NTNU

Kunnskap for en bedre verden

Department of Mechanical and Industrial Engineering

TPK4115 - Applied Project Management

THE ROLE OF EDUCATION IN PROMOTING SUSTAINABILITY IN PROJECT MANAGEMENT

Pre-Report

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4th May 2023

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1 Focus of the investigation

The increasing awareness of climate change and the urgent need to reduce our impact on the environment has led to a growing interest in sustainability, both in our personal lives and in our professional environments. Sustainable projects are initiatives that aim to reduce the negative impact on the environment and promote sustainable practices. The workplace has a crucial role to play in promoting sustainable practices and implementing sustainable projects. However, many workplaces lack sufficient knowledge and understanding of sustainable practices and projects, which can hinder their ability to contribute to environmental sustainability.

The goal of this investigation is to find the benefits a company gets from educating its project managers in sustainable projects. The investigation will mainly rely on research, both from a literature study of relevant academic articles and from our own user interviews.

2 Value and impact

Providing education to project managers about sustainability in projects can have significant value and impact on a company. One of the primary benefits of educating project managers is that it can lead to better decision-making in both project planning and execution regarding sustainability. A project manager with a good understanding of sustainability can identify opportunities to reduce waste and conserve natural resources to minimize the environmental impact. This will not only benefit the environment but also create value for the company as it will reduce expenses and improve the company's reputation as a green organization.

Another benefit of sustainability education for project managers is that it can have a positive impact on income. Sustainable projects can create long-term economic value by enhancing the stakeholder's trust and the company's reputation. This can lead to more projects, and access to more funding, investment, and other resources.

Lastly, educated project managers can help to implement sustainable practices in the organization's culture. This can create a sustainability-oriented culture where sustainability becomes an integrated part of every decision and every project. As a result of this, the company can achieve long-term sustainable growth.

3 Potential stakeholders

This investigative project is primarily research-based, and as such, the number of stakeholders and their level of relevance will be limited by the defined timeframe and scope of the project. However, if the project were to be implemented on a larger scale, the following stakeholders would be of significant relevance:

- Project Managers
- Lecturers
- Companies ordering projects where sustainability is relevant (customers)

The mentioned stakeholders are relevant considering that lecturers will be responsible for the education about sustainability, project managers will receive the education and customers will be motivated by the values that are generated.

4 Risk

Risk management is an essential proactive tool that seeks to increase predictability and reduce uncertainty in project planning. A crucial component of successful project management is the development of a robust project risk assessment plan. The plan should encompass four crucial components: risk identification, risk analysis and prioritization, risk response planning, and risk monitoring. By considering these components, project managers can proactively manage potential risks and ensure that the project stays on track while achieving its objectives.

Following the identification of potential risks, the risks were subject to a probability and consequences analysis, and categorized within a 3x3 matrix as shown below. The matrix facilitated the identification of critical, significant, and marginal risks.

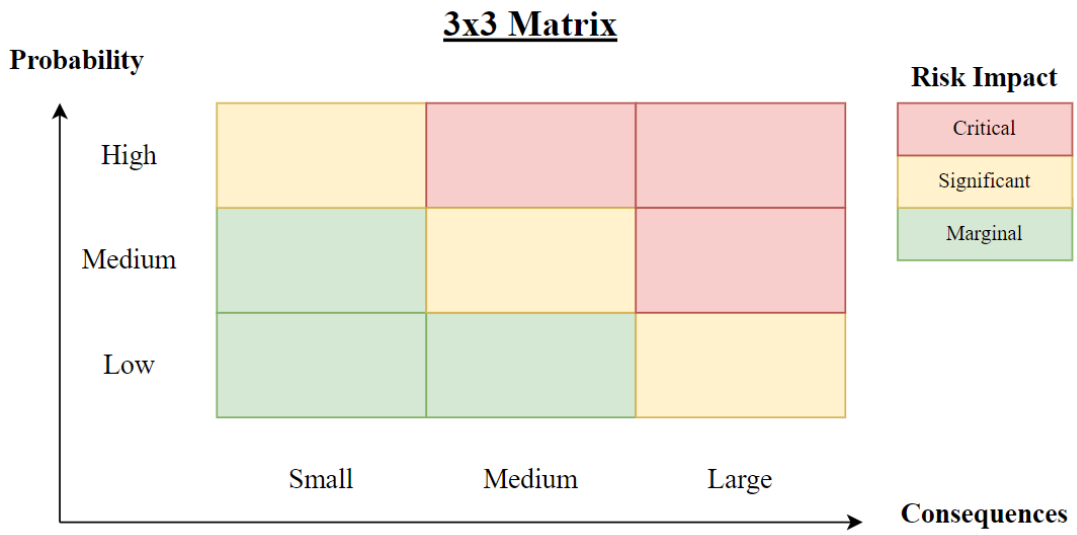

Figure 1: 3x3 Risk Impact Matrix

We conducted an analysis of the identified risks, taking into account their potential impact on the project and the probability of their occurrence. Our findings are summarized below: Table 1 presents the categorization of each risk according to its consequence, probability, and overall impact. Meanwhile, Table 2 outlines the control measures and mitigation strategies associated with each identified risk.

Risk Identified	Consequence	Probability	Risk Impact
Poor communication between group members	Large	Medium	Critical
Conflict or disagreements among group members	Medium	Medium	Significant
Failure to meet project deadlines	Large	Medium	Critical
Lack of clarity on project objectives or scope	Small	High	Marginal
Technical problems with virtual collaboration	Small	Low	Marginal

Table 1: Risks

Risk Identified	Control measures	Mitigation strategies
Poor communication between group members	Establish regular meetings and communication channels, assign clear roles and responsibilities, and encourage open communication and feedback	Encourage active listening during meetings and set communication expectations, such as response time, frequency, and honest communication. Use collaboration tools such as shared online documents
Conflict or disagreements among group members	Establish a conflict resolution process and encourage open communication and respect for differing opinions	Use the established conflict resolution process to address the issue and find a mutually acceptable solution
Failure to meet project deadlines	Establish a project timeline and set clear deadlines within the group, monitor progress regularly, and allocate resources effectively	Immediately communicate with the project manager and team members to develop a plan to get back on track. If there still are problems, contact the professor in the course
Lack of clarity on project objectives or scope	Establish clear project objectives and scope in the early phase, communicate project goals and expectations clearly, and monitor progress regularly	Ensure that all group members agree upon the project's objectives or scope through a detailed project initiation document outlining the project's purpose, goals, scope, and deliverables. Encourage them to seek clarification if something is unclear.
Technical problems with virtual collaboration	With issues such as internet connectivity problems, establish alternative collaboration methods, and maintain share files on Google Disk	Ensure the shared online documents are regularly updated after meetings and work sessions. If video meetings do not work, consider phone-calls or in-person meetings.

