

POLITECNICO DI TORINO

Master's degree in
Engineering and Management



ANALYSIS OF THE INTEGRATION OF SUSTAINABILITY PRINCIPLES INTO PROJECT MANAGEMENT: THE IMPACT ON THE ORGANIZATION - A2A CASE STUDY

Supervisor:
Prof. Alberto De Marco

Candidate:
Martina Soardo

Co-supervisor:
Prof. Filippo Maria Ottaviani

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ABSTRACT

The aim of this study is to examine the integration of sustainable business practices into project management, addressing key questions about the need for and impact of sustainability on traditional project management strategies. Based on fundamental principles, such as the Iron Triangle and the concept of Sustainability, including the Triple Bottom Line perspective, the research explores how these elements can be adapted to incorporate sustainability into project management practices, a topic known as Sustainable Project Management (SPM).

Through a comprehensive literature review, the study examines the integration of project manager competencies necessary to achieving sustainability objectives and the idea of projects as instruments for change. Macro issues such as stakeholder management, life cycle management and decision-making processes are analyzed to explain their relevance to Sustainable Project Management. In addition, various frameworks and models from the literature are evaluated for their benefits and limitations, with a focus on the key role of the project manager as a change agent in driving sustainable initiatives.

The study concludes with a detailed analysis and illustration of a case study derived from an internal initiative within the Organization where I conducted my internship, which provides insights into the practical application of sustainability within project management. The case study illustrates the methodology used to develop a maturity model, which assesses a project's readiness to implement sustainability interventions in management practices.

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1. INTRODUCTION

1.1 Purpose of the study

Current global challenges concerning sustainable development require an important change in how businesses operate and think. To make a real difference, sustainability can no longer be seen as a separate or specialized area but must be actively integrated into the way organizations operate. Governments support and encourage the private sector to develop and carry out significant global goals by introducing new environmental regulations and standards, and as a result, organizations are under pressure to change the way they do business.

The primary drivers of a significant shift in the way in which a business is done are the projects. Therefore, the role of the project manager is becoming increasingly important, given its influence on project management activity and in creating a sustainable economy and society. This study examines how this role has changed over time and the importance it has gained.

Although interest has grown among researchers, there is still a lack of a common framework and best practice for integrating sustainability concepts into project management. This work aims to address the following research questions: "What can be done in terms of integration of economic, environmental and social aspects into project management practice?" and "What are the limits and benefits that this new shift can bring?". It does so by referencing both the previously published literature and the given case study.

1.2 Principles of Project Management

Projects are regularly used to achieve objectives within an organization's strategic plan (PMBOK, 2013). Furthermore, they are regarded as the most effective means of bringing about change in both business practices and industry culture. They have the capacity to turn today's goals into concrete future outcomes, since they link a society's present and future. Projects need to be accurately planned out to be functional, which is accomplished through the discipline of project management.

Project management (PM) discipline sprang up in the 1950s as a result of the entire work of Kurt Lewin, who developed the planned change management model. The fact that the project management discipline emerged during a period of stable business conditions suggests that its early development was primarily conceptualized on project execution and process control, ignoring the importance of communication skills, the ability to deal with resistance

to change, and the knowledge to identify and include stakeholders in the project management processes. The field of project management has advanced, reaching the next stage with the development of organizational theory, leadership, and human resource management in the 1980s. Then, as part of the next wave of development in the 2000s, changes in the fields of risk management, stakeholder management, project evaluation, and soft skills were made (Tornjanski V., Knežević S. & Vulević B., 2013). Early thoughts in the project management discipline understand a project as a given and unique task, limited in time, complex in implementation and subject to evaluation. Therefore, key characteristics of a project are uniqueness, non-repeatability, specific aim, scope and limited period (PMI, 2017).

Since the field of project management is always evolving and adapting, professional groups are introducing more and more certification procedures and standards for project management. Over time, professional bodies such as the International Project Management Association (IPMA) and the Project Management Institute (PMI), respectively created in 1965 and 1969, have established regulations and related professional certification systems (IPMA framework since 1987, and PMP®, since 1984) to unify the definition in this field. According to PMI and the PMBOK (the guide globally recognized as a standard for project management), project management is the *“application of knowledge, skills, tools, and techniques to project activities to meet the project requirements”*.

The initiating phase of project management activities is followed by the planning phase and then by the activity's actual execution. The project manager must monitor and control the progress of work throughout the project lifecycle to reach the closing phase (PMI, 2017) (PMBOK, 2013).

More specifically, the project idea is developed from market assessments and customer requests during the initiation phase, which starts with a need or issue. The objectives and features of the project are also specified.

The project activities, scope and resources required are determined during the project planning phase. In addition, to estimating project effort and duration, risks are also identified and quantified. The project manager and team must also decide who is responsible for each operational task and how it will be carried out. During the project execution everything that has been planned is put into practice.

Finally, the project closing phase consists of a retrospective analysis to identify what is going well and what can be improved. Throughout the project, specified KPIs must be established and constantly monitored.

Each of the phases of project management processes mentioned above (initiating, planning, executing, monitoring and closing phase) are characterized, according to the PMBOK, by 10 areas of knowledge, which are defined as Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resources Management, Communications Management, Risk Management, Procurement Management, and Stakeholder Management.

The stages can occur by following a traditional method known as Waterfall methodology, in which activities are carried out in sequence, or an Agile method, which includes Kanban and Scrum, in which requirements and solutions develop over time through iterative and evolving approaches, allowing for a more rapid response to change. The most recent is a cross between the two, known as a hybrid one. The choice of which approach to take is made during pre-planning and is based on the following statement: if there is a greater structure to the activities, and budget and timeline are specified, the waterfall method will be used; however, in high-uncertainty situations, an agile strategy is advised.

Every project must be based on the three variables that determine the project's quality: time, cost, and scope. The scope is simply defined as all the features that are incorporated into the project to produce the end result, the cost is the budget required to produce the outcome, whereas the time is the activities' schedule. The task of project management is to find equilibrium between the three variables to ensure a high-quality outcome.

The “Iron Triangle” or “Triple constraint triangle” is commonly known in the literature as the balancing of the system composed of the aforementioned key factors of cost, scope, and time, as shown in Figure 1.

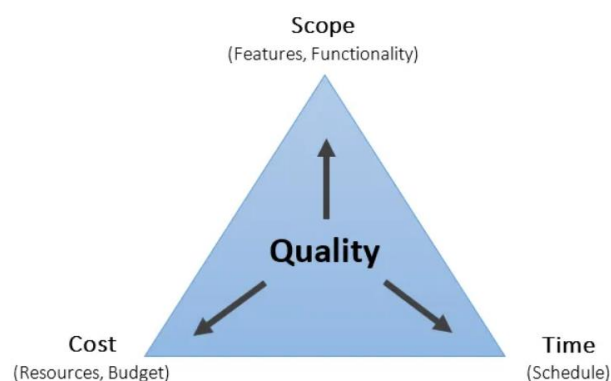


Figure 1. Iron Triangle

The triangle illustrates how the three variables are connected; if one is changed, the other two must also be altered to maintain the connection between the triangle's points. Instead, if one point is changed without altering the other one or both, the project's quality will suffer. Two different kinds of relationships are discernible. The first relationship is between the scope and the other two variables, specifically, the scope is directly correlated with time and cost, meaning that it moves in the same direction as these two factors. Maintaining proper scope is essential, for example, to tackle a larger project, it is necessary to increase both time and cost. The second kind of relationship is the one that is inversely proportional between time and cost. These two factors act in direct opposition to one another. If cost must be reduced, deadlines must be extended; yet, if unexpectedly insufficient time remains, you must increase your budget to manage shorter deadlines.

This study will look at how project management needs to change its focus to manage social, environmental, and economic effects instead of just scope, cost, and time, in order to integrate sustainability (Silvius A.J.G. & Schipper, R. P.J., 2014b).

The literature has begun to address the question of how to include sustainability in project management activities in the past ten years, and a new discipline, known as Sustainable Project Management (SPM), has emerged as a result. The inclusion could take place in one of two ways: first, by including sustainability in project activities, second, by including sustainability in the project, and therefore in the outcome (Sabini L, Muzio D. & Alderman N., 2019). In this study sustainability "by the project" will receive more attention rather than sustainability "of the project itself".

While projects have to deal with specific goals and deadlines, in fact, the phases of a project have a start and an end point, sustainability is more interested in long-term problems, which often do not have obvious answers. So, incorporating sustainability into project activities is challenging because, in addition to having various time horizons, there is no clear definition of sustainability that can be connected to project management, as it will be illustrated in the following paragraph.

1.3 Toward a sustainable future: Integration and evolution of Sustainability concept

Although there is growing agreement that society and industry must collaborate to achieve sustainable development, the term "sustainability" is still subject to dispute. In 1987, the United Nations Brundtland Commission defined sustainability as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*".

Following the nomenclature of the United Nations Sustainable Development Goals, (GSDR, 2023) “sustainability” has several different definitions and operationalizations. Definitions of the term vary, ranging from "weak" to "strong", for example, based on the integration and extent of collaboration among various actors.

It is a problem that the term still lacks a solid meaning because this opens for interpretations that, in fact, may be less sustainable. On the other hand, reducing the concept of "sustainability" to a fixed list of “to do” prevents its full development, rather, the emphasis should be on the "how," or the implementation of sustainability; that is, the application of sustainability in practice in every area where it is applicable.

One of the main reasons people misunderstand the term sustainability is that it's far too frequently defined exclusively in ecological terms, isolating it from human social behavior. Instead, an integrated perspective is necessary for an in-depth study. Accordingly, it has been suggested that the concept of sustainability should be interpreted as involving the integration of several viewpoints and techniques, such as industrial ecology, ecological economics, ecosystem health, and sustainable design, policy, and decision-making (Hallin A., Karrbom-Gustavsson T. & Dobers P., 2021). These areas can be grouped into three macro-categories: economic, social, and environmental. Elkington studied these three categories in 1997 and explained them under the Triple Bottom Line paradigm, which will be examined in greater detail in the study.

While going into specifics about the areas that are affected, we can state that an economy is sustainable if it consistently provides goods and services without damaging the environment or violating people's fundamental rights. In other words, it's an economic model that understands how to combine social sustainability with the natural ecosystem while promoting innovation. Social sustainability is often translated into measures pertaining to equal opportunities, such as adequate provision of social services, gender equality and social equity. As well, environmental sustainability is the most researched, and its application is in using energy and other resources without affecting the ecosystem, that is, without compromising biodiversity and the ability of future generations to provide for their own needs. These three fields are not independent of each other; rather, sustainability can only be discussed in relation to their full development. However, businesses frequently focus on applying one area while ignoring the other two.

The British business author and sustainability consultant, John Elkington, in 1997 coined the term “Triple Bottom Line” (TBL) in his book *Cannibals with Forks: The Triple Bottom Line*

of *21st Century Business* (Elkington J., 1997). The focal point is that businesses should be held accountable for their social and environmental impacts, in addition to their financial performance. This provides a framework for the creation of the Corporate Social Responsibility (CSR) concept, a management philosophy that encourages businesses to act ethically, to promote economic growth, to raise living standards of workers and the community at large. Organizations aren't obligated to pursue these goals, but if they do, they can build trust and credibility with their consumers, as well as provide financial success, after positive stakeholder involvement (Rasool S., Shoaib S., Chaudhry A. & Zafar F., 2013). TBL is a paradigm for evaluating an organization's performance in three dimensions: economic, social, and environment, as shown in Figure 2. The concept of sustainability ends at the intersection of the three dimensions because, as said before, it is incomplete if it does not address all aspects.

Elkington used the terms profit, people and planet as the three lines in his description, in fact the paradigm is also known as the 'Triple Ps'. In this analysis we will see how these components are incorporated into project management practice.

To achieve long-term success, companies that embrace the triple bottom line approach often try to find a balance between these three variables. This is because they understand that sustainable business practices benefit all stakeholders, including shareholders, customers, employees, communities and the environment.

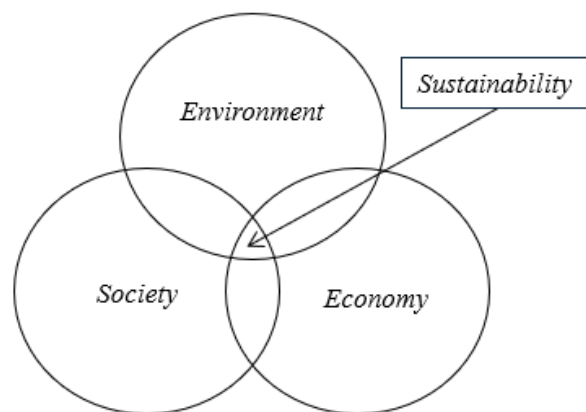


Figure 2. Triple Bottom Line

The economic dimension focuses on the organization's economic contribution to the surrounding system, such as boosting the local economy in a way that improves it and promotes its ability to sustain future generations. The social dimension refers to adopting ethical business practices that support communities and contribute positively to society.

Finally, the environmental dimension focuses on reducing greenhouse gas emissions, minimizing ecological footprints and using energy resources efficiently (Alhaddi, 2015). These three components need to be considered and managed throughout the project lifecycle in order to incorporate these dimensions into project management.

The idea of the "Triple Bottom Line" becomes relevant when considering sustainability in an organizational or business setting. More and more organizations are trying to align their projects and operations with the principles of sustainable development. There may be a variety of reasons for this, the most important of which are the development of economic value for the organization in terms of product performance and production costs, the improvement of the company's image and reputation, which are important both externally and internally, as they affect the motivation of consumers and employees. Another driver may be the desire to address global environmental challenges such as resource depletion and climate change. Project management is the perfect discipline to address these issues (Ebbesen J. & Hope A. J, 2013).

