines procedures for identifying, responding to, and recovering from cybersecurity incidents.
Third-Party Risk Management	<ul style="list-style-type: none"> - Vendor Security Assessments: Assess the cybersecurity posture of third-party vendors and contractors involved in the project. - Contractual Security Requirements: Include cybersecurity requirements in contracts with third-party service providers to ensure compliance.
Physical Security	<ul style="list-style-type: none"> - Secure Facilities: Implement physical security measures to protect servers, data centers, and other critical infrastructure.

Key	Description
	- Access Controls: Control physical access to facilities where project-related equipment and data are stored.
Regulatory Compliance	- Compliance Audits: Conduct regular audits to ensure compliance with relevant cybersecurity regulations and standards. - Privacy Regulations: Adhere to data protection and privacy regulations that may apply to the project.
Continuous Monitoring and Assessment	- Vulnerability Scanning: Conduct regular vulnerability scans to identify and address potential security weaknesses. - Penetration Testing: Perform penetration testing to simulate cyber attacks and assess the resilience of the project's security measures.
Secure Cloud Practices	- Cloud Security Measures: If using cloud services, implement security measures provided by the cloud service provider and adhere to best practices for secure cloud usage. - Data Encryption in the Cloud: Ensure that data stored in the cloud is encrypted to protect it from unauthorized access.
Secure Collaboration Tools	- Secure Communication: Use encrypted communication channels for team collaboration and project-related discussions. - Secure File Sharing: Implement secure file-sharing solutions with proper access controls to prevent data leaks.
Cybersecurity Policy and Governance	- Security Policies: Develop and enforce cybersecurity policies that define acceptable use, password requirements, and other security-related guidelines. - Governance Structure: Establish a governance structure to oversee and enforce cybersecurity measures throughout the project lifecycle.
Emerging Technologies	- IoT Security: If the project involves Internet of Things (IoT) devices, implement security measures to protect against IoT-specific threats. - Blockchain Security: If utilizing blockchain technology, consider security best practices to protect against vulnerabilities and unauthorized access.
Monitoring and Logging	- Security Information and Event Management (SIEM): Implement SIEM solutions for real-time monitoring and analysis of security events. - Log Management: Maintain comprehensive logs of system and network activities for forensic analysis and auditing.

Summary

This chapter has considered some of digitalization and technological trends that have significantly transformed project management practices. They were summarized as:

- Digital Project Management Tools: Adoption of cloud-based project management tools for collaboration, task management, and real-time communication.
- Artificial Intelligence (AI) and Machine Learning (ML): Integration of AI and ML for predictive analytics, risk management, and decision support in project planning and execution.
- Cybersecurity Measures: Heightened focus on cybersecurity to protect project data, communication channels, and critical infrastructure from cyber threats.
- Big Data Analytics: Utilization of big data analytics for in-depth project insights, performance tracking, and trend analysis to inform decision-making.
- Remote Collaboration Tools: Increased reliance on remote collaboration tools, fostering virtual teams and enabling flexible work arrangements.

Discussion Questions

1. What is the role of AI in project management?
2. What are the benefits of integrating AI in project management?

3. What are some AI tools and technologies used for efficient project management?
4. What are the advantages and disadvantages of virtual teams?

Suggested Reading

- McAfee, A., Ferraris, P., Bonnet, D., Calm ejane, C., & Westerman, G. (2011). Digital transformation: A roadmap for billion-Dollar organizations. MIT Sloan Management Review.
- Morakanyane, R., Grace, A. A., & O'reilly, P. (2017). Conceptualizing digital transformation in business organizations: A systematic review of literature.
- Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing Digital Transformation*, 13-66.
- Nambisan, S., Wright, M., & Feldman, M. (2019). The digital transformation of innovation and entrepreneurship: Progress, challenges and key themes. *Research policy*, 48(8), 103773.
- Guinan, P. J., Parise, S., & Langowitz, N. (2019). Creating an innovative digital project team: Levers to enable digital transformation. *Business Horizons*, 62(6), 717-727.
- Schoper, Y. G., Wald, A., Ingason, H. T., & Fridgeirsson, T. V. (2018). Projectification in Western economies: A comparative study of Germany, Norway and Iceland. *International Journal of Project Management*, 36(1), 71-82.
- Dings oyr, T., Nerur, S., Balijepally, V., & Moe, N. B. (2012). A decade of agile methodologies: Towards explaining agile software development. *Journal of systems and software*, 85(6), 1213-1221.
- Order, A., & BELHARET, A. Report on the Impact of Artificial Intelligence on Project Management.
- Kozarkiewicz, A. (2020). General and specific: The impact of digital transformation on project processes and management methods. *Foundations of Management*, 12(1), 237-248.
- Virtual Teams: Definition, Examples & Best Practices for 2023. <https://teambuilding.com/blog/virtual-teams>
- PM Skill Builder: Artificial Intelligence: A game changer for Project Managers. <https://pmi.nl/blog/pm-skill-builder-artificial-intelligence-a-game-changer-for-project-managers-20972>
- Muksha, S. (2021). The impact of information technology on project management performance. A case study of Vision City Project phase 1 (Doctoral dissertation, University of Rwanda).
- The Role of AI in Project Management. <https://www.linkedin.com/pulse/role-ai-project-management-chris-chiancone>