Table 2: Risk with control measure and mitigation strategy

5 Acquire skills

Table 3 contains the skills we consider to be relevant when conducting an investigative project based on research:

Skill	**How to acquire skill**
Collaboration	Proper coordination of tasks and ensuring effective cooperation of all.
Time management	To acquire the skill of time management, the group has decided to implement specific and measurable goals and tasks, which will be prioritized based on their importance. Furthermore, a planner should be created to ensure efficient progress tracking.
Organization management	The group members have been assigned specific roles and responsibilities to facilitate learning of the key principles of organizational management, including planning, organizing, directing, and controlling.
Research	Since everyone in the group have written a project thesis last semester, the members have strong research skills, including the ability to conduct literature reviews, analyze data, and draw feasible conclusions based on the research.
Critical thinking	Proper evaluation of source material and its origin is important to ensure the quality of the project.
Analytical skills	Important in order to solve problems during the duration of the project, as well as create creative and rational solutions with available information.

Table 3: Skills

Most of the skills listed above are learned by being students at the university, for example critical thinking, collaboration, and time management. Skills such as research ability have been heavily exercised while writing the project thesis last fall. This is something all team members did because we are all 5th-year students.

6 Breakdown structure

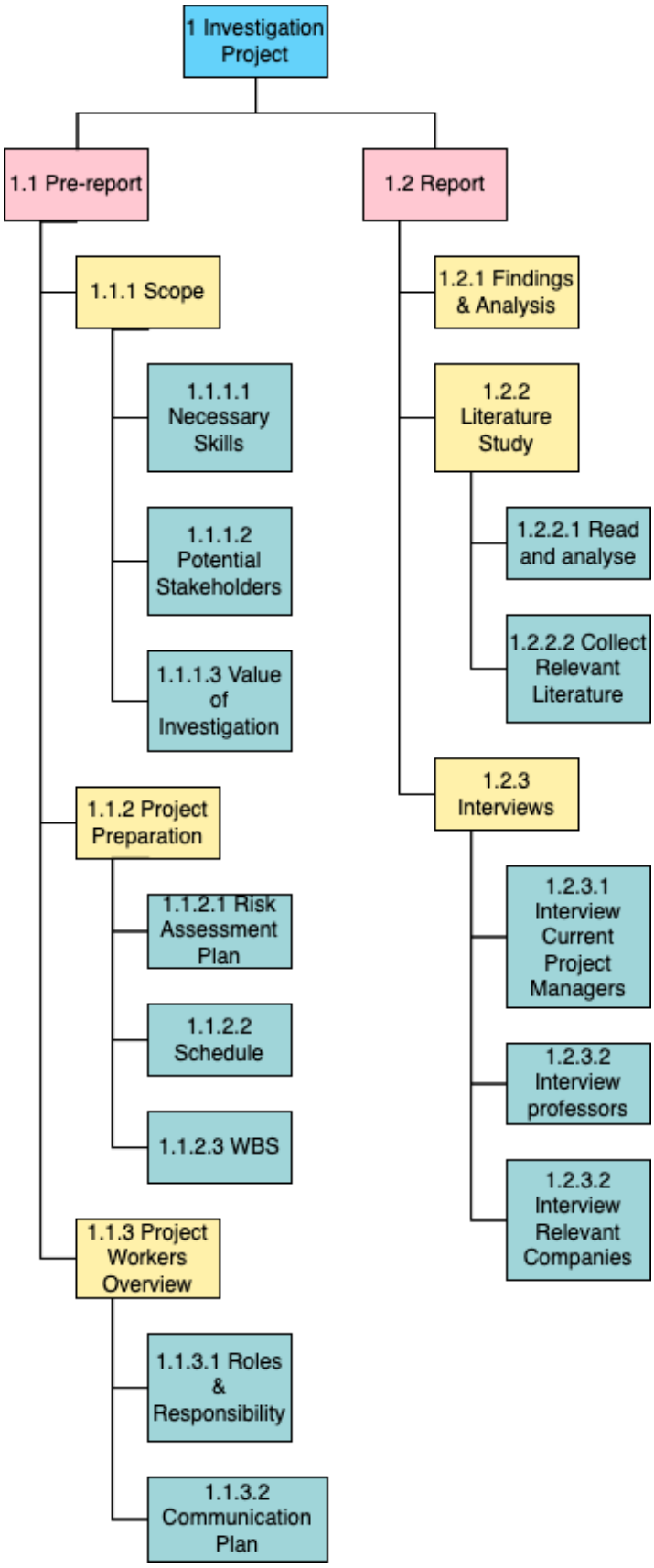

Figure 2: Overview of Work Breakdown Structure

7 Schedule

Table 4 represents the predicted schedule for the project with the activity, the duration, and the preceding activity listed.

Activity	**Duration (Weeks)**	**Preceding Activity**
A: Necessary Skills	1	None
B: Potential Stakeholders	1	None
C: Value of Investigation	1	None
D: Risk Assessment Plan	2	A: FS0, B: FS0, C: FS0
E: WBS	1	None
F: Project Schedule	1	E: FS0
G: Roles & Responsibility	1	None
H: Communication Plan	1	G: FS0
I: Collect Relevant Literature	3	None
J: Read & Analyse	3	I: FS0
K: Interview Project Managers	2	None
L: Interview Professors	2	None
M: Interview Companies	2	None

Table 4: Schedule

8 Success factors

The most important success factors that our group should adhere to in order to succeed in the project are:

- Realistic and clear objectives and goals
- Clear feedback within the group of stakeholders
- Different viewpoints
- Realistic schedule and sticking to it
- Proper communication with stakeholders
- Proper communication between team members
- Involvement of interview objects
- Good and comprehensive project risk assessment plan
- Good measurement
- Problem solving

9 Roles and responsibilities

The following subsection is going to describe the different roles and responsibilities. Our team has three different roles: Project manager, Project manager assistant, and Team member, as seen in Table 5.