In 2010, Grevelman and Kluiwstra (Grevelman L. & Kluiwstra M. , 2010) proposed a method to add sustainability in project management activities, by merging the Iron Triangle and the three pillars of TBL.

The concept behind the model, which is depicted in Figure 3, is that all five factors must be balanced for the project management process to successfully incorporate them, otherwise, the project is deemed to be not successful development. According to the authors, the "economical" factor, from the three pillars of the TBL, has absorbed the "cost" factor from the Iron Triangle. All five constraints are equally important.

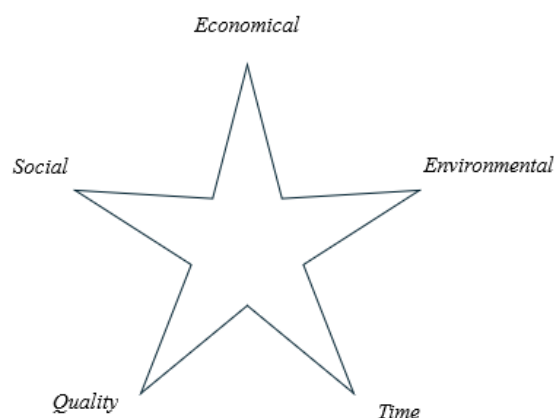


Figure 3. The Sustainable Project Management Star Methodology

Here the interpretation of sustainability in project management falls into the category of “sustainability as a constraint”. It is considered that integrating sustainability is a need that must be fulfilled, one that may be placed by project requirements or stakeholders. As a result, there is always an external incentive to understand sustainability's function as a constraint (Friedrich K., 2021). For the research Chawla et al. it is seen as an additional risk for the project (Chawla V.K., Chanda A.K., Angra S. & Chawla G.R., 2018).

In contrast to this perspective, another interpretation found in literature is sustainability seen as an instrument, as opportunity to better achieve the actual project goal (Carvalho M.M & Rabechini Jr. R, 2017). Indeed, it can help to create synergies, which can boost the competitiveness and market value of an organization or project. In this scenario, sustainability is seen as an investment that helps to reduce costs.

In the last scenario, sustainability is seen as a component of project success rather than a contributing factor. Because of the importance of all the dimensions of sustainability (economic, environmental and social), they are seen as equal objectives at the center of the project, rather than as a constraint or a secondary requirement to be met. Sustainability is seen here as a part or a dimension of the success of the project (Marnewick C., Silvius A.J.G. & Schipper R., 2019) (Friedrich K., 2021).

These contrasting perspectives fuel the gap in the search for a single way of integrating sustainability into project management practice. Nevertheless, they demonstrate the need for a holistic approach to the realization of the concept of sustainability.

Instead, to fully understand how sustainability has become a fundamental concern in today real world, it is necessary to take a broad view of the challenges faced by industry and technology over time.

Over history, there have been several industrial revolutions that have led to the change of established business methods into new ones, based on updated technologies and knowledge relevant to the times. Mechanization, electrification, and automation pushed the first three industrial revolutions, which progressively converted the agrarian economy into one centered on manufacturing, from the 1780s to the 1970s. The third industrial revolution, which depended on transistors, sensors, and microelectronics to generate data, was the foundation for the current fourth industrial revolution, or Industry 4.0. The term “Industry 4.0” was coined by German Professor Wolfgang Wahlster, in the year 2011, at the Hannover fair, and it is based on the internet-based technology connectivity to create a smart and automated system. Some examples of the technologies in use are: Internet of Things (IoT),

Machine Learning (ML), Artificial Intelligence (AI), Cloud computing and Additive Manufacturing (AM).

While the industrial revolution 4.0 is still ongoing, some researchers have already begun discussing its latest version, Industry 5.0. A new revolution where the goal is not only to increase profits and process efficiency, but also to focus on the impact of technologies on society and the environment, with humans acting as a driving force for change. The two essential components that are currently absent from Industry 4.0, sustainable development and human inclusion, are therefore expected to be present in the new era. In fact, it would be ideal to refer to the upcoming revolution as "Industry 4.0S" or "Sustainable Industry 4.0", rather than Industry 5.0, because it emphasizes sustainability in the social, economic, and environmental spheres (Santhi A. R. & Muthuswamy P., 2023). As a result of the new revolution, more organizations are becoming interested in this topic.

In recent times, an increasing number of companies have been aiming to obtain certifications related to their sustainability, in order to demonstrate their commitment and be transparent with stakeholders. One example of a volunteer initiative is adhering to the reporting standards of the Global Reporting Initiative (GRI), an international non-profit organization founded to define sustainable company performance guidelines. Another option is to obtain the certificate of Benefit Corporations, which is granted to companies, often referred to as B-Corps, that meet certain requirements and become certified as sustainable businesses by promising to support social and/or environmental causes, while also generating profits.

To summarize, sustainability is an approach that seeks to balance economic progress, environmental protection, and social well-being to ensure a sustainable future for the generations to come. More and more organizations are realizing that sustainability in business not only translates into being more accountable to the community, but is also a necessary condition for being competitive in the market.

1.4 The contribution of projects in sustainable development

Actually, organizations are attempting to incorporate sustainability into their mission. Initially, focusing on their marketing, corporate communication and annual reports, but recently focusing on project management activities. In fact, projects are "instruments of change" within businesses that play a key role in the implementation of sustainable business processes and practices. According to the viewpoint of some researchers (Silvius A. J. & Schipper R. P.J., 2014a) (Turner R. J. & Muller R., 2003), projects are short-term entities that businesses use to reach the change. In this definition, they are like temporary organizations that are connected to a permanent organization and make achievements that help this business reach its goals.

As seen in Figure 4, the permanent organization uses resources and assets in its operational business processes to provide value to its customers and, in the end, deliver business performance to stakeholders, all in accordance with predetermined objectives. But goal setting is only one aspect of the organization's strategic management, it also entails assessing the organization's business performance in relation to these objectives. The operations can go on if the performance meets expectations. However, there can be a need to make changes inside the company and usually, to bring about this change, a project is employed.

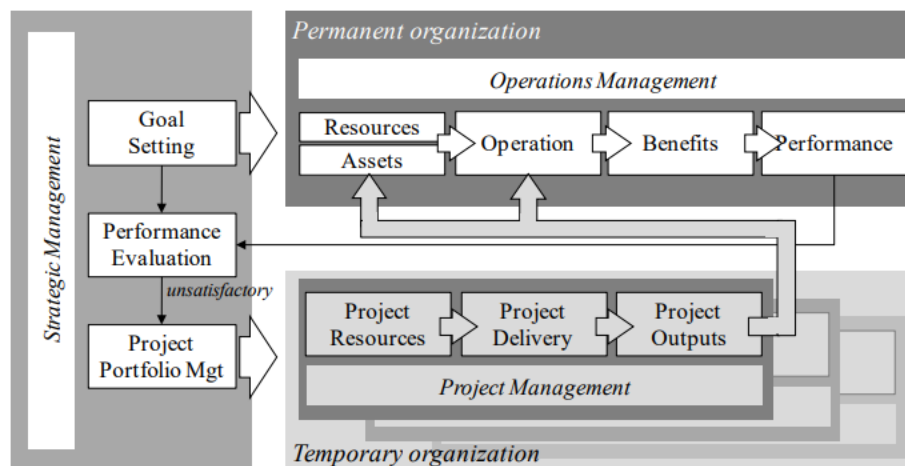


Figure 4. Project's integration

Projects are, therefore, characterized by:

- A temporary nature;
- Typically, across organizational structures;
- A clearly defined output or outcome that is rationally or ideally connected to the organization's strategy or goals;

- Allocated resources and budget.

Based on the idea of projects as instruments for change, it is clear that project management is necessary for advancement in order to achieve a more sustainable business' goal. The first person responsible for implementing the shift is the project manager, who makes decisions about project-related activities.

The study in the next paragraph focuses on the function of project manager, and the competencies required to be considered as a change agent. This is an attempt to apply the "abstract" notions of sustainability to the project manager's daily work.

Later we will examine the discipline of Sustainable Project Management. This particular focus is motivated by the fact that PM processes are frequently "overlooked" in the assessment of sustainability, due to the temporary nature of the projects, but how projects are managed is crucial to achieving a radical change towards a more sustainable future.

The research, on the other hand, does not include the sustainability of the project deliverables, which has already been extensively addressed in the literature.

1.4.1 The essential competencies of Project Manager

During the 2008 PMI European Conference, the author Russel demonstrated how the project manager is perfectly positioned to influence a company's operations toward greater sustainability. This establishes a new corporate social responsibility for project managers, who are responsible not only for achieving the desired goals, but also for doing so in a more conscious manner (Russel, 2008). Furthermore, Tom Taylor, the former leader of *Association for Project Management*, stated that "*Project and Program Managers are significantly placed to contribute to Sustainable Management practices*", implying that project managers should take responsibility for a more sustainable future throughout their leadership. But to get there, project managers must possess the necessary and adequate competencies (Silvius A. J. & Schipper R. P.J., 2014a).

Today, the most used guides for developing standards in PM competencies are the "IPMA Competence Baseline" (ICB) and "Project Management Competence Development" (PMCD).

The first version of the ICB was released in 1997, followed by an update in 1999, and in 2006: the ICB version 3 (IPMA, Individual Competence Baseline Version 3.0, 2006). The most recent edition was released in 2015: the ICB4 (IPMA, Individual Competence Baseline Version 4.0, 2015), however we focus only on the last two. While the PMCD framework

provides a general overview of the skills and behaviors required to become a competent project manager.

The subsequent analysis follows the chronological order of the most influential guides' publications to see how the inclusion of sustainability has evolved.

The 2006 ICB edition categorizes 46 project manager skills into the following three categories:

- Technical competencies (20 skills) which are concerned with the project management processes, methods and techniques;
- Behavioral competencies (15 skills) which deal with the project manager's personal qualities and interactions with project stakeholders;
- Contextual competencies (11 skills) which address the project manager interaction with project's context.

There is hardly little mention of sustainability in the guide; everything that can be related to it is in the form of "project context". Also, the mention of ethics, in a few competencies, shows that at least some social elements are taken into account. Other references to the social aspects of sustainability can be found in the skills *Personnel Management* and *Values Appreciation*.

The PMCD, the second commonly used framework, describes in a broader sense the most common competencies required by the majority of projects and organizations, considering that a single industry may necessitate specialized competencies. They can be subdivided into five dimensions, regardless the fact that knowledge competencies might be transversal (PMI, Project Manager Competency Development (PMCD) Framework, 2007):

- Knowledge: relates to the project manager's knowledge of project management;
- Performance: relates to what the project manager is capable of doing or achieving while using their project management knowledge;
- Personal: refers to how the project manager acts while carrying out the project or a related activity;
- Industry specific: refers to the awareness of regulatory and legal requirements;
- Organizational: relates to the internal policies or culture of a business.

There is no explicit reference to sustainability in any dimension, unless it is intended that sustainable goals could be part of the organization's objectives and that having a holistic view includes social, environmental, and economic factors.

More links to sustainability can be found in the PMI Code of Ethics and Professional Conduct (PMI, Code of Ethics and Professional Conduct., 2010), where it is established that the project manager's decisions must be guided by the values of honesty, responsibility, respect, and fairness, and where the best outcome is also the most ethical one (Silvius A. J. & Schipper R. P.J., 2014a). However, just the social aspect of sustainability is mentioned in this code, not every aspect of it.

In conclusion, there is a request for the inclusion of sustainability, as part of the competence of project manager, in all the preceding guides, but never in a comprehensive and exhaustive manner (Silvius A. J. & Schipper R. P.J., 2014a).

An attempt to create a framework that positions sustainability competencies as fundamental in the current state of change, was undertaken in Wiek *et al.*'s research (Wiek A., Withycombe L. & Redman C. L., 2011). This approach, applied to PM-related operations, views projects as change agents, despite their temporary nature, and establishes the skills needed to operate in an uncertain and new environment. The framework divides the competencies into five categories: systems thinking, anticipatory, normative, strategic and interpersonal. The first group refers to the ability to understand how the causes and effects of a complex problem are interconnected and the role that each resource, such as technology, plays. The second refers to the ability to think methodically about the future and, to determine which time scales are relevant to an issue and its potential solutions, as well as to have a sustainable vision. The third includes the ability to work with stakeholders to promote ethical values, the capacity to evaluate the sustainability of the current social-ecological situations as well as developing a sustainable vision for these systems. Strategic competencies support the ability to address sustainability issues and, to plan and intervene strategically by being able to recognize system's constraints. While the last category outlines the soft skills a project manager should possess, such as negotiation and collaboration skills, in order to be able to act as a motivator towards implementing sustainability and understanding the needs within his team.

In Table 1, we can see a comparison between the competence categories mentioned in the ICB3, and those indicated by Wiek. The areas of competence identified by Wiek's research are only partially or completely ignored in the great majority of cases.

ICB3 Project management competencies	Sustainability competencies (Wiek et al.'s research)				
	<i>Systems thinking competencies</i>	<i>Anticipatory competencies</i>	<i>Normative competencies</i>	<i>Strategic competencies</i>	<i>Interpersonal competencies</i>
<i>Technical competencies</i>	There are no mentions of technical skills that link the causes to the effects.			The ability to plan and implement interventions is full covered	
<i>Behavioral competencies</i>			Partially covered in terms of interacting with stakeholders to achieve the same objective, but there is no clear reference to the project manager's need to understand sustainable principles.		They are entirely representative of the personal qualities that a project manager should possess.
<i>Contextual competencies</i>	Partially covered by the field, organizations must deal with processes, systems and resources on a regular basis. The incorporation of sustainability may be included in the contest.	There is no mention of a medium-to-long-term system view.		Evaluate the context include also the social and environmental issues and its constraints.	