CHAPTER 11: SUSTAINABILITY IN PROJECT MANAGEMENT

This chapter is a simple overview that describes the subject of sustainability under a social, environmental and economic context within the practice of project management. It will begin by spelling out the meaning and value of sustainability. Although the subject of sustainability is still on a rising slope, given the scope of this essay existing literatures will be gathered, examined and used as a background understanding for later discussions (Hope, 2012). After these, the importance of sustainable development within the projects managements setting would be explained. It will also consider a few technics and methods that are normally employed when implementing sustainable development within the project management setting. This essay seeks to establish a relationship between Project management and sustainability practice, focusing more on areas such as; the environment, the society and the economy. Therefore, at different sections within this essay, samples would be sighted from these three various points of view. In addition to these the essay would look into the existing schools of thoughts that are contrary to practise of sustainable development. Thereafter the essay would conclude based on a simple but general analysis drawn from the whole discussion.

11.1 DEFINING SUSTAINABILITY IN A PROJECT CONTEXT

As a result of numerous changes in the socioeconomic climates of nations of the world, there has been massive increase in the rate at which national policies are adopting the system of sustainability. Given this situation, there is the need to clearly understand the subject of sustainable development. Sustainable development is the singular balance that exists between the environment, society and the economy (Clift, 2007). It is an act of developing projects in such a way that the unborn generation will not have to suffer any lack or want as a result of the impacts of past projects. This practice practically ensures that the society suffers less damage that could affect the coming generation. Furthermore, it ensures a balanced and stable economy that will enhance productivity in future projects. Alternatively, it is a way of investing safety and security for the future of the nation and world as whole (Stone, 2003).

According to study sustainability is the conscious act of reducing waste in any on-going project or even in a project that has already been achieved. Sustainability has come into being in project management as a result of the impact of such projects on the environment, society and the economy. Sustainability is the science of regeneration that fills up the present spaces and also attends to the future concerns. In other words, it is a subject that systematically forecasts that in as much as a project continues to receive from its environment; a time would come in the near future where the source of materials will become irresponsible. Therefore, in order to avert the period of irresponsiveness, the practice teaches the importance of regeneration in project management (Klopffer, 2003).

The subject of sustainability has three main areas of focus; these areas are all individually interrelated. They are the supporting building blocks to sustainability. Undeveloped nations of the world tend to focus more on the environmental and social aspect when handing projects. However, the projects that are developed in technically advanced nations tend to direct their focus more at the Economy. Alternatively, stable nations often seek the aspect of sustainable development that enhances the economy of such nations. However, there is the risk of environmental and social

dormancy when nations are more concerned with the issue of economic sustainability. In order to ensure a reasonable balance within a Project; it is suggested that all the three areas should be treated with equality (Klopffer, 2003).

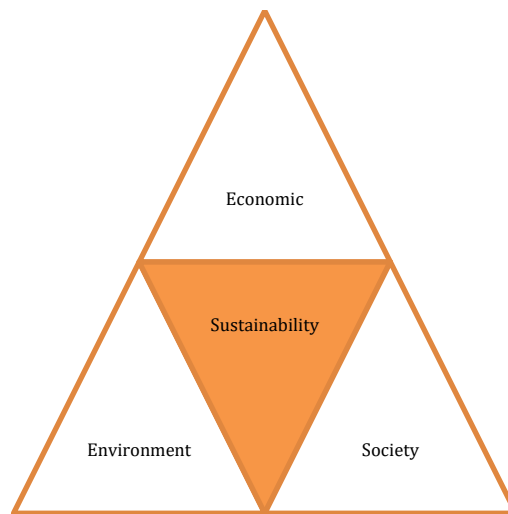


Figure 11. 1 Pillars of Sustainability
(Source: Klöpffer, Walter, 2003)

It is a practice in project management that considers the immediate environment where the project would be attainable. Sustainability is the element in a project that eliminates the possible hazards and rather makes it reliable. It is the analysis and removal of different forms of redundancy in each project. In other words, sustainability is to be able to setup a successful project with little or no opportunity cost; that is though there are uncertainties, the projects outcome would be able to minimize the level of uncertainties' such that they are lease visible (Robichaud and Anantatmula, 2011).

Sustainability is a way of saving costs that extends to different dimensions such as the environment, the society and the economy. When the committee handling a project in an environment takes the element of environmental pollution into consideration; it is a clear.