Project manager responsibilities: Coordination between the stakeholders and team members, monitoring of the project schedule and agenda maker.

Project manager assistant responsibilities: Overtakes responsibilities from the project manager if absent, responsible for the engagement of team members and a third person if disputes happen. The assistant is also responsible for document and file sharing.

Team member: Creation of new ideas and execution of tasks established on the project schedule.

Student	Role
10045	Project manager
10063	Project manager assistant
10013	Team member
10017	Team member
10130	Team member

Table 5: Team members and roles

10 Communication plan

It's important for the team to establish clear communication channels and expectations from the outset. Regular communication, collaboration, and effective document sharing will be key to the team's success. Below the main parts of the communication plan are described.

Meeting schedule: The group should meet at least once a week to stay updated on project progress, discuss any issues, and plan for the following week. However, depending on the project's complexity and deadlines, the frequency of meetings may need to be adjusted. The team should agree on a meeting schedule that works best for everyone. The regular meeting will be Wednesdays at 13.00.

Fixed agenda: It's recommended to have a fixed agenda for group meetings. This will ensure that the team covers all necessary topics and keeps the meeting focused. The agenda should be shared with the team before the meeting to allow them to prepare and contribute effectively. The project manager, with input from the rest of the team members, is responsible for preparing the agenda.

Meeting location: The group should agree on a meeting location that is convenient and easily accessible to all team members. This could be a physical location or a virtual one, depending on the team's preference and circumstances. A physical location is preferred and the project manager is responsible for booking a room at NTNU Gløshaugen.

Document sharing platform: The team will use Google Drive for exchanging, storing, and sharing documents. The platform chosen allows team members to access documents easily and collaborate in real time.

Communication with external stakeholders: The project manager is appointed as a point of contact for external stakeholders. The point of contact should be responsible for organizing communication with these stakeholders and keeping the team updated on any relevant information.

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Abstract

This report investigates the importance of sustainability in project management and the education of project managers in this field. It consists of a literature study that provides a theoretical background on the topic and describes similar work, as well as a small case study where different project managers were interviewed. The study finds that while many companies and universities have recognized the need to educate project managers on sustainability, the current education is insufficient. The interviewees highlighted the importance of incorporating sustainability into project management education and training to promote sustainable practices and help project managers prioritize sustainability in their work. They also underlined the current lack of education, resources and framework in terms of sustainability. This report does not investigate how project managers should be educated, but identifies the need and possible improvement in project management education in sustainability could cause.

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1 Introduction

In recent years, sustainability has become an increasingly important topic for businesses and organizations around the world, as they have to balance economic growth with environmental responsibility and social fairness (Xepapadeas 2005). In Norway, there is a growing realization of the need for sustainable practices in all areas of business, including project management (Aarseth et al. 2017). This particularly is true for engineer project managers, who often are responsible for overseeing complex and large-scale projects with significant environmental and social impacts. Projects play a pivotal role in the realization of more sustainable business practices, and the concept of sustainability has more recently also been linked to project management (Silvius and Schipper 2014). According to Bruntland (1987), sustainable development is "development that meets the news of the present without compromising the ability of future generations to meet their own needs".

Given the importance of sustainability in project management, there is a growing need to investigate how education and training can contribute to promoting sustainable practices among project managers. Education and training have a critical role in promoting sustainable project management practices, as they can provide project managers with the necessary techniques and knowledge to integrate sustainability into their projects (Aarseth et al. 2017). This investigation report aims to identify what and how sustainability is considered in projects, how project managers currently are being educated to handle more sustainability, and lastly, explore ways to enhance sustainability focus through improved education. The objectives of this report are divided into two parts:

1. Conduct a literature study
   - Identify how sustainability is defined in projects
   - Identify the current focus on sustainability in projects and how project managers are being educated
2. Conduct interviews with current and upcoming project managers
   - Identify how they have been educated in sustainability
   - Understand how they interpret sustainability and how its focus can be improved through education

The following research question is investigated and discussed:

- How is sustainability currently being focused on in terms of education and project management?
- What are the benefits and challenges of implementing and increased education in sustainability for project managers?

Key project employees, including all team-members, stakeholders, and company owners play an important role in the focus of a project, its success, and how sustainability is implemented. However, due to the size and time of this project, the scope of the study is limited to project managers. The focus of the literature study is therefore on project managers in general.

In conclusion, this research paper represents an important step toward promoting sustainability in project management. By examining the role of education and training in promoting sustainable practices among project managers, the study aims to provide valuable insights that can help organizations and businesses improve their sustainability practices and balance their financial goals with environmental and social responsibility. This paper also aims to encourage further research on the topic.

2 Literature review

The purpose of this chapter is to conduct a comprehensive review of the existing literature on sustainability practices in project management. We examine the challenges that have been identified in previous research and highlight the suggestions and recommendations made by scholars and practitioners to overcome these challenges and improve the sustainability performance of project management.

There have been written several articles focusing on the importance of education and preparation of project managers in order for them to perform as well as possible when working on real projects. For instance (Ramazani and Jergeas 2015) did a study on directions for future research in project management and states that there is a gap between what education providers are offering and what is needed to deal with projects in today's complex work environment. Ramazani and Jergeas (2015) argue that the education and training systems must do more to prepare project managers. It seems that current education does not adequately prepare managers to deal with the complex realities of the real world (Winter et al. 2006). Ramazani and Jergeas (2015) investigation revealed that current project managers believe that projects are becoming more complex causing expectations of project managers to demonstrate a mixture of skills including technical project management competencies, and interpersonal, and leadership behaviors. The interviewees in (Ramazani and Jergeas 2015) research also expressed their concern about both project management education at universities and corporate training and development. They explained that the world is always changing and all project environments are dynamic. Therefore educational institutions will never be able to fully cover the knowledge needed and it is, therefore, a need for continuous, phased training during the professional life of project managers to enhance the probability of achieving project success.