Table 1. Comparison between ICB3 and sustainability competencies

The real turning point is the release of ICB4, which defines sustainability as the ability to manage long-term effects and results, even while working on time-limited projects. The guide encourages a mindset that incorporates sustainability into all phases of the project's life cycle and managerial decisions. In fact, the project manager should be able to understand the broadest operational area and take appropriate actions.

The three pillars of "Perspective, People, and Practice" (PPP) represent the key dimensions of project management in the IPMA Competence Baseline4:

- **Perspective:** this dimension refers to the analysis of the project's context, which includes social, economic, and environmental factors. Covers the ability to recognize opportunities and challenges;
- **People:** this dimension represents the interpersonal and personal skills necessary to successfully manage a project, include aspects such as teamwork, leadership, communication and social responsibility;
- **Practice:** this dimension relates to the technical and methodological skills required to organize, execute, and monitor a project. These could include environmental impact analysis, sustainable resource management, and social impact assessment.

In comparison to the previous edition, this new version places more emphasis on flexibility and the adaptation of competencies based on the specific needs of the project and organization.

Finally, it has been demonstrated that there has been an evident evolution in the way sustainability is integrated into project management practice, in particular, it has been included as an explicit component of the competencies required of project managers. In fact, it is expected of project managers to assess how projects affect surrounding communities, resources, and environment in addition to completing project objectives. This more explicit approach to sustainability considers the evolution of global challenges and expectations in the context of sustainable project management.

In conclusion, it is clear from the literature that while many studies have examined project manager competencies in general (PMBok, ICB, ISO 21500:2012 and Prince2), there are relatively few that have examined project management competencies in the context of achieving more sustainable project management. Although some progress has been made, the literature about this topic is still expanding.

2. LITERATURE REVIEW

Over the past ten years, the concept of sustainability in project management has grown, particularly in literature, where it has attracted increased attention. More authors have been exploring the intersection between sustainability and project management practices, particularly in the emerging field of Sustainable Project Management (SPM).

2.1 Sustainable Project Management: Definitions and implications

Although SPM is a new concept, it is no longer a very original one in literature, in fact, from 2012 to the present, around 80% of publications on the subject have been published (Sabini L, Muzio D. & Alderman N., 2019). Regarding the nationality of the authors, contributions can be identified from a broad range of countries, recognition of the fact that sustainability is becoming a more pressing global issue.

According to some authors (Friedrich K., 2021) (Albert, M. & Mickel, F., 2019), there are several definitions of sustainable project management, that vary in what is represented. However, the most influent statement is provided by Silvius & Schipper (Silvius A.J.G. & Schipper, R. P.J., 2014b):

“Sustainable Project Management is the planning, monitoring and controlling of project delivery and support processes, with consideration of the environmental, economic 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.”

Similar to that, Armenia et al. (Armenia, S., Dangelico, R., & Pompei, A, 2019), explain sustainable project management as: *“the managerial practice aiming at pursuing project objectives by maximizing economic, social and environmental benefits through the proactive involvement of stakeholder, the consideration of the extended life cycle of resources, processes, and effects, and continuous organizational learning”*.

In both definitions we can see the importance of actively engaging stakeholders in achieving social, environmental, and economic goals, but the lack of clear guidelines on how to do arises from the fact that project management's field is varied and multidisciplinary.

The current literature presents two approaches to understanding and developing the connection between project management and sustainability, divided into: “sustainability of the project” and “sustainability by the project”. The first category covers sustainable practices across the project's phases and procedures throughout its lifecycle, independent of

the end objective of the project. This affects the mechanisms for stakeholders identification and engagement, monitoring, risk identification, communication, project team selection and organization. The second concept, on the other hand, is about developing something sustainable, independent of how PM procedures are carried out (e.g., a solar power plant, wind turbines, energy efficiency buildings). The two notions considered can coexist inside the same project, since both of them are based on the triple bottom line perspective. It may be concluded however, that Sustainable Project Management relates most to the concept of “sustainability of the project”, which is the approach taken into consideration in this study.

Silvius et al.'s survey examined how areas of typical project management steps (initiating, planning, executing, monitoring, and closing) may incorporate sustainability principles (Silvius A.J.G.; Schipper R.; Planko J.; Van der Brink J. & Köhler A., 2012). Their research led them to the conclusion that sustainability should be foreseen in the project's scope and objectives during the initiating and planning phases, and then can be included in the subsequent processes and methodology during the execution and monitoring stages. While the closing phase should be utilized to stabilize the amount of resources, materials, and energy that have been used. In fact, based on Toljaga-Nikolic et al.'s opinion, initiatives that yield inadequate outcomes cannot be considered sustainable (Toljaga-Nikolić D., Todorović M., Dobrota M. & Obradović T., 2020).

Moreover, adopting sustainable project management requires a certain amount of adaptability and receptivity to project-level change, particularly in the context of a social or environmental setting, where uncertainty is present. Sustainability can help prevent, evaluate, and manage risks by analyzing and mitigating potential hazards that the project may face, for example, actions aimed at reducing the waste of human resources and capital. According to Silvius et Schipper (Silvius A.J.G & Schipper R., 2015) sustainability pertains to the coexistence of nine fundamental principles: balancing or harmonizing social, environmental, and economic factors, short- and long-term orientation, local and global perspective, consuming income, not capital, about transparency and accountability, stakeholder involvement, prevent damage to the community, reduce waste and last sustainability is about personal and ethical values. The authors concluded that all nine sustainability principles influence the previously mentioned phases.

Organizations should apply sustainable project management principles not only to accelerate society's sustainable development, but also to gain a competitive advantage in the market. In fact, sustainability has emerged as a primary concern and a crucial metric for company

performance, so SPM can be viewed as an advantageous strategy that helps organizations deal with present-day and emerging sustainability challenges (Chofreh A.G.; Goni F.A.; Malik M.N.; Khan H.H. & Klemeš, J.J, 2019). As demonstrated by Michaelides et al. (Michaelides, R.; Bryde, D. & Ohaeri, U., 2014), sustainable project management practices lead to significant achievements, such as easier access to the capital market in the future, higher customer loyalty, supply chain improvements, capability development, long-term improvements in operational performance and efficiencies, positive organizational image and credibility, and more. Additionally, sustainability raises the quality of a project, making it more valuable to stakeholders and boosting project profitability.

However, the notion of a project's success can be interpreted in several ways. According to the classic project success approach, meeting the scope, time, and cost objectives is crucial, while for Shenhar and Dvir (Shenhar A.J. & Dvir D., 2007) the following additional strategic characteristics of project success must be taken into consideration: project efficiency, team impact, customer impact, business impact, and direct achievement as well as future readiness. As an example, in the field of construction, beyond the traditional parameters pertaining to monitoring project performance (cost, quality, schedule, process efficiency), Pulaski and Horman (Pulaski M. H. & Horman M., 2005) have created additional four characteristics representing sustainable objectives: safety/health, maintainability, resources used, and leadership in energy and environmental design (LEED) credit.

Since every project is unique, different projects have different success criteria (Muller R. & Turner R., 2007). In recent years, stakeholders' perceptions of project success have been taken into consideration when defining success, but it is acknowledged that various individuals will define it differently.

Critical success factors (CSFs) are features, conditions, or variables that, when appropriately sustained, maintained, or managed, can significantly affect the project's success from the standpoint of project management (Patanakul P. & Milosevic D., 2005). Various studies have revealed disparate CSFs and a lack of agreement among researchers, regarding the standards for evaluating project success and the variables affecting that success (Fortune & White, 2006). Furthermore, several researches, focusing on CSFs, have shown how context affects the characteristics considered most important and the validity of the relationship between certain CSFs and success.

The criteria used generally relate to these areas of knowledge: project management actions, project procedures, human factors, external issues and project related factors. However, as

there is no single method of assessment, the consideration of sustainability as a design standard can also be seen as a critical element of a project's success.

According to the literature, incorporating sustainability has reduced environmental harm, improved social benefits, increased compliance with laws and standards, and decreased health and safety concerns (Carvalho M.M. & Rabechini R., 2017).

The adoption of sustainable approaches by projects can result in a grade. In fact, organizations frequently use voluntary standards, like ISO rules, to ensure the quality and dependability of the goods and services they supply. These could apply to several industrial sectors and address various business topics, but only in the last several years have these certifications begun to take into account the sustainability into project management as a criterion. Examples include ISO 14001, which focuses on environmental management and provides guidelines for implementing, maintaining and improving an environmental management system within an organization; ISO 26000, which offers a set of principles and rules for incorporating social responsibility into business activities and decision-making processes; and ISO 9001, which focuses on quality management and can be integrated with sustainability criteria. These rules provide reference points and guidelines for incorporating sustainable practices into business project and activity management, helping organizations become more aware of and accountable for the environmental and social impact of their operations (Marcelino-Sadaba S., Gonzalez-Jaen L. & Perez-Ezcurdia A., 2015).

Finally, the strategy that a company has chosen to implement must include projects to ensure that day-to-day activities are in line with long-term goals.

2.2 Common Macro - themes

Evaluation and effective application of all three sustainability pillars – social, economic, and environmental – stand as imperative for achieving sustainability into project management practices. As stated by the authors Alvarez-Dionisi, Turner, and Mitra (Alvarez-Dionisi L. E., Turner, R. & Mitra, M., 2016) the three factors are interconnected and must be managed competently in order to achieve their effective implementation. Their research delineates how the project's strategy and perspective significantly influence the application of the triple bottom line method, varying between projects. Consequently, a need has been noted for the development of generally recognized criteria that are applicable to most projects, in order to assess and determine their potential for sustainability.

Comprehensive evaluation of literature revealed several overarching themes, crucial for the integration of sustainability principles in projects (Marcelino-Sadaba S., Gonzalez-Jaen L. & Perez-Ezcurdia A., 2015), notably focusing on:

- Stakeholder management;
- Life cycle management;
- Evaluation and decision-making processes.

Other measures that can be taken to ensure the sustainable management of a project include: minimizing waste through the responsible and efficient use of resources, selecting innovative technologies, considering the resilience and adaptability of the project – in fact, the resilience of the project to environmental, social and economic challenges is crucial - and putting in place effective monitoring systems that can help identify areas for potential improvement.

In the following paragraphs there is an in-depth discussion of the three most common macro-themes that emerged from the literature review.

2.2.1 Stakeholder management

Applying sustainability theory to the PMI's definition of a stakeholder, which is "*an individual, group, or organization who may impact, be affected by, or perceive itself to be affected by a decision, activity*" produces a far larger number of individuals involved in the project (PMI, 2017). Achieving sustainable stakeholder management means actively involving and understanding the needs, issues and interests of the many parties participating in the project. Identification of the project's social, environmental, and economic effects on the various stakeholders depends on this proactive and transparent involvement.

According to Achterkamp and Vos, active involvement of interested parties helps to define specific standards for sustainable results and activate organizational procedures in accordance with these standards (Achterkamp M. & Vos J.F., 2006), while for Singh et al. (Singh R.K, Murty H.R, Gupta S.K & Dikshit A. K., 2007) stakeholder involvement helps to formulate the indices that are used to evaluate the project's sustainability. Both agree that engagement from stakeholders is essential to reaching a consensus on what constitutes a sustainable process or product in a particular project.

Organizations and governments, as well as businesses and customers, need to work more closely together to build more sustainable systems; indeed, decisions need to be made at multiple levels of society, including individuals, businesses, and national and international organizations. Many times, national and international authorities' rules, regulations

and standards obstruct sustainability, but when all stakeholders - both direct and indirect - are involved, the best possible outcome can be reached (Hanssen O.J, 1999).

There are two main subfields in the literature on stakeholders' management: strategic and moral path. The latter is primarily concerned with striking a balance between the interests of stakeholder groups, while the former emphasizes a proactive oversight of stakeholder interests (Frooman J., 1999). However, to accomplish sustainable stakeholder engagement, project managers must strike a balance between private economic, social, and environmental goals from any interested group, not just those with more power or those who are directly involved. Developing a sustainability strategy is one of the first challenges in operating a project in a more responsible manner, so managing stakeholders can be considered a technique for linking the approach to ethical and social issues (Singh R.K, Murty H.R, Gupta S.K & Dikshit A. K., 2007).

Achterkamp and Vos (Achterkamp M. & Vos J.F., 2006) suggested a framework based on the queries of who should be involved, inside and outside the organization, at what stage of the project, and how. In comparison to those who were not engaged, the authors predict that groups who participate in stakeholder involvement will be more dedicated to the outcomes. This indicates that the selected participants have a higher probability of acting in accordance with the sustainability standards proposed during the stakeholder engagement process. Furthermore, beyond the traditional definition of the triple bottom line (people, planet, profit), an additional criterion has been included, which is to consider any potential negative effects related to the project and equally distribute them among each of the stakeholder groups.

As an alternative, according to the findings of De Brucker et al. (De Brucker K., Macharis C. & Verbeke A., 2013) in a complex project, with several participants, a stakeholder-oriented multi-criteria analysis (MCA) is required to appropriately involve and address a range of sustainable development issues in the decision-making process. A practical example is provided by Tam et al., who identify stakeholders' communication as the key to achieving better environmental management and performance, particularly in construction projects. The reliability and efficacy of the communications are crucial for facilitating effective collaboration, so as a result, a communication mapping model for environmental management (CMEM) is proposed in their study (Tam V.W.Y, Shen L.Y, Yau R.M. & Tam C.M., 2007).