Practice of environmental sustainability. In other words, the project team will not only prioritize project accomplishment but also ensure that they accomplish the project function devoid of pollution which is harmful to the project environment. However, where the project team makes safety a part of their priority; it is clear that the project is operating from the social sustainability point of view. For instance, building structures that are put in place should be able to conform to safety rules. In other words, the structural engineers must have built it bearing in mind that the lives of the users will be at stake if safety is not considered. Sustainability is a refurbished kind of management system where the value derived from the outcome remains unchanged or even gains better credits than the former (Brown, 2011).

11.2 THE TRIPLE BOTTOM LINE

The Triple Bottom Line (TBL) of People, Planet and Profit, a term coined by Elkington (1997), has become an influential approach all over the world (Chabowski et.al., 2011; Svensson & Wagner, 2015). This model set up the key of long-term strategies for companies making the transition to

sustainability, based on three important dimensions of sustainable development: environmental quality, Social equity, and economic benefits (Elkington, 1998).

The most commonly accepted model to describe sustainability and the TBL is the nested spheres model, also called the Venn diagram explanation (Figure 11.1). Sustainability can be illustrated as the place where the three dimensions overlap. However, one of the limitations of this approach is that it does not show levels of hierarchy between the three dimensions. Consequently, Getzner (1999) named it “weak approach” to sustainability and suggested instead a “strong approach” to it, portraying a wider environmental system where both the economic and the social domain, as subsystems, have a limit (Figure 11.2). This model also called also called the Russian doll model, has been seen by many scholars as a stronger sustainability model (Chapman & Eames, 2007; Hosseinian-Far & Jahankhani, 2015). In similar vein, Lawson and Beckmann (2010) advocate that this model highlights that “whatever is conducted in a business system must be compatible with the wider social and environmental systems”.

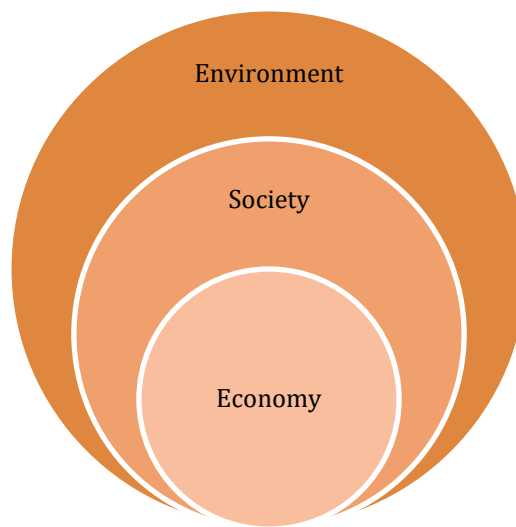


Figure 11.2 The overlapping spheres model
Source: Sandhu et al., 2014

Economic dimension

The economic dimension of TBL–Profit–focuses on the value created by the organization and goes beyond its financial performance and financial concepts as sales growth, cash-flow, shareholder value, etc. to include the economic and operational business impact on the society (Chabowski et al., 2011). Further, it focuses on the organization’s performance through the efficient management of its strategic capabilities such as core competencies, shareholder value creation, and marketing orientation (Akroush, 2012). According to Choi and Ng (2011), consumers became more concerned with economic sustainability since the economic downturn in 2008 as it jeopardizes financial stability and, consequently, employment.

Social dimension

The social dimension–People–encompass the impact of an organization on the people’s welfare, including both employees and community, and addressing issues like education assistance, community interaction, charitable causes, and fair fare practices (Engardio, 2007). A prevailing topic in this dimension is the increase in Corporate Social Responsibility (CSR) initiatives which has been receiving considerable focus not only on research but also on corporate strategies and operations.

Environmental dimension

The environmental dimension – Planet – relates to the organization’s attempts to minimize environmental impact as well as their use of energy and waste production, in order to reduce their ecological footprint. Some evidence that the greening of the marketplace is becoming mainstream is the proliferation of green products, eco-labelling, and ISO 14001 certification.

Porritt (2007) and Bansal (2005) argue that the environmental dimension of the TBL is the most important, while the economic and social are secondary because everything else depends on the Earth’s resources, limits, and systems. In fact, the environmental dimension has received most focus by scholars’ research than the social and economic ones (Seuring & Müller, 2008; James et al., 2015). Interestingly Sheth, Sethia, and Srinivas (2011) claim for a reshape of this dimension with reference to consumers, redefining it as the impact of the environmental change on human health and well-being resultant from consumption.