Thomas and Mengel (2008) researched how project managers should be educated and also identified the increasing level of chaos, complexity, and uncertainty in project environments. Thomas and Mengel (2008) concludes with the following: *Master project managers need to develop the emotional and spiritual skills and capabilities to create buy-in and provide orientation even in complex, unknown, and uncertain environments. Thus, they need to learn and practice how to lead the changes into an unknown future by surfing on the edge of chaos.* To acquire these skills, project managers require a learning environment that encourages them to critically reflect on theory while actively engaging in practice on a continuous basis (Thomas and Mengel 2008). According to Thomas and Mengel (2008) this learning environment should also consist of self-organizing networks of self-managing teams that consciously empower each other.

Ramazani and Jergeas (2015) study focuses on project managers in the oil industry and Thomas and Mengel (2008) study focuses on educating project managers in general. Not only have projects become more complex, but they also have an increased focus on sustainability (Silvius and Schipper 2014). In order to understand the impact of sustainability on project management Silvius and Schipper (2014)

defines several dimensions of sustainability. According to him, sustainability is about:

- Balancing social, environmental, and economical interests.
- Both short-term and long-term orientation.
- Local and global orientation.
- Values and ethics.
- Transparency and accountability.
- Stakeholder participation.
- Risk reduction.
- Eliminating waste.
- Consuming income, not capital.

Additionally, Silvius and Schipper (2014) studied how the sustainable factors actually impact the management of projects and synthesized the following areas of impact: Recognition of the context of the project, identification of stakeholders, project specifications and requirements, dimensions of project success, selection and organization of the project team and, project sequencing and schedule. Silvius and Schipper (2014) mentions PRINCE2 and PMBOK as educational resources that have been used globally as a guideline for project managers, and emphasizes their lack of focus on sustainability. PRINCE stands for Projects In Controlled Environments and is described as a structured method for effective project management for all types of projects (Wideman 2002). Project Management Body of Knowledge (PMBOK) is a set of standard terminology and guidelines for project management and is a recognized standard for the project management profession (Guide 2001). Research from Brundiers and Wiek (2017) states that students often find themselves overwhelmed when working on sustainability issues. Academic materials are not well suited for an introduction to sustainability students or early career professionals (Brundiers and Wiek 2017). While there are numerous resources available on project management, only a small fraction of them address sustainability within the context of professional skills, as noted in Kerzner 2017. For instance, a typical project management textbook is over a thousand pages long, yet only a handful of those pages discuss sustainability.

According to Jääskä et al. (2021) incorporating sustainability principles into the project, product, and services is a challenging task and requires new personnel competencies and skills. She suggests providing managers with educational games in order to embed sustainability in project management in a purposeful, integrative, innovative, and seamless manner (Jääskä et al. 2021). Brundiers and Wiek (2017) presented an overview of the professional skills in sustainability and developed an introductory course designed to build students' capacity in these skills. Langara College offers a first-year engineering course that is meant to introduce students to engineering design and case studies (Taheri 2018). The course is optimized to raise awareness of the sustainability issues the planet is currently facing.

Thomas and Mengel (2008) studies pinpointed that there is no empirical evidence that educated project managers have a benefit compared to project managers without a specific advanced education. Hussein (2015) conducted an analysis on Norwegian project managers and how a blended learning approach to create a meaningful learning environment could be created. There are various papers focusing on

how project managers should be educated in order to achieve success in projects in a rapidly changing environment. There are also several studies emphasizing the importance of implementing and focusing on sustainability in projects. However, we have identified a lack of research on how project managers could be educated in sustainability in project management, especially if they already have commenced their professional careers.

3 Method

This chapter will present and justify the methodology approach of the paper. It will cover how the literature review has been utilized and the methodology behind the semi-structured interview.

According to Rajasekar et al. (2006), methodology refers to a systematic approach to problem-solving. Additionally, Karlsson (2010) asserts that the hallmark of good research is that it is well-executed from a methodological standpoint. Almalki (2016) categorizes research methods into two main groups: quantitative and qualitative, with some methods classified as mixed. Quantitative methods gather numerical data from surveys, experiments, and other sources to investigate an objective reality. Qualitative methods aim to interpret meaning from focus group participants' perspectives and experiences through techniques such as literature review, observation, and interviews. This paper employs a qualitative methodology, which provides advantages such as in-depth understanding, flexibility, theory development, rich data, and participant perspectives. These benefits align with the purpose and objectives of the project.

The research project was undertaken with a specific research question and project objective in mind. To address the research question and achieve the objective, a literature review was conducted to explore relevant topics. Moreover, semi-structured interviews were conducted with project managers with different experiences to obtain practical information and fill any gaps in the research.

3.1 Literature Review

This review primarily involves a theoretical investigation, which includes analyzing existing literature to establish the credibility and relevance of the research. By doing so, it will also help to identify research gaps that limit the research's scope (Croom 2010).

The literature review focuses on establishing a foundation for the research questions and gaining a better understanding of the topic. To conduct the review, two sets of search terms were created: main search words and additional search words, as seen in Table 1. The additional search terms were used mainly to narrow the scope and were combined with the main search terms as needed.

Relevant literature was primarily sourced through database searches on Google Scholar, Springer, Scopus, NTNU Open, and Oria. Abstracts of potentially suitable papers were thoroughly examined to determine their relevance to the investigation project. The relevant papers were then categorized thematically and saved for further study. After the initial set of papers was identified, the snowball sampling technique was employed to expand the search. This involved using the references cited within the previously identified papers to uncover additional relevant papers (Goodman 1961).