To sum up, all the sources found agree that stakeholders' involvement and management are essential to giving them a holistic view of the project and enabling their participation in integrating sustainability.

2.2.2 Life cycle management

In terms of life cycle management, sustainability focuses on analyzing and optimizing each stage of the project, from planning and development to implementation, monitoring and closure, in order to reduce environmental, social and financial impacts.

Adopting a sustainable approach requires an interdisciplinary perspective and might happen at various project stages. For example, from the beginning phase of research, a business can explore novel technologies and procedures, implement a sustainable design, apply production techniques that reduce waste, and make effective use of available resources. Actually, the life cycle approach takes into account not only the project execution but also the preceding and subsequent phases, including resource management, waste management and energy management.

According to Marcelino-Sadaba et al. (Marcelino-Sadaba S., Gonzalez-Jaen L. & Perez-Ezcurdia A., 2015) there are various ways in which life cycle management might be executed: within construction projects, the life cycle of the building and the project have a significant overlap, in particular during the phases of building design and construction. Tsai et al. affirm to minimize environmental impacts during construction, a Life Cycle Assessment (LCA) must be carried out. LCA is a robust and globally recognized system analysis instrument that measures energy conservation and efficiency evaluations over the span of material life cycle (Tsai W.H , Lin S., Liu Y. Lin W.R & Lee K.C., 2011). Although Life Cycle Assessment (LCA) techniques are commonly associated with the life cycle concept through the implementation of ISO 14040, the focus of life cycle management goes beyond LCA.

Within the context of products, Umeda et al. (Umeda Y, Takata S., Kimura F., Tomiyama T., Sutherland J.W., Kara S., Herrmann C. & Duflou J.R, 2012) contend that life cycle considerations—which may include eco-design and design for the environment—should be the primary focus of product design, while from a process perspective, factors to take into account are process planning and phase design. Accordingly, they suggest a three-stage framework for life cycle development: (1) preparing a comprehensive life cycle model for the product and life cycle plans that take the social, environmental, and economic aspects into consideration, (2) the team draws out life cycle flow design and product design from a

life cycle viewpoint, and (3) the team puts the planned product life cycle into practice, such as setting up the supply chain.

In summary, a process involves multiple life cycles, each of which interacts to improve the environment, society and economy over the life of the project.

2.2.3 Evaluation and Decision-making processes

When sustainability is a factor to be considered, it's critical to know how to make decisions that will ensure the project's responsible development. This is because the decision-making process is always difficult and heavily influenced by the environment in which the project is produced.

Pope et al. (Pope J., Annandale D. & Morrison-Saunders A., 2004) state that, before project manager and his team start considering their options, it's often crucial to outline the pertinent sustainability concepts, objectives, and criteria as fully and realistically as feasible. Drafting a sustainability assessment is an essential step for decision-making processes. Usually, this assessment has two primary objectives: to minimize "unsustainability" and to satisfy TBL criteria and, in most cases, are based on indices and indicators.

Selecting appropriate indicators is a subjective choice, in fact adds uncertainty to the process. Decision-making may be influenced by the way that data are selected, their accuracy, processing, standardization, diagramming, weighting values, and aggregate approaches (Singh R.K., Murty H.R., Gupta S.K. & Dikshit A.K., 2009). In order to estimate the level of accuracy and improve the transparency of data, sensitivity analysis and uncertainty are especially helpful.

In actuality, the sustainability assessment process differs greatly based on the manner of decision-making is carried out, and the specific jurisdiction of the government. Furthermore, due to the various facets of sustainability, the analysis will be always multicriteria, and on several occasions, there will be also many objectives (Marcelino-Sadaba S., Gonzalez-Jaen L. & Perez-Ezcurdia A., 2015) (Bond A., Morrison-Saunders A. & Pope J., 2012).

Sabada et al. discuss decision-making in terms of choosing the most suitable project as well as, once the project has been selected, choosing the most sustainable procedure, so the one that yields the best indicators or indexes. To make the decision, Singh et al. (Singh R.K, Murty H.R, Gupta S.K & Dikshit A. K., 2007), have developed a selection technique based on composite indicators. The composite sustainability performance index, or CSPI, measures sustainable performance across the three pillars of sustainability: economic,

environmental, and social, in the context of the steel industry. After being assessed, sub-indices were combined to create the CSPI. Other dimensions of sustainability have been taken into account including organizational governance and technological. The CSPI is the result of evaluating and averaging sub-indices. Following that, the analytical hierarchy method (AHP) is employed to determine the relative importance of sustainability indicators and sub-indicators at various levels.

Because the effects of a project can last longer than the project itself, all authors agree that stakeholders should be included in the decision-making process.

As a conclusion, we can state that when there are multiple decision-making paths, it is necessary to evaluate the choices made in order to guarantee sustainable development, both at the pre-planning phase and during the project's development.

A comprehensive summary of the various strategies presented by the authors on the macro issues addressed in the discussion of sustainable management, can be found in the table below.

Macro - themes	Achterkamp et al. (2006)	Klaas De Brucker et al. (2013)	Singh et al. (2007)	Tam et al. (2007)	Umeda et al. (2012)	Pope et al. (2004)	Sadaba et al. (2015)
Stakeholder engagement	Introduce a framework based on the issues of who should be involved, when, and how in a project. Additionally, consider any potential negative effects and equally distribute them among each of the stakeholder groups.	Introduce stakeholder-oriented multi-criteria analysis and social cost-benefit analysis to appropriately involve and address a range of sustainable development issues.	The involvement helps create the metrics that assess the sustainability of the project.	Communication-mapping model.			
Life cycle management	Activate organizational procedures consistent with sustainability criteria.				They suggest a three-stage framework for life cycle development: developing a thorough life cycle model, draw out life cycle flow design and put the planned product life cycle into practice.		Analysis on various ways in which life cycle management might be executed.
Evaluation and Decision-making		Multi-criteria analysis and social cost-benefit analysis.	Analytical Hierarchy Process based on CPSI (composite sustainability performance index) to determine the relative importance of sustainability indicators and sub-indicators at various levels.	Communication-mapping model.		Drafting a sustainability assessment to outline the pertinent sustainability concepts, objectives, and criteria.	Analysis will be multicriteria, and on several occasions, there will be also many objectives.

Table 2. Recurring macro-themes when integrating Sustainability into Project Management

Finally, to achieve a sustainable project management practice, all levels of the organization must share the same understanding of what it means: a company must develop a culture that values sustainability through the transfer of best practice and knowledge.

Organizational learning is an emerging topic on how a business gains knowledge, improves its capabilities, adapts to its operations, and generates new ideas based on past experiences.

In addition, organizational learning is the capacity to adapt and change in response to new information, barriers, or external changes (Schulz, 2017).

2.3 Narrative Perspectives

Sabini et al. (Sabini L, Muzio D. & Alderman N., 2019) divided the SPM narrative into three different perspectives, specifically, the incorporation of sustainability within PM practices answers to three different concerns. This categorization has effectively showcased the various approaches found in literature. The first narrative (the *why*) is about the benefits that sustainability adds to PM, as well as reasons why it should be incorporated into project management processes. The second dominant narrative (the *what*) examines the characteristics and key points of SPM and determines how they vary from traditional PM techniques and, the last narrative (the *how*), identifies practical methods for implementing SPM.

The following paragraphs develop an in-depth study of the narratives that were previously cited.

2.3.1 Why - The Reasons

The first analysis looks at the potential reasons for businesses to adopt sustainability. The motivations tend to be different, some of these are purely ethical and moral (Silvius A. J. G., Schipper R.P.J. & Nedeski S., 2013), others emphasize that including sustainability within PM practices improves the organization's resilience to changes as well as the long-term results (Perrini F. & Tencati A., 2006). However, the most frequently cited reason is economic in nature. As we have already mentioned, using SPM practices ensures a competitive advantage in the market, improves economic performances and increases credibility with stakeholders (Michaelides, R.; Bryde, D. & Ohaeri, U., 2014).

Moreover, the public's opinion serves as the basis for a broad range of organizational decisions, in fact as stated by Carvalho and Rabechini, (Carvalho M.M. & Rabechini R., 2017) the success of the project is increased when project managers are encouraged to take into account adverse social and environmental effects.

Adopting these changes, particularly within the corporate culture, is a challenging process that requires the evolution of an organization's core processes and brings benefits in both the short and long term. Furthermore, Perrini and Tencati (Perrini F. & Tencati A., 2006) argue that to achieve full implementation, a system of regular assessment must be in place to ensure ongoing progress.

2.3.2 What - The Trade off

The following narrative discusses the methodologies that need to be introduced in respect to traditional PM practices. The authors Sabini et al. (Sabini L, Muzio D. & Alderman N., 2019) have examined three different perspectives regarding the possibility of facing new challenges: at the macro-level, taking into account long-term effects on the whole project environment, at the project level, considering the various trade-offs that could arise and at the micro-level, focusing on the single project manager's set of activities.

The first perspective analyzes how, in contrast to traditional PM practices, long-term consequences to the community, stakeholders, and the business are taken into consideration. When a project is implemented responsibly, even though it is just temporary as mentioned above (Silvius A. J. & Schipper R. P.J., 2014a), its effects can still be beneficial or detrimental over the long term.

The second refers to the primary problems that could occur with integrating sustainability, in the same way as the traditional PM Iron Triangle, trade-offs are necessary. In essence, Martek et al. (Martek I., Hosseini M., Shrestha A., Zavadskas E. & Seaton S., 2018) said that sustainability is a "*trade-off between three competing ambitions: environmental protection, economic growth, and fairness for people*". Several authors in literature studied techniques to identify a trade-off analysis method, which vary from identifying sustainable success factors to developing frameworks or guiding principles, to concentrating on stakeholder interactions. However, everyone seems to agree that PM needs to adapt in order to handle the challenges of managing new practices and techniques.

The final perspective focuses on the decisions made by an individual project manager. Actually, the project manager is the one who primarily contributes more to the planning of the sustainability objectives in the projects, thus, it is crucial to understand the decision-making procedures used (Carvalho M.M. & Rabechini R., 2017). Numerous variables can impact, such as the specific competencies required and the motivation supporting the decisions. Silvius (Silvius A. J. G., 2017) found that the majority of project managers are more focused on the triple constraint criteria—that is, time, cost, and quality—than on the triple bottom line aspects. Sustainability objectives are generally implemented when they are aligned with business objectives or when they are required by law. Therefore, for sustainability criteria to be more substantive and achieved, stakeholders need to be actively involved throughout the process.

2.3.3 How - The Frameworks

The final narrative, that was identified by Sabini et al., deals with the evaluation and representation of specific and useful frameworks for putting SPM into practice. Although the tools have often been tested on specific projects, this does not limit their potential for generalization.

In 2010, Iris Oehlmann was one of the first to provide a useful framework for comparing projects based on the implementation of sustainability (Oehlmann I., 2010).

The model, known as "The Sustainable Footprint Methodology", was developed during the author's work on TAQA's Bergermeer gas storage project. Oehlmann has designed a 3 by 3 matrix in which the three pillars of the triple bottom line: people, planet and profit, are represented on the horizontal axis, while on the vertical axis there are three phases that a project faces during its life-cycle: project pre-planning, project execution and asset operation. The last three levels ensure a comprehensive perspective, that is not limited to project implementation; in fact, it is necessary to adopt the framework from the beginning, as early sustainability decisions will affect subsequent stages. The decision to limit the number of levels to three, for the purpose of describing project management phases, stems from the fact that different projects require different phases, and in order not to overlook any of these phases, it seemed necessary to group them into macro-cluster. Then, many sustainability indicators are defined in each matrix cell. For example, in the horizontal People row, the "Customer" indicator, in the pre-planning phase, describes how the use of the product will affect the overall quality of life of the customer and the community, while the "Society" indicator, during project implementation, means avoiding corruption, acting competitively and complying with law. Furthermore, questions are used to designate the ones that are not measurable or quantifiable. These indicators are not independent of each other, some improvement or worsening of one may lead to the increase or decrease of others, and some of them can be found in more than one project phase.

This framework can be used by the project manager to weigh up trade-offs and understand the impact of the project, but there are limited opportunities for cross-project benchmarking.

On the other hand, Verrier et al. (Verrier B., Rose B., Caillaud E. & Remita H., 2014) suggested a tool that compares the companies using Lean and Green performance metrics. The authors developed it using a case study research methodology based on 21 French industrial companies.

The Lean methodology helps companies reduce waste to increase productivity, save costs and improve quality through continuous development. It aims to eliminate seven types of waste: excess production, waiting, transportation, defects, improper processing, unnecessary inventory and unnecessary movement. The primary objective of the Green Methodology is also to reduce waste (excess water, electricity and resources, excess waste, pollution, greenhouse effect and eutrophication), but it also focuses on the social and environmental dimensions, taking into account community health and poverty.

The authors have concluded that by combining the two methods, it is possible to determine the optimal practices to follow in order to achieve sustainable development goals. The green and lean indicators were built on the results of three qualitative and quantitative questionnaires submitted to the stakeholders. The first was about each company's green awareness, the second concerned their alignment with the Lean and Green ideologies and the last was about how companies measure and quantify many types of consumptions.

At the end, the researchers presented a Lean and Green matrix that may be used to enhance competitiveness and identify and promote best practices for lean-oriented sustainable development project.

The indicators can make a reliable connection between Lean efficiency and Green effort in different companies, but they need to be more specific to better represent each business in each industry sector.