Figure 11.3 The interconnection of the elements of the Triple Bottom Line concept
Source: Anastasiia Dalibozhko and Inna Krakovetskaya, 2018

11.3 STRATEGIES TO MAKE PROJECTS MORE SUSTAINABLE

The temporary character of projects may seem to contradict the long-term orientation of sustainability. However, projects help firms realize long-term investment objectives. Projects and project management take place in an environment that is broader than that of the project itself. Understanding the framework in which the project takes place helps ensure that work is carried out in alignment with the goals of the enterprise and managed in accordance with the established practice methodologies of the organization. (PMI, 2008)

Despite the ways projects have been managed in the past, project management does not happen in a vacuum. All projects take place within a strategic context, and there are both internal and external environmental factors that surround or influence a project's success. These factors may enhance or constrain project management options and may have a positive or negative influence on the outcome (Figure 11.3). In much the same way that a project manager must balance cost, schedule, and scope, there are tradeoffs that must be made between the economic, social, and environmental factors surrounding a project.

Responsibility for economic sustainability means moving beyond the simple ROI (return on investment) for the project and ensuring that it fits into the overall strategy of the firm. What are the key economic drivers for the organization? How does this project contribute to those drivers? How will this initiative, once deployed, contribute to the long-term fiscal viability of the organization?

Ensuring a project is socially sustainable involves reflecting on organizational culture, structure, and processes, existing human resource skills and personnel practices, both inside the firm and throughout the value chain.

Reaching toward environmental sustainability requires a mature evaluation of capital equipment and facilities requirements, use of resources, purchasing practices, contract management, and industry standards.



Figure 11. 4 Sustainability: Strategic Context for Project Management

(Source: <https://www.pmi.org/learning/library/project-management-global-sustainability-6393>)

Implementing sustainable practices in projects is crucial for minimizing environmental impact, promoting social responsibility, and ensuring long-term success. Table 11.1 presents some strategies for making projects to be sustainability.

Tabel 11.1 Strategies for making projects more sustainable

Strategy	Description
Define Sustainability Goals	Clearly define sustainability goals and objectives for the project, considering environmental, social, and economic aspects. Ensure that these goals align with organizational values and industry standards.
Life Cycle Assessment (LCA)	Conduct a life cycle assessment to evaluate the environmental impact of the project from inception to completion. Identify opportunities for reducing resource consumption and minimizing waste throughout the project life cycle.
Green Procurement	Implement green procurement practices by selecting suppliers and vendors who prioritize sustainable sourcing, eco-friendly materials, and ethical labor practices.
Energy Efficiency	Optimize energy usage by incorporating energy-efficient technologies, utilizing renewable energy sources, and implementing practices to reduce overall energy consumption during project operations.
Waste Management	Develop a comprehensive waste management plan to minimize, reuse, and recycle project-related waste. Ensure proper disposal of hazardous materials and encourage the use of recycled materials.
Biodiversity Conservation	Consider the impact of the project on local ecosystems and biodiversity. Implement measures to protect and restore natural habitats affected by the project.
Community Engagement	Involve local communities in the project planning process. Address their concerns, provide benefits, and contribute to the social and economic development of the community.

Strategy	Description
Sustainable Design and Construction	Integrate sustainable design principles in construction projects, such as energy-efficient buildings, green infrastructure, and environmentally friendly materials.
Transportation and Logistics	Optimize transportation and logistics to reduce the carbon footprint of the project. Utilize fuel-efficient vehicles, promote public transportation, and minimize travel-related emissions.
Water Conservation	Implement water conservation measures, such as efficient irrigation systems, rainwater harvesting, and the use of water-saving technologies in construction and operation.
Carbon Offsetting	Offset carbon emissions through investments in carbon offset projects or by participating in carbon credit programs to neutralize the project's environmental impact.
Stakeholder Collaboration	Collaborate with stakeholders, including clients, suppliers, and local communities, to create a shared commitment to sustainability. Foster a culture of responsibility and accountability.
Continuous Monitoring and Reporting	Establish key performance indicators (KPIs) to measure and monitor sustainability metrics throughout the project. Regularly report on progress and make adjustments as needed.
Adoption of Green Technologies	Embrace green technologies such as solar panels, energy-efficient HVAC systems, and smart building technologies to enhance project sustainability.
Educate and Train Project Team	Provide education and training to project team members on sustainable practices and their role in achieving project sustainability goals. Foster a culture of awareness and responsibility.
Certifications and Standards	Pursue certifications such as LEED (Leadership in Energy and Environmental Design) or other relevant standards to validate and demonstrate the sustainability of the project.
Innovation and Research	Encourage innovation in sustainable practices and stay informed about emerging technologies and methodologies that can enhance project sustainability.

By incorporating these strategies, projects can contribute to environmental and social well-being while maintaining economic viability. Sustainable project management not only aligns with global sustainability goals but also enhances the reputation and long-term success of organizations.

11.4 CASE STUDIES ON SUSTAINABLE PROJECT MANAGEMENT

Overview of the case study

The maturity model assesses how sustainability is considered in a specific project. The fact that the unit of analysis of the maturity model distinguishes it from other project management maturity models that most often assess the maturity of process performance and control on the level of the organization. Since projects are performed within, or between, organizations, and are therefore existing within a certain organizational context, a case study approach appears to be a suitable research methodology (Yin, 2009).