Main search words	Additional search words
Project management	Governance
	Stakeholder management
	Education
	Sustainability awareness
	University
	Challenges
	Sustainability seminar
Sustainability education	Characteristics
	Universities
	Company

Table 1: Search words for Literature review

3.2 Semi-structured interview

Semi-structured interviews were conducted with students and both new and experienced project managers of different nationalities through a combination of in-person meetings, virtual meetings via Microsoft Teams, and email exchanges. This interview format is beneficial for exploratory, explanatory, or evaluative research, as it allows researchers to explore different aspects and identify the advantages and disadvantages of various approaches. The choice of conducting such interviews was motivated by the need to evaluate and compare the findings of the literature study with industry experts' opinions and explore the important factors to consider when examining education's role in promoting sustainability in project management.

The semi-structured interview process was informed by the methods outlined by Becker et al. (2012) and Matthews and Ross (2010) an interview guide was created and can be found in Appendix A. This ensured that relevant topics were covered and that the conversation remained focused on the areas of interest. There was no strict order of questions, and the interviewer had the flexibility to ask additional questions in response to the participants' replies. The interviews were tailored to each participant, which is one of the advantages of this research method.

The interviews provided an opportunity to delve deeply into the role of education in promoting sustainability in project management and to capture the nuanced experiences and perspectives of the participants. They also served as a valuable source of new insights and ideas for the role of education in promoting sustainability in project management. To ensure the accuracy and reliability of the data collected, all interviews were recorded and transcribed whenever possible. A summary of the interviews was then sent to the participants for verification and to be used in the final report. Table 2 presents a list of the objects who were interviewed.

Role	Description
Student	Student and soon-to-be project manager
Novice PM	Novice project manager, Orkla ASA
Professor	Professor and project manager
Experienced PM	Project manager with 27 years of experience

Table 2: Interview objects

4 Findings

This chapter will present the findings and results obtained from the research and investigation.

4.1 Interview findings

This subsection provides extractions of the most important and interesting findings from the interviews.

Four interviews were conducted with individuals with varying degrees of experience in project management, ranging from novices to those who have been in the field for several years. The results of the investigation were both interesting and valuable, and it is evident that sustainability should be a more significant key factor in project management.

According to the interviewees, project management stakeholders are increasingly recognizing sustainability as a crucial factor as the world becomes more environmentally conscious. While sustainability is commonly associated with climate change, it extends beyond environmental issues, as demonstrated by the 17 UN sustainability goals (Members 2023). Therefore, to promote sustainability, it is essential to consider diverse perspectives and take a comprehensive approach that encompasses more than just environmental and climate-related concerns, as one interviewee pointed out.

One key finding is that all the interviewees think sustainability should be integrated into the education given to project managers as a core topic, rather than as an add-on or optional module. This means that project managers should learn to incorporate sustainability considerations into the project planning, execution, and evaluation, rather than treating sustainability as an afterthought or a secondary concern. According to the most experienced project manager, integrating sustainability into project management education would necessitate a mindset shift from the conventional focus on cost, time, and quality to a more comprehensive approach that considers environmental and social impacts.

When queried about the potential difficulties of integrating more sustainability education into project management, the interviewees identified multiple challenges that could arise. The findings are presented in Table 3. The table indicates that in addition to shifting mindsets around sustainability, various factors such as social awareness, economics, politics, and technology can also pose obstacles to integrating sustainability into project management. The project manager with significant experience, faced a particular challenge in getting cross-functional teams, such as engineers, marketing, and business analysts, to collaborate and understand government sustainability regulations while working on a product.

Area	Description
Environmental	This challenge relates to the impact of the project on the environment, including factors such as air and water pollution, carbon emissions, and the depletion of natural resources.
Social	This challenge relates to the project's effect on individuals and communities, covering aspects like human rights, labor norms, community involvement, and cultural preservation.
Economic	This challenge pertains to the project's financial sustainability, encompassing factors such as cost-efficiency, ROI, and the project's lasting economic effects.
Political	Political factors' influence on the project includes government regulations, policies, and stakeholders' interests.
Legal	This challenge relates to the project's impact on legal frameworks and regulations, covering factors such as adherence to laws, regulations, and policies, as well as legal risks and liabilities associated with the project.

Table 3: Identified challenges with integrating sustainability in project management

It was common for all the interviewees to have received little to no education on sustainability during their studies, and they had also not received any significant training on the topic in their workplaces. The consensus was strong that education of this kind would be of great benefit in the future. It was pointed out that there are currently some barriers to integrating sustainability into project management education at universities, such as strict educational rules from the university faculties and limited resources. If a course is added to the curriculum, another must be eliminated to maintain the correct number of credits. However, the interviewee suggested that these barriers could be overcome by re-prioritizing existing courses and resources.

The experienced interviewee emphasized the need for a systematic framework for sustainability management in projects, emphasizing that project managers should require education and training on sustainability to effectively prioritize sustainability in their projects. This includes providing guidelines and resources such as videos on sustainability management to assist project managers in achieving sustainability goals. The education or training program should cover a wide range of sustainability principles, such as the life cycle of products, carbon footprint, environmental protection regulations, sustainability procurement practices, and finance.

The professor also pointed out that even though life cycle assessments are available for sustainability, they have not been fully integrated into the project and risk management processes, indicating a knowledge gap in understanding the environmental impact of products throughout their life cycle. This suggests a need for education and training on how to keep sustainability in mind and balance different goals while remaining compliant with sustainability goals set by authorities.

Overall, these findings highlight the importance of incorporating sustainability into project management education and training to promote sustainable practices and help project managers prioritize sustainability in their work. By doing so, there is a greater likelihood of shifting towards a more

sustainable approach to projects in the long run, as opposed to being solely results-oriented.

The literature review conducted in this study highlights the inadequate preparation of project managers for the complexities and uncertainties of real-world projects, particularly challenges associated with sustainability. The literature review findings align with the interview results, highlighting the necessity for a systematic sustainability management framework in projects and prioritizing sustainability education. The lack of focus on sustainability in the education of project managers is clear from a university level. This is evident from the limited coverage in university textbooks and popular resources like PRINCE2 and PMBOK.

The literature review also identifies barriers to integrating sustainability into project management education. However, while interviewees mentioned strict educational rules and limited resources, the literature highlights a lack of research on how project managers could be educated in sustainability in project management, especially mid-career. Both the interviews and literature emphasize the need for a mindset shift toward sustainability dimensions from traditional project management focus.