A conceptual model linking project success to sustainability was developed by Silvius and Schipper in 2015 (Silvius A.J.G & Schipper R., 2015). Using the existing literature as a basis, they have developed six criteria to stabilize a project's success and nine sustainability dimensions (mentioned in previous paragraphs) that should be taken into account in project management. Then, they developed a structured questionnaire to ask respondents about the predicted or perceived impact of a particular sustainability factor on the six project success metrics. In doing so, they were able to demonstrate that the relationship between project success and sustainability is not straightforward, but complex. One constraint of the model is that it is still too generic and subjective to be reliable for benchmarking between projects, in fact it's the least robust among the tool mentioned.

A more integrated framework has been proposed by Chawla et al. in 2018 (Chawla V.K., Chanda A.K., Angra S. & Chawla G.R., 2018). The paradigm is based on the fact that different issues for integrating sustainability may arise at different levels of the decision-

making process, involving resources with multiple roles and needs. Human resources are those who make decisions and choose an effective forward-thinking strategy for projects in a corporation, and in general, they are organized into three levels:

- Project staff (staff, supervisor and junior managers): the lowest one, their task is to implement sustainability in the projects;
- Project manager (manager, senior manager, general manager): their assignment is taking sustainability into account when planning, executing, and controlling a project and they are responsible for the training of project staff;
- The management of the project Company (high level of management, policymakers, directors, chief executive officer and the president): their responsibility is creating guidelines for project sustainability execution, evaluation, and control.

The framework consists of incorporating feedback into every action, decision, and process that will be evaluated by the company, stakeholders, and customers to take corrective action and ensure the sustainability of the project. Nonetheless, the fact that the responsibilities of human resources are not always so obvious and evident in enterprises, presents a limitation on the application of the method.

Armenia et al. (Armenia, S., Dangelico, R., & Pompei, A, 2019) provide additional insight into the topic. They proposed an innovative conceptual structure that brings together five important aspects of sustainable project management: corporate policies and practices, resource management, life cycle orientation, stakeholders' engagement, and organizational learning. Stakeholder engagement was the SPM dimension that was studied the most, whereas corporate policies and practices and life cycle orientation are the oldest sustainable project management aspects. Resource management includes, in addition to financial and natural resources, also the social capital of the organization, while organizational learning is crucial because business should learn lessons from their past efforts and make ongoing sustainable improvements.

The relationships between the five elements of the framework are shown in Figure 5, which also highlights how projects should extend their boundaries when integrating the concept of sustainability into project management.

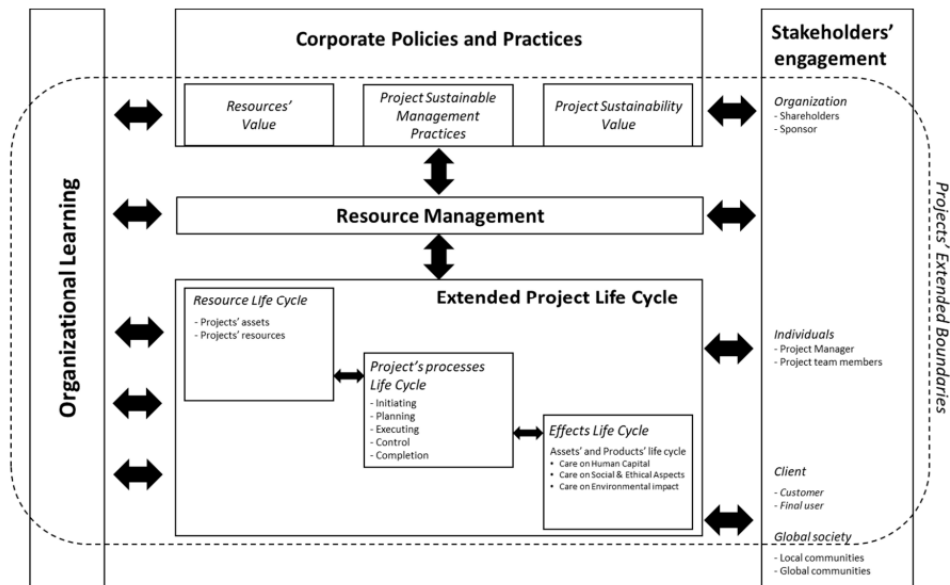


Figure 5. Armenia et al.'s framework

Nevertheless, the framework has certain drawbacks. Firstly, the research is still in its early stages, so the dimensions could be expanded, secondly the social issues are not fully taken into consideration in the methodology.

The last tool presented is the one developed by Madureira and colleagues (Madureira R., Silva C., Amorim M., Ferreira Dia, M., Lins B., & Mello, G., 2022) in 2022. The model, named “the Project Management Triple Sustainability Cube”, is intended to be a practical guide for project managers. Towards this aim, the tool provides guidelines for implementing practices in line with the environmental, social, and economic triple bottom line sustainability vectors. These rules are in relation to people, processes, and innovative solutions during the whole project life cycle.

The tool shows 3x3x3 distinct areas of sustainability practices that project managers can use for every project development. The 27 total categories are the outcome of the triple bottom line pillars' intersection with the project development life cycle phases (management, implementation, dissemination and evaluation) and the following variables dimension.

The first variable, "Processes Green Indicators", relates to general organizational practices, such as the inclusion of environmental impact in the risk assessment plan; the second, "People and Systems", focuses on the specific decisions that a project manager can make, such as the decision to print each interim report or to store them in a repository and only publish the final one. The last, "Go/No Go Digital or Innovation", looks at all the processes that influence the team's decisions to adopt more digital solutions, such as the alternative of combining all the websites into a single platform for synergy.

The advantage of this paradigm is that it can be updated and integrated more quickly, but on the other hand it relies heavily on the willingness of project managers to be change agents and their commitment to integrating sustainability. Another disadvantage is that there are no specific quantifiable indicators, most of them being qualitative.

Table 3 allows for a comprehensive overview of the cited frameworks with respect to their respective limitations.

Oehlmann (2010)	Verrier et al. (2014)	Silvius & Schipper (2015)	Chawla et al (2018)	Armenia et al. (2019)	Madureira et al. (2022)
<i>The Sustainable Footprint Methodology</i>	<i>Lean and Green indicators</i>	<i>Conceptual model</i>	<i>Integrated framework</i>	<i>Conceptual framework</i>	<i>Triple Sustainability Cube model</i>
<p>3 by 3 matrix</p> <p>Horizontal axis:</p> <ul style="list-style-type: none"> • People • Planet • Profit <p>Vertical axis:</p> <ul style="list-style-type: none"> • Project pre-planning • Project execution • Operation of the asset 	<p>Combining the Lean and Green approaches provides indicators for business benchmarking. The outcome is a <i>Lean and Green matrix</i> that can be used to identify best practices</p>	<p>It consists of a questionnaire asking to confront these two arguments:</p> <ul style="list-style-type: none"> • 6 criteria that stabilize a project's success • 9 sustainability dimensions 	<p>It consists of incorporating <i>feedbacks</i> by:</p> <ul style="list-style-type: none"> • Project staff • Project manager • The management of the project Company <p>They will be evaluated to take corrective action and ensure the sustainability of the project</p>	<p>It is made up of connections between five crucial aspects of sustainable project management:</p> <ul style="list-style-type: none"> • corporate policies and practices • resource management • life cycle orientation • stakeholders' engagement • organizational learning 	<p>3x3x3 distinct areas of sustainability practices obtained from the intersection of:</p> <ul style="list-style-type: none"> • 3 elements of the TBL • 3 phases of Project Development Life Cycle • 3 variables dimension
Constraints					
Limited opportunities for cross-project benchmarking	Indicators need to be more specific to better represent each business in each industry sector	Too generic and subjective	Dividing up the tasks among the human resources is complex	Only five dimensions are taken into account	Project managers must have a strong commitment to integrating sustainability

Table 3. A comparison of the models and frameworks in the literature

The analysis is not exhaustive due to the early stage of the topic, but it broadly covers the many types of tools found in recent literature.

2.4 Green project management

Currently, sustainable project management is yet in its initial phases, and project managers who follow its principles are still the minority, in contrast to a far more widespread approach: the Green Project Management (GPM).

The concept of green project management is centered on incorporating eco-friendly practices throughout project life cycle to reduce environmental impact, maximize resource utilization, and take social factors into consideration. This approach may involve using methodologies and tools, such as the PRiSM (projects incorporating sustainable methods) and GPM P5 standards, to assess and manage the environmental impact of projects over short and long term, on the surrounding environment.

Dr. Joel Carboni, President of GPM Global, stated, during an interview in September 2014, that the following are among the sustainable principles of green project management (Alvarez-Dionisi L. E., Turner, R. & Mittra, M., 2016):

- *Commitment & Accountability*: acknowledging everyone's fundamental rights to appropriate and suitable surroundings as well as to equal opportunity, just compensation, moral procurement practices, and respect for the law;
- *Ethics and Decision Making*: encouraging corporate ethics and making decisions that adhere to universal standards by reducing, and preventing negative short and long term effects on the environment and society;
- *Integrated and Transparent*: integrate all environmental protection aspects during reporting and governance phases and improve the link between them;
- *Principle and Values Based*: developing and utilizing resources and technologies in a way that conserves and enriches our base of natural resources;
- *Social and Ecological Equity*: paying attention to population centers and environmentally sensitive areas while taking the consequences into account;
- *Economic Prosperity*: establishing budgets and goals that balance stakeholders' needs and those of future generations.

Originally created in August 2011, the GPM P5 standards specify what and how to quantify a project's sustainability impacts. P5 extends the triple bottom line theory (people, planet and profit) to allow for the integration of project product and process, and through the use of ISO standards, GRI indicators and the UN Global Compact Ten Principles, provides the sustainability framework upon which the PRiSM approach is built. Organizations can

increase their ability to provide a comprehensive cradle-to-cradle report by implementing the PRiSM methodology (Carboni J. & Gonzalez M., 2014).

The two new critical factors are *product* and *process*, the first indicator states that the life cycle of the product has to be considered from social, environmental, and economic perspectives. A “product” is defined as any tangible or intangible service, goods, resource or outcome undertaken by an organization. Sustainability should be taken into consideration at every stage of the project to guarantee the efficacy of the product, from the design until it is delivered in its finished form. The second key factor is related to the ISO norm 21500: 2012, where the process is defined as “a set of connected activities” and the processes are categorized into three macro-groups: project management, delivery and support processes. The P5 standards take into account the effectiveness with which activities are carried out to assess the overall level of sustainability.

As stated by Carboni and Gonzalez (Carboni J. & Gonzalez M., 2014) a P5 impact study is implemented, in accordance with the PRiSM approach, since the project's pre-planning phase. The goal is to identify and rank sustainability risks and opportunities, in order to increase the project's value and ensure that it is in line with the organization's strategy and has a positive influence on the environment, society, and economy.

In contrast to the challenging to measure triple bottom line methodology, the impact of P5 is defined by a score system: every product deliverable and project procedure is evaluated ranging from a positive, neutral, or negative scale against every P5 component. The lower the value the better because it has the least impact.

The results of the P5 impact study offer important information about the problem areas from a sustainability standpoint. Then, the highlighted issues can be examined in a sustainability management plan (SMP) to suggest possible corrective actions. The implementation of an SMP increases the possibility that sustainability integration in project initiatives will be successful (Creasey, 2023).

To sum up, we can say that the GPM PRiSM methodology monitors the project from start to finish, taking into account the P5 standards, to ensure an optimal outcome in terms of project success criteria and the impact of the delivery on the economy, society and the environment.

3. RETHINKING LEADERSHIP: PROJECT MANAGERS PIONEERING SPM

Project managers are one of the key stakeholders affected by the shift towards sustainable project management practices. Project managers who prioritize sustainability support organizational goals by using more responsible methods and tools. They are more environmentally conscious, that is, they try to carry out projects without negative impact on the environment or the community, and they take into account the variety of dynamics that can arise in a team with different cultural backgrounds. In this regard, they go beyond the role of a project "administrator" focused on scheduling and control.

Hwang and Ng (Hwang B. & Ng W.J., 2013) stated that "*today's project manager fulfils not only traditional roles of project management, but also must manage the project in the most efficient and effective manner with respect to sustainability*" (Magano J., Silvius A.J.G, Silva C. S. & Leite A., 2021).

In the last years, there has also been an evolution in the way project managers are described in professional guidelines. For example, the IPMA Individual Competence Baseline version 4 states that the project manager must be able to "*assess the impact of the project on the environment and society*" and "*research, recommend, and apply measures to limit or compensate negative consequences*" (IPMA, Individual Competence Baseline Version 4.0, 2015).

Despite this perspective, the majority of project managers lack sufficient incentives to take sustainability into account when implementing projects; in fact, a number of elements and conditions still impact the project manager's desire to address sustainability.

Since sustainability is seen as a normative sense based on values that influence people's attitudes and behaviors, different project managers are likely to perceive efforts to practice sustainability differently, therefore, as we will see in the case of applicability in this study, the organization's values and culture still play an important role.

Silvius and colleagues (Silvius A.J.G. & Schipper R., 2020) conducted a survey's research to identify the determinants that motivate project managers to incorporate sustainability into their projects and after that, detailed studies were conducted to analyze the characteristics of the project management groups, such as gender, age, level of education, certification, type of project, and location that fall into these divisions (Marnewick C., Silvius A.J.G. & Schipper R., 2019) (Magano J., Silvius A.J.G, Silva C. S. & Leite A., 2021).