The case study concerns the project Open Remote of the Finalist IT (Information Technology) group in Beijing. This case was selected because both the result of the project, open source software

for a universal remote control on a Smartphone, and the process of the project, with a Western IT company using its Chinese subsidiary to deliver the project, offer many opportunities for considering sustainability aspects. The data collection for this study was done by semi-structured interviews with the general manager of Finalist Beijing and the project manager of the project Open Remote. The general manager provided more general information about the company, and the project manager filled in a maturity assessment questionnaire.

Finalist IT Group is a Dutch IT service provider with branches in New York and Beijing. It specializes in consultancy, project and application maintenance. The Beijing office employs approximately 30 people and is engaged in local Chinese business and in projects that are acquired by the other Finalist branches. As mentioned on their corporate website (www.finalist.com), the company's mission statement is: "We help our customers achieve long lasting competitive benefits by successfully implementing best of breed IT-solutions."

The Project Open Remote is an open source software development project where Finalist Beijing, with a core development team of ten people, designs and implements a software application for iPhone, iPad, and other Mac-products. The project is destined for the US and has a budget of over one million dollars. The goal of the project is to design and program an open source software application for controlling the lighting, air condition, entertainment equipment, and other electrical devices in the average home that normally require many separate remotes (and batteries). The purpose of the project is to create an application (a service) that replaces the numerous remote controls that are often required to operate the many electrical appliances of the average home. Therefore, in this case the product (remote control and batteries) is redesigned into a service (the application). The application typically qualifies as Green IS because it replaces battery-consuming devices by an app on an existing device.

The finding of case study

The case study includes the application of the Silvius and Schipper (2010) maturity model in order to analyze how sustainability is considered in the Green IS project Open Remote. Results of the maturity assessment are portrayed in Figures 11.5, 11.6 and 11.7. The data are separated into three categories: profit, people, and planet. Figures present both actual and desired level of consideration of sustainability in the project. From low to high maturity, the levels of consideration are:

- Sustainability aspects are not considered in the project;
- Sustainability aspects are considered at the level of the resources of the project;
- Sustainability aspects are considered at the level of the business processes of the project;
- Sustainability aspects are considered at the level of the business model of the project;
- Sustainability aspects are considered at the level of the products/services the project delivers.

Profit Perspective

The results of the questionnaire's category Profit show a rather high presence of sustainability within this particular project. The highest level of sustainability, namely sustainability in products and services, is firmly present with a score of 75%. Although all the four preceding levels are at a desired height, the project manager does still see room for improvement on the level of products and services. The desired level here is 100% instead of the current 75%. The highest presence of sustainability can be found in the business model and in products and services. The other three levels have an equal score of 25%. However, since the highest levels of sustainability have the highest sustainability presence (75% each), the level of sustainability can be seen as very high. The answers given by the project manager of the project in the case show that thinking about the long term, being flexible and

improving the company are very important aspects. These aspects contribute to a higher level of sustainability as the future is being kept in mind and the company functions to improve constantly.

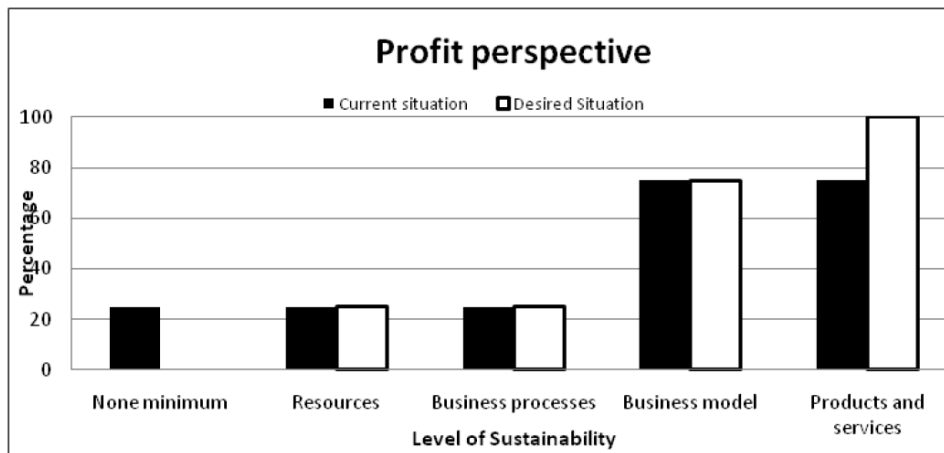


Figure 11.5 Data for the Profit Perspective
(Source: A. J. Gilbert Silvius, 2011)

Planet Perspective

Figure 11.6 clearly shows that Finalist is completely satisfied with their level of sustainability within the planet perspective. The graph shows that the current situation is the same as the desired situation.