5 Discussion & Conclusion

This chapter discusses the findings from the investigation project. First, the findings related to the research question will be discussed. Then the limitations of your findings and future work will be presented. The chapter finished with a conclusion summarizing the investigation project.

5.1 Discussion

The investigation project aims at answering research questions regarding sustainability education in project management, which we initially defined. However, throughout the research and investigation phase, several valuable discoveries were made.

Current focus on sustainability
The finding that project management stakeholders are increasingly recognizing sustainability as a crucial factor is encouraging. With climate change and environmental degradation posing significant threats to our planet, it is essential that all sectors, including project management, take steps to promote sustainability. The United Nations' 17 sustainable development goals have played a crucial role in broadening the understanding of sustainability beyond environmental issues. As a result, project management stakeholders are recognizing the need to consider diverse perspectives and adopt a comprehensive approach to sustainability.

The interview findings reveal that there today is little sustainability education given as all of the interviewees had little to no formal education in sustainability. This is an interesting observation due to the diverse backgrounds and varying levels of experience of the interviewees. Ranging from a student to a project manager with over 25 years of experience, the finding indicates that not much has changed in the last 25 years in terms of sustainability curriculum and training for project managers in Norway. There could be several possible explanations for this trend, such as a limited focus on sustainability in educational institutions and workplaces, and the resistance to change. Despite the growing awareness of sustainability as an essential component of a sustainable future, there may still

be a lag in integrating it into academic curricula and workplace practices. From the interviews, we also learned that it is hard to change the curriculum of university courses due to strict educational rules, which may explain the lack of change in sustainability education at the university over the past 25 years.

What are the challenges and benefits of implementing education
The findings presented in Chapter 4 also underscore the importance of incorporating sustainability education into project management at both the university and workplace levels. However, there are several challenges and benefits associated with implementing such education.

The lack of resources and strict educational rules in universities is one of the main challenges identified. Literature shows a gap between the education provided and the knowledge required by project managers to manage complex projects. This challenge is particularly relevant when it comes to adding a course on sustainability to the curriculum. Universities have limited resources and can only offer a limited number of courses to their students. Therefore, adding a new course would require careful consideration of the trade-offs involved. Additionally, due to the lack of education at the university a lot of the education is pushed over at the companies today. This is especially challenging for smaller businesses and start-ups as they often don't have the time and resources to provide sustainability education.

Another significant challenge in promoting sustainability is the difficulty of incorporating sustainable practices into bigger companies that may have a fixed mindset. Many established companies may also have outdated systems and practices that are not aligned with sustainability principles. Changing these systems can be a long and difficult process, and may require a significant shift in the company's culture and values. To overcome this challenge, it is important to approach sustainability from a business perspective. Sustainability practices can be cost-effective and can provide long-term benefits to the company, such as improved brand image and increased customer loyalty. By emphasizing the business benefits of sustainability, it may be possible to convince older mindsets to adopt sustainable practices.

One of the main benefits of having sustainability-educated project managers is that they are better equipped to integrate sustainability practices throughout the entire project. This means that they can identify potential environmental, social, and economic consequences of projects and take steps to minimize them. For example, they can ensure that project designs are energy-efficient, reduce waste, and minimize the use of non-renewable resources. By doing so, they can help the company to achieve sustainability goals and reduce the environmental footprint.

5.1.1 Limitations and Future work

While interviewing four individuals can provide valuable insights, it is important to recognize its limits in depth and breadth. Even though trying to choose four interviewee objects with different experiences and backgrounds, it still may be challenging to get a diverse range of perspectives and opinions. With a small sample size, it may be difficult to draw any significant conclusions from the data collected. Additionally, the data collection method relied on self-reported measures, which can be influenced by

personal bias and not accurately reflect actual behavior. The interviewees can verify the literature research that has been done, but it might not be enough to validate found results.

Furthermore, the study focused on the perspectives of project managers and did not include other stakeholders such as project team members, clients, or educational institutions, whose perspectives may differ. The narrow approach may not give a complete understanding of what factors are necessary in order to implement sustainability education to project managers, which could make it hard to apply the findings from this study more widely.

Future work should consider using multiple data collection methods to gain a more comprehensive understanding of the research topic. This could involve increasing the number of interviewees possessing a background in project management, academics at universities, and other relevant parties. Additionally, conducting a survey to get real-world insight and data on the current situation within this research topic would be interesting.

Our investigation reveals inadequate priority given to sustainability in projects, and project managers lack the necessary skills for successful implementation. While we identified the problem, our study did not delve into effective ways to implement sustainability in project management. Therefore, a more comprehensive study focusing on specific actions to promote sustainability in projects is necessary. This study should equip project managers with the tools and resources to successfully integrate sustainability into their projects.

Despite these limitations, the implications of this research are significant. By promoting sustainability in project management education, we can help to ensure that sustainability considerations are integrated into projects from the beginning. This can help to minimize the negative impacts of projects on the environment and society, while also contributing to the long-term economic success of the project.

Future research in this area should focus on developing and evaluating strategies for integrating sustainability into project management education. This could include evaluating the effectiveness of different educational approaches, such as experiential learning or online courses. Additionally, the research could explore how education can be used to promote sustainability in specific types of projects or industries.

5.2 Conclusion

The project began with a discussion about the growing importance of sustainability in response to the urgent need to reduce our impact on the environment. Through scoping, we wanted the investigation to focus on sustainability practices within project management since the majority of the group studies production management. We tried to expand the knowledge of how workplaces and educational organizations can improve their understanding of sustainable practices to enhance their ability to contribute to environmental sustainability. Through academic literature analysis and user interviews, the study explored the potential benefits of such education for promoting sustainable practices in the workplace.

Our findings suggest that although project management stakeholders are increasingly recognizing

sustainability as a crucial factor, there is little actual sustainability education and training today. Incorporating sustainability education into project management is necessary, but it poses several challenges. However, further research is needed to evaluate the effectiveness of different educational approaches. Overall, this study contributes to our understanding of the role of education in promoting sustainability in project management and provides a foundation for future research in this area.