The three distinct stimulus identified patterns are: intrinsically motivated, task-driven, and pragmatic. The first group of project managers has included sustainability because they want to do so and it's the "right thing" to do for them. Their concerns are on the potential effects that the projects could have on the environment, the future, and the planet; they don't care about rewards, benefits, or reputation. Furthermore, there is little stimulation found in the guides by the professional associations (PMI and IPMA) or in their standards of conduct. Also, for this set of participants, the project assignment does not offer much motivation, they themselves are quite sensitive.

The second group consists of individuals that are not interested in incorporating sustainability into their practices without any incentives. They are willing to do so only if sustainability is addressed in the project's specifications or objectives, at the client's request, or in exchange for compensation. In addition, this group of project managers is strongly motivated by the value that consumers and critical stakeholders place on sustainability, even though they themselves have shown a lack of sensitivity to the practical elements involved in addressing sustainability.

On the other hand, the last group of participants, although not highly self-motivated, would take action if they saw a viable opportunity for sustainability. In this category, a large number of project managers were identified as result-oriented, as well as team and people-oriented.

Every study conducted has confirmed that the dominant trend among project managers is that they are intrinsically motivated to incorporate sustainability (Marnewick C., Silvius A.J.G. & Schipper R., 2019) (Magano J., Silvius A.J.G, Silva C. S. & Leite A., 2021). After that, on the equal footing of the two task-driven and pragmatic groups. The fact that most project managers are intrinsically motivated to think about sustainability is a consistent result that suggests project managers' motivation is not a barrier to implement SPM. The findings also show that, but not very strongly, there is a link between these three patterns: task-driven project managers adversely affected the other two patterns. Furthermore, it has been shown that the task-driven pattern is more prevalent in "hard" project types, like those related to the manufacturing, mining, and engineering industries. In fact, research findings indicate that project type and industry have an impact, while numerous social-demographic factors - including age, gender, education, and geographic location - do not demonstrate a statistically significant difference in representation within the three stimulus patterns.

However, the conclusion shared by Marnewick et al. best summarizes the findings: "*The type of pattern that determines a project manager's behavior is a personal trait*".

It is worth noting, however, that even while project managers' attention to these issues is growing, author Økland has demonstrated that there is still a gap between what effectively describes literature and how it is implemented in practice (Økland, 2015). For example, many practitioners are still reluctant to take a firm stance for fear of jeopardizing their relationship with key stakeholders or project owners who are not interested in such sustainable practices. For this reason, Silvius and Schipper (Silvius A.J.G. & Schipper, R. P.J., 2014b) concluded that, in order to effectively implement SPM, project managers need to change the way they viewed their role. Typically, they assume a subordinate role to the project sponsor and oversee the project's scope, deliverables, budget, risks and resources in accordance with the requirements of the stakeholders, but nowadays, they must also be aware of how projects affect society to take actions to mitigate any bad impacts.

It doesn't matter if project managers are actually accountable for the consequences, because the SPM is about *taking* responsibility.

From a different perspective, as stated in Sabini and Alderman's study (Sabini L. & Alderman N., 2021), we can analyze the conflicts that occur when practitioners attempt to meet all of the objectives, even when they diverge from one another.

The following are the types of contrasts that project managers may face when trade-offs related to sustainability arise:

- Projects' short-term focus and sustainability's long-term orientation;
- Organizational contradictions that arise in daily practices;
- Lack of guides and institutional support.

The incapacity of practitioners to handle paradoxical situations causes them to react a variety of ways. According to a research survey (Sabini L. & Alderman N., 2021), there are five different types of responses depending on the project context.

The first is to put greenwashing into practice, which refers to actions that appear responsible but are only outwardly displayed. It consists of a declaration of greenness rather than a true implementation of SPM. The second advocates the idea that SPM is a team effort, in contrast to the conventional notion of the project manager as a single leader who guides the project to completion, so that other stakeholders can be educated in sustainable behaviors. A common third response is to not worry about sustainability if it isn't explicitly stated among the project's requirements.

Instead, the fourth reaction consists of shifting the responsibility of implementing sustainability on other stakeholders, such as the project owner or the organization. The last one is the most drastic because the project manager believes that sustainability is an unnecessary complexity to the project, so he refuses to implement SPM practices.

However, to influence a project manager's behavior, the implications of frameworks and models need to be operationalized in daily practice through real techniques and tools. In addition to acquiring tools, project managers need to be educated about the concept of sustainability and how to apply it to their projects. Acquiring knowledge about sustainability increases awareness and can have an impact on stakeholder perspectives.

Following the previous overview of the role of the project manager, we can conclude that the project manager's function has changed throughout time: from being a planning and control-focused administrator of the project to a leadership role that contributes to the project's shaping. Every practitioner is different, and the role of a leader can be interpreted in many ways. Today, however, more and more project managers are trying to take environmental and social factors into account, always based on individual skills and values as well as the complexity and standards of the project.

4. A2A S.P.A. – CASE STUDY

After analyzing, in the previous chapters, the current literature and the frameworks proposed over the years, this section will try to illustrate the efforts to integrate sustainability into the practice of project management made by the department of the Organization where I had the opportunity to do my internship. My aim is to present the outcomes of a practical situation in which the issue has been addressed, analyzing what steps have led to the final result and how their attempt differs from traditional frameworks.

To proceed with the internal initiative, it is necessary to first contest the company where I conducted my internship, as the contest also affects the outcomes.

4.1 Company overview

During my academic career, I had the opportunity to work as an intern at the Italian multi-utility A2A S.p.a. from September 2023. I was placed in the Project Management Office (PMO Pooling), where my role was to monitor and support internal projects within the Group.



Figure 6. Group logo

A2A was founded on 2008, January 1st by the merger of AEM S.p.A. Milano, ASM Brescia S.p.a., and AMSA. The histories of AEM, AMSA, and ASM have been entwined since their founding because of the proximity of the people they serve, and the similar services offered. This has made it possible to create a single, coherent reality. The motivation behind the merger was the desire to become more competitive in the Italian multi-service market. Actually, A2A stands for the top operator in managing urban waste in terms of tons waste, recovering energy from waste and by volume heated with district heating. Furthermore, after moving from multi-utility to Life Company (January 2021) the Group has paid increasingly more attention to the Italian energy market; in fact, in a short period of time, it has become the second operator for: distribution of electrical energy, generation of installed total

capacity from renewable energy sources (hydroelectric, solar, bioelectric, and wind) and the fourth operator for sold electrical energy.

The Company is a leader in the development of renewable energy sources and distribution networks. It has a competitive advantage thanks to its distinctive business strategy based on technology, sustainability and quality.

Being a Life Company means ensuring people's safety, alongside an understanding of the territory, investing in the provision of essential services, long-term sustainability, transparency, innovation in all business activities, and responsible marketing campaigns.

The biggest tangible commitment to become a fully functional Life Company, was the development of the industrial plan for the next ten years. The industrial 2021-2030 plan was presented in 2020 with the goal of achieving significant targets, with 16 billion euros invested on the development of the circular economy and the energy transition; likewise, the slogan *"Life is our duty"* was chosen. The plan's investment portfolio aligns with 11 ESG (Environmental, Social, Governance) objectives, with about 85% of investments matching the UN Sustainable Development Goals and 65% the European Union's Targets.

In the coming years, A2A hopes to lead the sustainable growth of the Country by implementing an economy that considers energy, water, and environment for creating new values. In addition, given the positive trend in the first three years of the plan, which has accelerated industrial growth and the transformation into a Life Company, the Group has set itself even more ambitious goals in its strategic plan for 2024-2035, always keeping sustainable development as a central theme.

A2A's approach is centered on sustainability, in fact the company supports the idea that natural resources should be utilized cyclically, such that *"value is the only thing that exists"*. By 2030, they hope to have completed 40% of scale-up projects, which will position Italy as the world leader in the energy transition with 100% of capital expenditures going toward SDG-supporting initiatives.

The following statement, set out in the Company's profile, explains the approach the business wants to take for the next years:

"Our business approach is a tangible and quantifiable contribution to a shared, sustainable, and respectful world in the future."

Renato Mazzoncini, CEO

The importance of the 'S' of ESG is very evident in the Company's strategy, demonstrating that the people within the company (more than 13,000 employees) are valuable assets that are significant in relation to other capital.

The other corporate capitals that are considered for strategic operations are as follows:

- *Financial capital*: the economic resources that are utilized in production processes;
- The *manufacturing capital* consists of all the real estate, physical assets, machinery, and equipment used in the production of services;
- *Natural Capital*: environmental processes and resources;
- *Human capital*: the abilities and experiences of A2A individuals;
- Our *intellectual capital* consists of our knowledge and skills;
- *Relational Capital*: sharing of values and relationships with stakeholders to increase collective wellbeing.

Numerous internal initiatives have been launched in recent years to advance the process of transforming into a Life Company. Examples include the digitization of corpus of documents, the Technical Academy initiative to promote the exchange of skills between generations, the use of suppliers evaluated with an ESG score, and the publication of a sustainable procurement policy. Additionally, a managerial initiative has been launched, which will be explained in detail in the following chapters, to introduce sustainable practices into project management activities.

Furthermore, by 2040, the main goal is to achieve carbon neutrality on direct and indirect emissions (i.e., scope 1 and scope 2) 10 years in advance of the Paris Agreement. This will be possible through gradual combination of some interventions, such as the development of renewable energy, carbon capture solutions, and a phase-down of carbon-intensive businesses.

As a result, the Group has been added, for the third consecutive year, to the list of 500 companies (*Europe's Climate Leaders, 2023*) that most effectively reduce their footprint and strive to keep global warming to 1.5°C.

4.2 Business model

The Group has a divisional organizational structure with centralized operations. The objective of each business unit is to independently oversee the essential activities of each business segment, as shown in Figure 7.

The several business units that comprise the Company are detailed as follow:

- *Generation and trading*: management of trading activities on national and international markets for all energy-related commodities (such as gas, electricity, and environmental resources) and management of the generation plant portfolio;
- *Market*: deals with the sale of natural gas and electrical energy to open market customers as well as the marketing of these products to clients under protection. Furthermore, the focus is on providing services related to energy efficiency and electric mobility;
- *Environment*: the activities are related to managing the integrated waste cycle, which includes material and energy recovery, small-scale material and energy treatment, and waste collection and storage. Also, manage external activities aimed at providing know-how and technologies to realize pre-treatment requirements.
- *Smart Infrastructures*: develops and manages functional infrastructure activities related to the multifaceted services the Group offers. The BU oversees the whole integrated water cycle, furthermore, develops infrastructures in the field of telecommunications, proposes solutions and applications aimed at realizing new city and territory models, builds and manages a network of renewable infrastructure functional to the electrification of transportation;
- *Corporate*: covers advisory, strategic direction, coordination, and control functions related to management, as well as business and operational support services.



Figure 7. A2A Business Unit

The connection between all business areas, which distinguishes A2A, is the strategic key to effectively contribute to the energy transition and the circular economy of the territory.

Through mergers, sales, and liquidations, A2A Group grew its total number of companies from 130 to 163 between 2018 and 2021 (update: 1/1/2022). A2A, in other words, is a collection of several societies, each within their own market-specific business unit.

Despite being a publicly traded company at first, the organization's nature has changed significantly over time. As disclosed to Consob, actually 25% of the shares are owned by the municipality of Milan, another 25% by the municipality of Brescia, and the remaining percentage is put up for sale. The category in which A2A equities are listed in the FTSE – MIB is the "Public Utilities - Electricity" sector.

Geographically speaking, A2A S.p.a. has expanded more into northern Italy, with a focus on Lombardy, where the company's origins are situated. It currently expanded its activities and made several acquisitions around Italy and Europe, as can be seen in Figure 8. Its activities are mostly focused on producing energy and gathering waste, especially in the regions of Lombardy and Piedmont, Apulia and Calabria.

Revenue more than double from 15.549 million in 2021 to 23.166 million in 2022, as a result of continuing growth (Source: A2A-budget-integrated-2022).

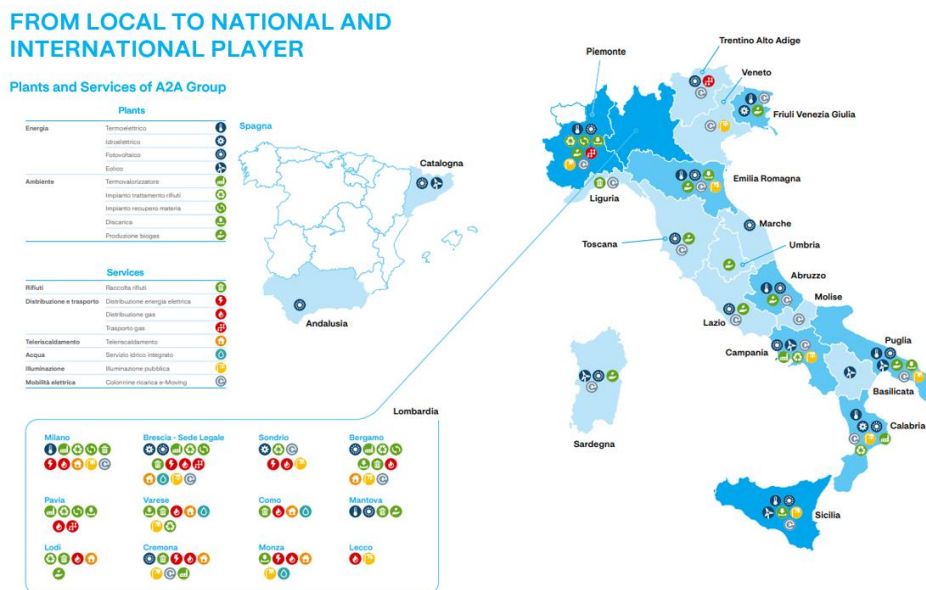


Figure 8. A2A Map - Source: budget-integrated-2022

In summary, the goal of the A2A business model is to create long-term, shared value for the Organization and the community.