The highest presence of sustainability is, once again, on the level of products and services. Contrary to the profit perspective, however, the score for the none/minimum category is 57.14%. This percentage is decidedly higher than in the profit perspective. From this, we can conclude that there is a higher overall presence of sustainability in the profit perspective of the project than in the planet perspective.

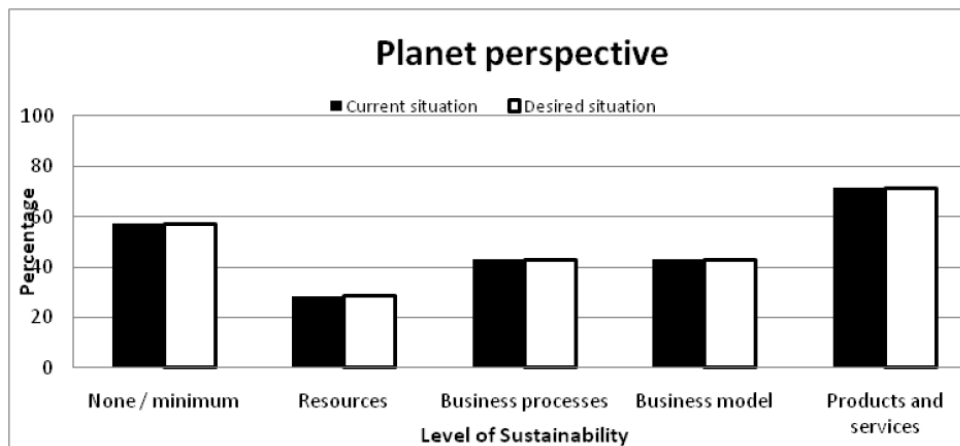


Figure 11.6 Data for the Planet Perspective
(Source: A. J. Gilbert Silvius, 2011)

People Perspective

Finally, the products and services category of the people perspective scores a neat 100%, as can be seen in Figure 11.7. Finalist tries to maximize their sustainability when it comes to people. This means fair work, wages, and futures for the company's employees. The company has many standards for, for example, labor practices, health and safety, and equal opportunity. Besides this, the

respondents also mention that they constantly try to improve upon this with every project and make sure that everyone is still satisfied.



Figure 11.7 Data for the People Perspective
(Source: A. J. Gilbert Silvius, 2011)

Overall, the Open Remote project shows a relatively high presence of sustainability, particularly on the level of products and services. This is not unexpected for a Green IS project. Given the almost completely lacking difference between current situation and actual situation, it can also be concluded that there Finalist is satisfied regarding the level on which sustainability is considered in the project.

As can be concluded from the data analysis, the Open Remote project contributes to establishing a more sustainable company. The project's goal is to replace physical products (remote controls and batteries) with a service (in this case a software application). It does not produce waste in usage. As a matter of fact, using it would reduce waste simply because of all the remotes and batteries you don't have to purchase, use, and dispose of any more.

Noticeable about the data analysis is that the highest presence of sustainability occurred on the level of products and services. In this case, where the project is turning a product into a service, it's not that peculiar. In fact, turning products into services is one of the renowned strategies to create more sustainable businesses (Girshick, Shah, & Waage, 2003). However, the significantly lower scores on the consideration levels resources, business processes, and business model indicate that considering sustainability aspects in the project of developing a Green IS application is a less developed area. Thereby confirming the earlier findings of Gareis et al. (2009).

Another noticeable fact resulting from the data is that although in the case there seems to be a solid presence of sustainability, there also seems to be no desire to improve upon this, even where it can still be improved. Finalist indicated that there is no desire to change their current situation. From this, we can hypothesize that Finalist saw a business opportunity, something that would make for a good service, but never tied it specifically to sustainability or a sustainable strategy. The company seemed unaware of the concept of sustainability in general, and never specifically implemented it into its business plan. Finalist has a long-term vision, wants to grow, wants to earn a healthy profit and also wants to treat their employees fairly, but all of this not specifically because of an explicit sustainability ambition. This lack of motivation, or lack of awareness, does not change the findings of the case, but it does influence the potential for a more complete consideration of sustainability aspects of the project.

Summary

This chapter has considered some of the key aspects of overview of sustainability in project management. Sustainability in project management involves integrating environmental, social, and economic considerations into project planning and execution. The goal is to create positive impacts while minimizing negative effects on people, the planet, and profitability.

- Triple Bottom Line (TBL): Consideration of the triple bottom line—people, planet, and profit—ensuring projects contribute to social responsibility, environmental conservation, and economic viability.
- Environmental Sustainability: Implementation of eco-friendly practices, resource efficiency, and renewable energy sources to reduce the project's environmental footprint.
- Social Responsibility: Prioritization of ethical practices, community engagement, and fair labor standards to ensure positive social impacts and stakeholder well-being.
- Economic Viability: Integration of sustainable business practices to ensure the project's economic success, long-term profitability, and resilience to changing market conditions.