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Appendix

A Interview guide

A.1 Introduction

Introduce yourself and explain that the purpose of the interview is to gather information regarding the project manager's experience with sustainability in projects. Ask the interviewee to provide information about them, including their age and work experience.

A.2 Sustainability and project specific

- Have you managed any projects that had specific sustainability goals or requirements? if yes, please elaborate:
  - How did it go?
  - What are some of the biggest challenges you have faced in managing sustainable projects or projects where sustainability is essential?
- How does your company define sustainability in a project context?
  - How do you set sustainability goals for a project and how do you monitor them?
  - Do you consider sustainability criteria when deciding what projects to go for?
- How do you prioritize sustainability in your project management approach, compared to other factors (such as profit, duration etc)?
- How do you communicate sustainability progress to stakeholders?
- How do you ensure project team members are aware of and aligned with the company's sustainability goals?
- After a project is done:
  - How do you evaluate the sustainability impact of a completed project?
  - What steps do you take to ensure sustainability lessons learned are captured and shared?

A.3 Education

- Have you had any training or education on sustainable project management in the workplace?
- If yes:
  - Elaborate, for how long, how much compared to other sectors?

- If no:
  - Do you feel like you should have had it, why/why not?
- In your opinion, how important is it for project managers to have education and training on sustainability in projects?
- What types of education and training do you think project managers need in order to prioritize sustainability in their projects?
- What are the most important topics that need to be covered?
- Do you think there are any challenges/barriers that occur in project management regarding sustainability that could be avoided with the correct education beforehand?

A.4 Conclusion

Do you have any additional comments or insights? Thank the interviewee for their time and input.

NTNU
Kunnskap for en bedre verden

Department of Mechanical and Industrial Engineering

TPK4115 - Applied Project Management

THE ROLE OF EDUCATION IN PROMOTING SUSTAINABILITY IN PROJECT MANAGEMENT

Reflection Report

Authors:
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10017
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4th May 2023

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1 Introduction & summary of the investigation report

In recent years, there has been increasing recognition of the impact that economic growth can have on the environment (Xepapadeas 2005). As a result, sustainability has become a critical concern for businesses and organizations worldwide, as they strive to balance their financial goals with the need for environmentally and socially responsible practices. In Norway, there is an increased focus on sustainable practices in all aspects of business, including project management (Aarseth et al. 2017).

Given the growing importance of sustainability in project management, there is an increasing need to understand how education and training can promote sustainable practices among project managers. There is limited research covering education on sustainability. The investigation report aims to identify the impact of education on sustainability in project management.

The investigation report is divided into two parts in order to understand the various education and training programs available to project managers and how they are perceived. Firstly, the study explains the existing knowledge and practices on the topic through a literature study. The literature study revealed how projects have become more complex causing raised expectations of project managers (Ramazani and Jergeas 2015). Furthermore, the study revealed that educational institutions will never be able to fully cover the knowledge needed and it is, therefore, a need for continuous, phased training during the professional life of project managers to enhance the probability of achieving success in projects. In order to cope with the need for education of project managers Jääskä et al. (2021) and Taheri (2018) respectively an educational game and an introductory course designed to build capacity in needed skills to cope with sustainability in projects. The literature study also gives a theoretical foundation of sustainability in projects, and the current international project management standards and guidelines.

Our research also consists of a case study where we interviewed several project managers with varying experiences. According to a professor at NTNU, project managers should require education and training in sustainability in order to prioritize it in their projects. The professor does not include sustainability in his teaching, but emphasizes the importance of implementing a focus on it through a systemic framework. An experienced project manager explains that he never had any particular education regarding sustainability in project management. In order for project managers to prioritize sustainability in their projects, he believes the managers require a comprehensive education and a training program that covers a broad aspect of relevant topics, such as the life cycle of products, carbon footprint, and regulations for environmental protection. We also interviewed an upcoming project manager, that revealed the lack of relevant education.

In conclusion, this research paper represents an important step toward promoting sustainability in project management. By examining the role of education and training in promoting sustainable practices among project managers, the study aims to provide valuable insights that can help organizations and businesses improve their sustainability practices and balance their financial goals with environmental and social responsibility. We evaluate our research as successful, as our hypothesis regarding lack of education was confirmed.

2 Reflection on your project management effort

Evaluation of the organization of the project group, distribution of the tasks, roles, and responsibilities? What went well and what did not go so well? Why so?

Despite having prior experience working on projects during previous courses and internships, we lacked experience with performing project-based investigation assignments. As a result, we began the initiation process of the project by delving into literature, mainly *Veien til suksess* (Hussein 2016), to gather insights.

The project was initiated by brainstorming together regarding what type of investigation project to pursue. The group members had different ideas and approaches, which led to extensive time discussing potential topics before deciding. This discussion was important because we wanted everyone to feel comfortable and have a genuine interest in the investigation. However, it was excessively time-consuming and in retrospect, we should spend less time choosing the main topic. It would be a better approach to choose a topic early, and then spend time researching it, followed by scoping the project afterward, making the planning process more iterative.

At the start of the project, we established individual roles and corresponding responsibilities. Everyone was satisfied with their role, and the assignment of roles helped team members understand their specific duties and the scope of their work, which improved efficiency. For example, there was a particular role responsible for scheduling and booking locations for the meetings. This was beneficial to structure the group. However, we experienced that many of the responsibilities were very general, and, in retrospect, we realized that the roles were not designed specifically enough considering the actual writing and research tasks.

Even though it was valuable that everyone contributed during the literature study phase, it would be much more efficient to establish stricter and more specific responsibilities. A division of tasks among team members, where one group is assigned to the case study, another to the literature study, and a third to the introduction, could have contributed to a more efficient project outcome. A considerable amount of time was devoted to designing a comprehensive work breakdown structure (WBS) for the project. However, it became apparent that the potential benefits of this management tool were not fully realized, particularly since we did not delegate responsibilities according to the WBS. To address this issue, we could assign specific tasks and activities to team members based on their expertise and availability as outlined in the WBS, ensuring that each member has clear expectations and deadlines for completing their assigned tasks.

Student	Role
10045	Project manager
10063	Project manager assistant
10013	Team member
10017	Team member
10130	Team member

Table 1: Team members and roles

Evaluate the effectiveness of the risk management plan of your project? What went well and what did not go so well.