In fact, A2A has established a set of principles, operational procedures, organizational tools and policies that, when combined, help the various business units within the Group to integrate and manage sustainability.

4.3 Project Management Sustainability Program

During my internship I was hired into the Project Management Office (PMO), which oversees the optimization of internal projects within the Group. The team is quite dynamic and includes about thirty members.

Following is a summary of the PMO's business structure's mission:

- support the preliminary stages of the procurement process by providing input in assessing and estimating PM/PMO needs on planned project initiatives and evaluating the possibility of internalization, consistent with project objectives and facility capacity;
- participate in the setup phase of projects by supporting the planning of activities and guiding the definition of the project team structure;
- support, as part of the projects followed, the communication of the progress and main results achieved by the projects to Top Management and establish and maintain a project knowledge base accessible by all stakeholders;
- supervise and operationally monitor the projects' performance, tracking and communicating potential risks and important concerns in an organized manner, and proactively initiating steps for relevant mitigation;
- ensure proper integration and appropriate synergies between projects by identifying and subsequently monitoring possible technical-functional interdependencies between project streams, supervising and facilitating inter-functional communication between different stakeholders;
- organize and carry out quality assurance tasks by leading teams to guarantee that project management protocols are followed, that project goals are fulfilled on schedule, and that allowed delivery quality levels and standards are met;
- promoting enterprise-wide project management standards and practice by centrally developing and maintaining processes and templates for project management;
- encourage "lessons learned" from projects by fostering best practices in project management inside the organization.

It is in this context that the internal corporate initiative, called the “Project Management Sustainability Program”, was born. The initiative was launched in July 2022, in order to fulfill the sustainable development goals (SDGs) outlined in the 2021-2030 business plan, and represent the Group's sustainability mission. Given this, project governance is essential

to ensuring that ESG (Environment, social and governance) concerns are taken into account in corporate management.

The project was launched to establish sustainability in project management as an achievable goal in the context of A2A. Indeed, the main objectives of the initiative are to improve the quality of project deliverables, making them more sustainable throughout their lifecycle, to create a corporate standard for sustainable PM within the Group, and to pay greater attention to the needs of stakeholders.

The following sections analyze the project in three distinct steps, the first covering the literature review and preliminary brainstorming, the second the prioritization and maturity models adopted, and the third the practices found and the adoption phase.

4.3.1 Conceptualization phase

This first step consists of an internal analysis of the literature and a call to action from PM professionals. The aim of this step is to identify the macro guidelines that should be considered when developing a sustainability framework for projects.

According to Silvius and Schipper (Silvius A.J.G. & Schipper, R. P.J., 2014b), integrating sustainability into PM practices requires a shift in focus from managing scope, cost and time to managing social and environmental impacts. Starting from the principles of project management (Iron Triangle) and extending the literature with Ebbesen's research (Ebbesen J. & Hope A. J, 2013), a call to action was issued to redesign the triple constraint triangle to include sustainability.

Ebbesen's study is based on a survey of 17 project managers who were asked to rethink the Iron Triangle from a sustainability perspective. One of the initial issues was the slight variation in the concept of the Iron Triangle. While most participants discussed the three restrictions as time, cost, and scope, other professionals instead mentioned resources, time, and scope or functionality. However, the majority of project managers indicated that the three fundamental elements were interconnected and essential to project success.

What was lacking was a common understanding of the issue of sustainability; while some participants seemed to understand the Brundtland definition, and they discussed the issue in terms of social, environmental, and economic responsibilities, others considered sustainability only from a single dimension, rather than adopting a more comprehensive triple bottom line perspective. In addition, one participant brought up the idea of Corporate

Social Responsibility (CSR), stating that it is a crucial factor for project managers to take into account in order to define a project and, as a result, deliver better outcomes.

Following these observations, the final results of the task were four interpretations, as shown in Figure 9.

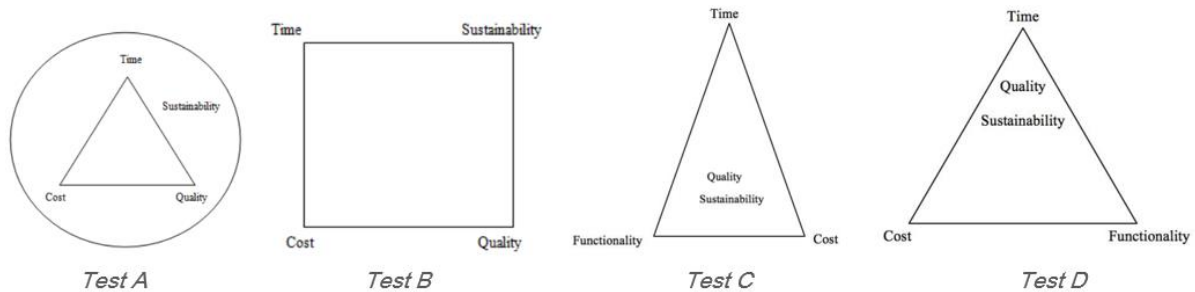


Figure 9. Integrating sustainability into Iron Triangle

Test A suggests that they see sustainability as an issue that the project had to deal with, rather than as an additional dimension. In all areas, sustainability is the driving force behind the project. On the other hand, the adjacent figure, called the "Iron box," interprets sustainability as another constraint that should be considered. The respondents in test C aim to convey that project constraints, such as time, cost, and functionality, are equally significant for project success. The positioning of quality and sustainability in the middle of the triangle indicates that these two concepts are the result of balancing the other three, in fact, according to the participants, the main factors influencing project quality and sustainability are time, cost, and functionality. The final interpretation attempts to show the Iron Triangle as an enlarged version of itself. Project managers clarify that, in order to be sustainable, project resources must be "returned to nature," which will raise the cost, duration, and functionality of the project.

The results of the study show that while practitioners see sustainability as a critical component to be considered in project planning and delivery, there is disagreement about how sustainability principles should be incorporated into projects and where the issue stands in relation to traditional time, cost and quality constraints.

Thus, after reviewing the available literature and failing to find a unique roadmap for integrating sustainability principles into PM practices, the PMO Pooling department has succeeded in defining its own Iron triangle.



Figure 10. Integrating sustainability into Iron Triangle: internal initiative

Figure 10 includes sustainability within the three constraints, indicating that it should become a long-term benchmark for proper project management. Project sustainability should maximize the other three variables and be quantifiable over time, resulting in a system of thorough KPIs that provide a quantitative method.

After identifying the macro-guiding principles that need to be considered when developing a sustainability framework in projects, structured brainstorming sessions, with PMO Specialists, were held to identify potential project-specific sustainability interventions.

During the workshops, 4 project phases were identified: *initiating*, *planning*, *executing*, and *closing*. Participants were required to individuate at least one action, target, or area of intervention to be focused on, in order to maximize sustainability in each of the project's four phases, as depicted in the example in Figure 11.

	TIME	COST	QUALITY
<i>Initiating</i>	<ul style="list-style-type: none"> Schedule a capacity review 	<ul style="list-style-type: none"> Make/Buy analysis that takes into account the need for training resources Sustainability project Cost Model 	<ul style="list-style-type: none"> Sustainability Stakeholder Map Sustainability Assessment Model
<i>Planning</i>	<ul style="list-style-type: none"> Sustainable management KPIs with stakeholders Communication plan 	<ul style="list-style-type: none"> Identifying and formalising possible cost saving opportunities Mitigation solutions 	<ul style="list-style-type: none"> Multi-project KPI register Internal scouting for proposal of most suitable technological tools
<i>Executing</i>	<ul style="list-style-type: none"> Rationalise the number/duration of planned meetings, focusing on quality and objectives 	<ul style="list-style-type: none"> Prioritise and maintain a steady pace without going over budget Analysis of potential savings 	<ul style="list-style-type: none"> Ongoing collection of feedback Transparency in the approach Planning fixed internal alignments
<i>Closing</i>	<ul style="list-style-type: none"> Planning with stakeholders external Follow-Up to the project 	<ul style="list-style-type: none"> A cost comparison Vs. the planned Detailed analysis of deviations (extra costs) 	<ul style="list-style-type: none"> Checking project sustainability KPIs by data analysis Review Lesson learned

Figure 11. Brainstorming session - Example

Following the initial brainstorming sessions, a set of sustainability interventions were identified for each project phase. In addition, a degree of alignment with the three dimensions of sustainability (economic, social and environmental) was assigned and indicators of impact on time, quality and cost were identified for each group of interventions to make the analysis more objective.

The interventions of the initiating phase were primarily focused on cost and quality outcomes, as supported by the scope of the project phase under examination: formulating project objectives. The TBL dimensions most affected by the interventions of this project phase were the social and economic ones. Indeed, it is crucial to analyze and plan stakeholder involvement during the initialization phase. This includes sharing the costs and benefits of the project and ensuring that communication is open and transparent to all stakeholders. As with the GMP P5 analysis tool, one of the key interventions at this stage is to ensure openness and transparency in meeting project objectives, and to interact with stakeholders along the way to promote organizational learning.

During the planning phase of the project, the interventions focused primarily on the quality and time aspects of the Iron Triangle, while the TBL elements focused on the economic dimensions. Part of the sustainability interventions involved trying to increase the operational efficiency of the project and finding ways to adapt to needs in order to achieve a higher level of sustainability. The success of a project is often attributed to its planning; it is essential to have a thorough work plan that always includes opportunities for reporting to stakeholders and for verifying the sustainability management KPIs.

The social dimensions have outweighed the other TBL components during the project execution phase, and the interventions were almost evenly distributed among the three Iron Triangle dimensions. The aim of the sustainability interventions proposed at this stage was to promote a sustainable mindset among team members and other stakeholders to encourage the adoption of more sustainable decision-making processes. The monitoring of results activity has a high impact on reaching the scope, but KPI management is not always simple to apply and requires adequate effort.

In the closing phase interventions focused on the quality dimension. Given the significant weight placed on stakeholders during this phase of the project, the social components outperformed the other TBL components in terms of impact. In fact, the main objectives of the interventions were to ensure that the lessons learned could be applied to future projects and to implement change management monitoring measures.

4.3.2 The prioritization and maturity model

Once the potential interventions in different phases of the project life cycle had been identified, they were optimally prioritized, to be defined and tested on projects later on. The MoSCoW methodology was used to prioritize interventions at an initial macro level.

The MoSCoW technique is commonly used in Agile project management to assist teams in setting priorities and choosing which features or activities to concentrate on. Encouraging a clear comprehension of priorities and assisting in the delivery of the most crucial components first.

The method makes use of four priority categories:

- *Must have*: constitutes an essential intervention for achieving sustainability goals (Minimum Usable Subset);
- *Should have*: is a very important aspect that should be included in the work that is done;
- *Could have*: is an optional, but desirable requirement. They are taken into consideration only when time and resources permit;
- *Won't have*: are purposefully left out of the current project scope.

The interventions were divided into the previous four groups based on the added value that each intervention could have on the sustainability of the project.

For example, the definition of an integrated "trade-off matrix" of the sustainability component is a "must have" intervention to be implemented during the initiation phase and always at the same project phase, a "won't have" practice is to consider the sustainability KPI as only an administrative component of the project. A "should-have" intervention is to monitor the sustainability achievements through a log, while a "could-have" intervention is to offer the most appropriate technological tools for tracking sustainability objectives.

Therefore, the interventions that *must have* come first should be considered, followed by those that *should* and *could* have been implemented. While those categorized as *won't have* were practices not to be adopted.

After the initial qualitative macro-prioritization of the interventions, there was the model creation and development phase, which considered the input of the surveyed specialists and the selection of new assessment dimensions for the quantitative analysis: the interventions' transformative impact on project output and the complexity of their implementation.

However, before creating the maturity model that will assess the project's readiness to receive and adopt sustainability interventions, it is necessary to take into account the project's characteristics to ensure this maturity model can be applied to different projects.

Among the common knowledge about project characteristics, the ones that show up most frequently in the literature are (Weaver P., 2010): project size and duration, project type, project degree of technical difficulty, team and number of departments, hard and soft skills of PM practitioners, complexity of stakeholder relationships and project degree of uncertainty, particularly with regard to sustainability integration. Some of these characteristics have been grouped under the complexity dimension, which is essential for applying different project types and evaluating their results using the suggested model.

Two new evaluation criteria have, therefore, been identified to categorize interventions: interventions' transformative impact and complexity of implementing sustainability interventions.

The impact has been measured using the potential benefits that the sustainability intervention provides to the 10 project management knowledge domains (Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resources Management, Communications Management, Risk Management, Procurement Management, and Stakeholder Management). Based on the assumption that some knowledge areas have a greater impact on sustainability objectives than others, a weighting percentage has been assigned to each area, which either increases or decreases the assigned impact value. Particularly, a greater "weight" has been assigned to the following three pillars: quality, resource and stakeholder. The percentage ranged from 13% (dimensions of stakeholder management) to 5% (integration management).

Additionally, the transformative impact has been measured for each field of knowledge using a Likert scale ranging from 0 to 3, customized for each intervention.

For example, the participant was asked to rate the impact of the interventions on the project's communication quality using a Likert scale, considering the knowledge area of Communications Management inside the project. More specifically, it investigated whether the intervention had any positive effects on the quality of the project's communication (0), had a slight improvement on the established targets (1), had a positive impact (2), or improved all of the established targets (3).