Sustainability in project management is a holistic approach that aligns projects with broader environmental, social, and economic goals. It not only mitigates risks but also enhances long-term value, promoting responsible and resilient project outcomes.

Discussion Questions

1. What could you do as a project manager to encourage long-term sustainability?
2. How can we make sustainability sustainable?
3. What are the benefits of sustainability in project management?
4. What are the challenges of sustainability in project management?

Suggested Reading

- Hope, A. (2012). Project management as if the world matters: At the intersection of sustainable development and project management.
- Stone, M. P. (2003). Is sustainability for development anthropologists?. *Human Organization*, 62(2), 93-99.
- Klöpffer, W. (2003). Life-cycle based methods for sustainable product development. *The international journal of life cycle assessment*, 8, 157-159.
- Robichaud, L. B., & Anantatmula, V. S. (2011). Greening project management practices for sustainable construction. *Journal of management in engineering*, 27(1), 48-57.
- Brown, A. S. (2011). Sustainability. *Mechanical engineering*, 133(11), 36-41.
- Elkington, J. (1997). The triple bottom line for 21st century business. *Journal of Experimental Psychology: General*, 136.
- Chabowski, B. R., Mena, J. A., & Gonzalez-Padron, T. L. (2011). The structure of sustainability research in marketing, 1958–2008: A basis for future research opportunities. *Journal of the Academy of Marketing Science*, 39, 55-70.
- Svensson, G., & Wagner, B. (2015). Implementing and managing economic, social and environmental efforts of business sustainability: Propositions for measurement and structural models. *Management of Environmental Quality: An International Journal*, 26(2), 195-213.

- Elkington, J. (1998). Partnerships from cannibals with forks: The triple bottom line of 21st-century business. *Environmental quality management*, 8(1), 37-51.
- Getzner, M. (1999). Weak and strong sustainability indicators and regional environmental resources. *Environmental management and health*, 10(3), 170-177.
- Chapman, D., & Eames, C. (2007). Position paper: Backgrounding new guidelines for EE/EfS. Retrieved June, 11, 2011.
- Hosseini-Far, A., & Jahankhani, H. (2015). Quantitative and systemic methods for modeling sustainability. *Green information technology*, 83-92.
- Lawson, R., & Beckmann, S. (2010). Contemporary perspectives on sustainability and marketing in a financially challenged environment—Editorial comment. *Australasian Marketing Journal*, 18(3), 179-180.
- Chabowski, B. R., Mena, J. A., & Gonzalez-Padron, T. L. (2011). The structure of sustainability research in marketing, 1958–2008: A basis for future research opportunities. *Journal of the Academy of Marketing Science*, 39, 55-70.
- Choi, S., & Ng, A. (2011). Environmental and economic dimensions of sustainability and price effects on consumer responses. *Journal of business ethics*, 104, 269-282.
- Engardio, P., Capell, K., Carey, J., & Hall, K. (2007). Beyond the green corporation: Imagine a world in which eco-friendly and socially responsible practices actually help a company's bottom line. Its closer than you think. *Businessweek*, (January 29), 50.
- Ferrell, OC, & Gresham, LG (1985). A contingency framework for understanding ethical decision making in marketing. *Journal of Marketing*, 49(3), 8796.
- Correia, M. S. (2019). Sustainability: An overview of the triple bottom line and sustainability implementation. *International Journal of Strategic Engineering (IJoSE)*, 2(1), 29-38.
- Silvius, A. J., & Nedeski, S. (2011). Sustainability in IS projects: A case study. *Communications of the IIMA*, 11(4), 1.
- Okeniyi, J. O. (2015). Project Sustainability: Overview of Sustainability in Project Management.

GLOSSARY

Agile Project Management. An iterative approach to managing software development projects that focuses on continuous releases and incorporating customer feedback with every iteration.

Competitive Advantage: The unique edge or capability that sets a company apart from its competitors and allows it to outperform in the market.

Continuous Improvement: The ongoing effort to enhance products, services, and processes incrementally to achieve higher quality and efficiency.

Critical Path Method (CPM). A method used to estimate the minimum project duration and determine the amount of schedule flexibility on the logical network paths within the schedule model.

Digitalization. The use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business.

Employee Engagement. The extent to which employees are committed to their work, involved in their roles, and motivated to contribute to the organization's success

Environmental Impact: The effect that business activities have on the natural environment, including resources, ecosystems, and climate.

Gantt Chart. A bar chart of schedule information where activities are listed on the vertical axis, dates are shown on the horizontal axis, and activity durations are shown as horizontal bars placed according to start and finish dates

Initiating Process Group. Those processes performed to define a new project or a new phase of an existing project by obtaining authorization to start the project or phase.