In this case, the targets identified were effectiveness in communicating the message to the appropriate audience and effectiveness in using the communication channels.

Finally, the impact of each intervention was determined by the average of the impact ratings in each knowledge area.

The other variable taken into account when developing the model was the complexity of implementing the interventions. The following four dimensions have been used to quantify implementation effort, in terms of people and time, as well as the capacity and willingness of the business to apply them:

- People component indicates the number of stakeholders required for the initiative's implementation. It is general knowledge that projects with many stakeholders are more difficult overall;
- The necessary effort to carry out the intervention, taking into account factors such as time, cost, and the level of knowledge or specialization required;
- Awareness refers to the current level of understanding in business context of the importance of the intervention;
- Readiness is the current level of business capacity for accepting an initiative, considering the organizational and technological requisites that are necessary.

To provide an objective assessment of each intervention, a point score based on the Likert scale (0-3) was also allocated to each dimension. The overall complexity of each intervention was derived from the arithmetic median of the four categories.

Following the initial phase of classification, a graphic representing the impact and complexity was developed. If the intervention is found to have high impact and low implementation complexity, it falls into the "to do" category and should be tested and improved before others; on the other hand, if the tool falls into the high complexity, low impact category, it will not be tested at all. The category "high improvement" refers to interventions that have a significant impact on the project, but also result very complex; the category "low improvement" refers to interventions that have a low influence on the project's output but are not complex. Both of them would be tested and evaluated later on.

The division of groups is depicted in Figure 12.

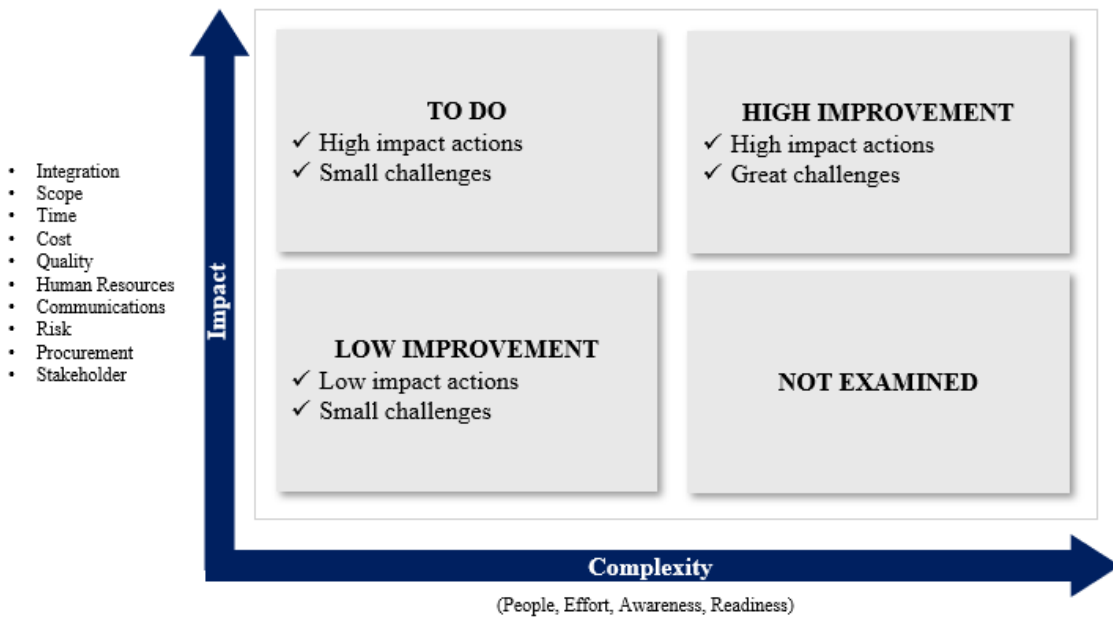


Figure 12. Maturity Model development for assessing project's readiness to implement sustainable interventions

After the first division, the interventions within each category were prioritized utilizing the Moscow results' prior findings. Prioritization has allowed efforts to be focused on interventions with higher added values. Figure 13 illustrates that the implementation plan gave priority to the interventions located in the upper left section of the matrix.



Figure 13. Maturity Model

4.3.3 Adoption phase

The adoption phase involved providing participants with interventions to test in their own work, based on the project's needs and level of development.

Nearly forty sustainability interventions were tested, of which only twenty were ultimately found to be viable project management practices that could be put into practice. From the initial range of interventions available, through the testing phase in a multi-stakeholder participatory project, some were fine-tuned, some were eliminated because they were not considered useful or feasible, some were grouped under a single framework because they were considered comparable.

Sustainability interventions have resulted in the development of practical and methodological tools that can support the project manager throughout the life cycle of the project. Some examples include the “Sustainability Stakeholder Map”, a strategic tool that allows to survey key project stakeholders, analyze their level of influence on sustainability performance and use the information to identify actions that will maximize their level of engagement and satisfaction or the “Sustainability Project KPI”, which is a guide developed in 3 macro-phases: defining sustainability KPIs, identifying areas of interest, and tracking and reporting on the outcomes.

All the main aspects of sustainable project management covered in the literature are affected by these frameworks: stakeholder management, decision making and life cycle management. Furthermore, depending on the specifics of the project, the project manager may decide to use a mix of tools at different stages of the project's development. On the other hand, from the point of view of putting the model into practice, the project manager's decision-making skills are still crucial.

In order to make sustainability a key component of business project management, a set of five guidelines called the "Sustainability Golden Rules" has been developed. They outline best practices for more sustainable project management and encapsulate the methodological tools identified. The overall purpose of the "Sustainability Golden Rules" is to synthesize the lessons learned during the initiative and to establish a standard corporate guide for project managers. They are the result of combining project management knowledge with sustainability aspects. These guidelines have been published in the “Project Sustainability Handbook”, which has been shared inside the Company in April '23. Through the development of the “Project Sustainability Handbook”, each intervention was linked to one

or more sustainability categories (created within the PMO project), which were based on the United Nations Development Goals (SDGs) to align the initiative with the strategic objectives of the Company plan 2021 - 2030. In this way, the actual contribution in terms of sustainability of the proposed interventions was verified.

This initiative may have paved the way for further scalable initiatives within the Company to achieve greater sustainability in all its operations. In addition, the initiative can be integrated and improved in the future thanks to organizational learning, the process by which a company focuses on its ability to learn from its successes and failures, as well as from its own experience. In fact, due to the dynamic nature of this project and its inherent subjectivity to change, the “Sustainability Golden Rules” identified can be supplemented with new perspectives not yet analyzed.

This initiative is only the first step towards future research projects, which could be implemented in the business strategies for continuous improvement.

4.3.4 Highlights

This paragraph highlights the weaknesses and strengths of the corporate initiative “Project Management Sustainability program” mentioned earlier, along with the main identified gaps. A comparison is also made with other frameworks found in literature.

Firstly, the Organization appears to be using a waterfall approach to project management, with a well-established macro program plan at the outset. Although the idea of bringing the interventions together in a single handbook was developed towards the end of the initiative. From the beginning of the project, dedicated resources were identified for the operational monitoring of the activities, managed by the project governance. Moreover, specific moments were set aside for sharing the results and feedback with the entire PMO Pooling structure and certain moments of confrontation were scheduled. Thus, every phase of the project (initiating, planning, executing, monitoring and closing phase) was addressed.

The participants in the workshop (PMO Specialists) were involved in all phases of the project, but what was lacking was a structured change management process, both in the pre-planning phase and post completion.

Change management is crucial for dealing with business transformation. Its aim is to support individuals in the process of change, which in this case is to guide them towards a new organizational culture, as people are the most important part of the process. It is therefore important to educate them about change and explain the importance and benefits of business evolution and innovation. In the absence of this approach, there is a risk that the initiative will be seen as a one-off project with a beginning and an end, rather than a continuous business improvement project.

In this case, however, more reliance was placed on the individual's willingness and ability to bring about change.

The objectives of the initiative were clearly defined from the beginning. They included aligning the project scope with the A2A Group's sustainability mission, developing tools that better prioritize stakeholder needs and defining a sustainable business PM standard. Such goals have been defined in accordance with the Organization’s awareness of and willingness to embrace the change paradigm.

Compared to other frameworks, identified in the literature, this set of methodological tools addresses all dimensions of the triple bottom line (people, planet, profit) by categorizing interventions according to sustainability dimension. However, as in Madureira et al.'s Triple

Sustainability Cube model (Madureira R., Silva C., Amorim M., Ferreira Dia, M., Lins B., & Mello, G., 2022), to put into practice the tools, project managers must have a strong commitment to effectively integrate sustainability into their projects, as they decide how a project will be implemented. In addition, as a heterogeneous set of sustainability interventions, care must be taken to apply them at the appropriate stage of the project's maturity, otherwise the benefits of using the methodological tool will be lost. To this end, the project manager's decisions are crucial.

Unlike the frameworks analyzed previously, the creation of the methodological tools is based on brainstorming sessions with several project managers, and not based on a specific project. In fact, the model allows for project-specific considerations by offering flexible application choices and integration with existing frameworks.

Similar to Chawla et al's integrated framework (Chawla V.K., Chanda A.K., Angra S. & Chawla G.R., 2018), practitioners feedback has been instrumental in improving the methodological tools for ease of use.

The analysis was conducted qualitatively through prioritization using MoSCoW and quantitatively by calculating transformative impact and complexity of application, unlike some of the frameworks identified in the literature, which have no quantitative evidence. These methods allow for comparison of individual sustainability interventions, but do not permit cross-project benchmarking.

Following these considerations, strengths and weaknesses of the corporate initiative can be identified.

The main strength lies in adopting an integrated approach that considers traditional project management criteria (time, cost, quality) in relation to sustainability dimensions. Secondly, in the active involvement of stakeholders through structured brainstorming sessions and, the use of the MoSCoW intervention prioritization methodology, to ensure a clear understanding of priorities and focus efforts on the most critical activities.

The development of a maturity model then enables the assessment of project readiness for sustainable interventions based on transformative impact and implementation complexity. Furthermore, sustainability interventions have evolved into useful tools for project managers, facilitating sustainability integration into project governance.

The project focuses on a topic which is still being explored, this gives it the opportunity to integrate new perspectives and methodologies.

The first weakness observed is the identification of the complexity of implementing interventions relies on assumptions and depends on the specific circumstances of the project, as does the transformative impact assessment based on a subjective Likert scale. Then effectiveness of integrating sustainability into projects depends on the competence and sensitivity of practitioners in using guidelines and tools provided.

In addition, there are insufficiently planned Key Performance Indicators (KPIs) to evaluate long-term impact on business results and overall sustainability and to monitoring the effectiveness of sustainable project management practices.

Addressing these weaknesses could further strengthen the corporate initiative and improve its overall effectiveness in promoting sustainable project management practices.

At this stage, the maturity model is designed for project management practices, but it can be extended to assess the integration of sustainability in other areas. Therefore, this initiative may be easily scaled up and replicated inside the Organization because it provides a methodological approach to be adapted.

5 CONCLUSIONS

The research, which aimed to determine whether it would be possible to incorporate environmental and economic factors into project management practices, found that while numerous attempts have been made, there are numerous challenges to overcome. Thus, to address the previous research questions: "What can be done in terms of integration of economic, environmental and social aspects into project management practice?" and "What are the limits and benefits that this new shift can bring?" a literature review was conducted with the purpose of examining common themes related to the topic, as well as motivations, trade-offs, and existing frameworks.

There were few examined frameworks that provided the reader with specific, concrete suggestions, the majority of the models' output was more theoretical than practical. Even so, several sustainability interventions might be added to the current practice to incorporate TBL characteristics into project management.

As the study explores, a key player in implementing the transition to a more sustainable model is the project manager, whose competencies and expertise depend on his or her natural motivation and willingness to address sustainability challenges.

One of the shortcomings mentioned is the imprecise definition of sustainability in a practical sense, which was further amplified by the diversity of ideas that emerged from the literature review. Still, it appears that different perspectives on the function of sustainability exist within the field of research. The most widely accepted definition of sustainability in project management stemmed from Elkington's research and was based on the concept of triple bottom line. Furthermore, as the topic is still in its infancy and is not addressed much in project management guidelines, project managers do not have any behavioral guidelines. Therefore, when faced with these issues, they respond in different ways, sometimes even outside of the goal of integrating sustainability.

As the research suggests, the first step is to shift the role of the project manager from being a planning and control-focused administrator to that of someone who is aware of the project environment and can manage it effectively. To achieve this, it's essential that project managers have the right incentives, whether they are ethical, or whether they integrate sustainability as a project requirement or stakeholder demand. In addition, since there is no guide that can be considered as a complete set of rules in the field of sustainable project management, it is necessary to provide them a set of practical actions and interventions. In

this sense, the mentioned initiative has tried to fill the gap with the maturity model developed to enable decision-making. Always starting from the necessary premise that to implement change, an organization must support innovation and the evolution of conventional management practices.

There are currently just a few management approaches that have been adopted and applied, such as Green Project Management, which focuses on incorporating environmentally friendly and sustainable practices throughout the project life cycle. But what is still missing is an overall view which includes environmental, social and economic dimensions and long-term goals.

In addition to the limitations mentioned above, it's worth noting the nascent state of the literature surrounding the research study.

With more practical results and case studies, a body of best practice in sustainability integration can be built up, possibly even with a more sector-specific focus. Future research on this topic could also examine the current state of practical measures, in order to assess the alignment of proposed actions and develop a comprehensive set of recommended actions for practitioners on a global scale.

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