Innovation. The introduction of new ideas, methods, or products to drive positive change and growth within an organization

Kaizen. A Japanese business philosophy emphasizing continuous improvement in processes, products, and services..

Kanban Board. A visualization tool that shows work in progress to help identify bottlenecks and overcommitments, thereby allowing the team to optimize the workflow

Lean Thinking. The fundamental principle involves identifying and eliminating different types of waste (MUDA) in project processes, such as overproduction, delays, and unnecessary tasks

Net Present Value Rule. An investment concept stating that project should only be engaged in if they demonstrate a positive net present value

Organizational Ownership: The sense of responsibility, commitment, and pride that employees feel towards their work and the success of the organization

Operational Excellence: The ongoing effort to improve processes, eliminate waste, and enhance efficiency to achieve superior performance and outcomes

Planning Process Group. Those processes required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve

PRINCE2 (PRojects IN Controlled Environments). a structured project management method and practitioner certification programme, emphasises dividing projects into manageable and controllable stages.

Project Management. The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Project Management Body of Knowledge. A term that describes the knowledge within the profession of project management. The project management body of knowledge includes proven traditional practices that are widely applied as well as innovative practices that are emerging in the profession.

Project Management Knowledge Area. An identified area of project management defined by its knowledge requirements and described in terms of its component processes, practices, inputs, outputs, tools, and techniques.

Project Management Plan. The document that describes how the project will be executed, monitored and controlled, and closed.

Project Management Information System. An information system consisting of the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes.

Project Management Plan. The document that describes how the project will be executed, monitored and controlled, and closed.

Project Management Process Group. A logical grouping of project management inputs, tools and techniques, and outputs. The Project Management Process Groups include initiating processes, planning processes, executing processes, monitoring and controlling processes, and closing processes. Project Management Process Groups are not project phases.

Project Management System. The aggregation of the processes, tools, techniques, methodologies, resources, and procedures to manage a project.

Project Management Team. The members of the project team who are directly involved in project management activities. See also Project Team. Project Manager (PM). The person assigned by the performing organization to lead the team that is responsible for achieving the project objectives.

Project Organization Chart. A document that graphically depicts the project team members and their interrelationships for a specific project.

Project Management Plan. The document that describes how the project will be executed, monitored and controlled, and closed.

Project Manager (PM). The person assigned by the performing organization to lead the team that is responsible for achieving the project objectives

Project Charter. A document issued by the project initiator or sponsor that formally authorizes the existence of a project and provides the project manager with the authority to apply organizational resources to project activities.

Project Procurement Management. Project Procurement Management includes the processes necessary to purchase or acquire products, services, or results needed from outside the project team.

Project Quality Management. Project Quality Management includes the processes for incorporating the organization's quality policy regarding planning, managing, and controlling project and product quality requirements, in order to meet stakeholders' expectations.

Project Resource Management. Project Resource Management includes the processes to identify, acquire, and manage the resources needed for the successful completion of the project.

Project Risk Management. Project Risk Management includes the processes of conducting risk management planning, identification, analysis, response planning, response implementation, and monitoring risk on a project.

Project Schedule. An output of a schedule model that presents linked activities with planned dates, durations, milestones, and resources.

Project planning. A crucial part of project management focused on creating a detailed plan that outlines the steps and resources necessary to achieve the project's objectives, including identifying the project's scope, establishing a timeline, assigning tasks and resources, and budgeting for the project

Project Schedule Management. Project Schedule Management includes the processes required to manage the timely completion of the project.

Project Stakeholder Management. Project Stakeholder Management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyze stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution

Risk Mitigation. A risk response strategy whereby the project team acts to decrease the probability of occurrence or impact of a threat.

Stakeholder. An individual, group, or organization that may affect, be affected by, or perceive itself to be affected by a decision, activity, or outcome of a project, program, or portfolio.

Stakeholder Analysis. A technique of systematically gathering and analyzing quantitative and qualitative information to determine whose interests should be taken into account throughout the project

Stakeholder Engagement Plan. A component of the project management plan that identifies the strategies and actions required to promote productive involvement of stakeholders in project or program decision making and execution.

Sustainability. The practice of meeting current needs without compromising the ability of future generations to meet their own needs.

Sustainable Project Management. The planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economical and social aspects of the life-cycle of the project's resources, processes, deliverables and effects, aimed at realizing benefits for

stakeholders, and performed in a transparent, fair and ethical way that includes proactive stakeholder participation

Transparency: The practice of openly sharing information, processes, and decisions within an organization to build trust and accountability

Value Stream Mappings. a visual tool that displays all critical steps in a specific process and easily quantifies the time and volume taken at each stage

WATERFALL. The Waterfall approach treats the project as a linear process consisting of a series of sequential basic stages

Work Breakdown Structure (WBS). A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.