At the beginning of the project, one team member got the responsibility of engineering the risk management plan. She identified five risks crucial for the project. In retrospect, the risks identified were accurate, as it occurred challenges with numerous of the risks. For instance, one of the risks identified was "technical problems with virtual collaboration". One team member contributed remotely, and we had to organize semi-virtual meetings. The mitigation strategy was to write detailed meeting summaries so each team member could consistently be updated on the newest agreements and new assignments. This mitigation strategy was important, as it sometimes was hard for everyone to follow the semi-virtual meetings. Having the meetings either entirely remote or in-person could potentially increase efficiency and improve the workflow. That being said, recognizing this as a risk made us more aware of the problem, and it could potentially have been even worse without the mitigation plan. The impact of this identified risk should have been marked as significant instead of marginal.

Many of the challenges and struggles during the project were already identified in the risk assessment. Even though we could not manage to prevent them completely, we still identified them, which reduced their impact and made us solve them more quickly.

We made the risk assessment at the beginning of the project. During the work, our scope got more detailed and we got a better understanding of the problem. Next time, it would be beneficial to re-evaluate the risk plan in order to update it with new risks identified when the project got more detailed. The effectiveness of the risk plan could be improved by using monitoring techniques. Next time we would also include every team member in the development of the risk assessment, as people have different views and experiences.

Evaluate the effectiveness of the communication plan? What went well and what did not went so well?

At the beginning of the semester, we held an initial meeting to establish mutual expectations for the project. During this meeting, we discussed our individual motivations and goals for the project, as well as shared our prior knowledge and expertise to aid in the commencement of the actual work.

When it comes to the communication plan the group is overall very satisfied. Regular communication, collaboration, and effective file collaboration tools were the keys to success. Since we had some team members contributing remotely, it was very important to have a good overview of the project and ongoing work in a cloud file-sharing system. At the beginning of the project, we decided that the project manager should be responsible for all communication with external partners. We thought it would make the communication between stakeholders better with only one person. However, we realized during the project that it would be much more effective to let the team members have responsibility for some interview objects each. Therefore, we assigned each team member a designated interviewee. This allowed for greater ownership and control by each team member over their respective interview process.

At every subsequent meeting, we clarified the tasks that each team member was responsible for before the next meeting. This was a positive experience as it ensured continuous progress. However, we suffered from bad communication regarding when to meet. In the communication plan, we decided to have weekly meetings every Wednesday at 13:00. The schedule was not being followed, due to

unforeseen occurrences that occupied the group members' schedules. This caused an unnecessary amount of time being used to plan when the meetings should take place. It also made us have fewer meetings than desired. Another problem we experienced was the effectiveness of the meetings. The absence of a fixed agenda written prior to the meetings caused us to waste valuable time on irrelevant topics. Having no agenda also made us waste time before the meetings actually started. This led to meetings being interrupted in the middle of important discussions due to time constraints.

Hussein (2016) states that important factors in order to succeed vary with the type of project. For instance, in a project where budget is the main criterion, project planning and control are important in order to execute the project with satisfaction. Even though our investigation report aims to inspire research regarding sustainability in production management, it remains a report with a specified delivery date. Therefore, effective communication was crucial to meet the project's deadline and also to ensure that our findings and recommendations are properly communicated to each other. By doing so, we could maximize the impact of our report and contribute to the ongoing discourse on sustainability in project management.

Did the group manage to deliver the project results according to the originally stated success criteria (according to your original plan)? If no, why? Is there any deviations between the stated success criteria and your final evaluation of the project? Reflect on the causes or reasons of this deviation.

Overall, we are satisfied with the success criteria we established and believe that we followed them very well. For instance, one of the criteria was proper communication between the team members and external partners. Even though our meetings sometimes was experienced as unorganized, we still had very good communication between the members. Everyone contributed evenly, and we listened to each other's suggestions and proposals. We also listed "realistic schedule and sticking to it" as a success factor, which includes meeting schedules and task completion schedules. It was difficult to have consistent weekly meetings as we had initially planned. However, we were clear and strict with each other's tasks between meetings. This approach ensured the timely completion of tasks and facilitated significant progress throughout the semester.

There were some deviations between the stated success criteria and our final evaluation of the project. The main reason for this deviation was that the initial success criteria were based on assumptions and expectations that were not fully accurate or realistic. As we progressed with the project, we encountered some unexpected challenges that required us to adjust our goals and priorities. For instance, "different viewpoints" was identified as important in order to succeed in this project. Even though we interviewed project managers of different ages and expertise, four people is not sufficient to get a broad range of perspectives on the research topic. Additionally, some of the success criteria were too vague or subjective, which made it difficult to measure their achievement objectively. For instance, the success criteria "good measurement" and "problem-solving" should be made with more thought, as they are quite general and with little context. Despite these deviations, we believe that we were able to deliver a successful outcome that met the needs and expectations of our criteria.

Our project management effort was evaluated as successful, and we gained valuable insights for improvement in the future:

Scale	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Our Response				X	

Table 2: Project management effort

3 Evaluation of the impact (Project success)

All companies, especially in Norway, have a responsibility in reaching the sustainability goals set by the United Nations and many companies have internal sustainability goals (United-Nations 2023). The companies are putting their trust in the project managers to guide the project in a way of reaching sustainable development goals. The target audience is therefore large and can be shown in Table 3 with explanations.

Target group	**Explanation**
Educational institutions	Universities, colleges, and vocational schools that offer project management courses or programs would benefit from the findings of this research. They can use the insights to develop or revise their curricula to incorporate sustainability principles and practices in project management.
Project managers and professionals	Practitioners in the field of project management who are seeking to incorporate sustainability principles in their work can use the findings to enhance their knowledge in this area.
Organizations and businesses	Companies and organizations that engage in project management in Norway will benefit from the research by understanding the importance of incorporating sustainability practices into their operations. They can use the findings to train their employees, enhance their processes, and contribute to sustainable development.
Policy-makers and government agencies	The results of the study could be of interest to Norwegian policy-makers, particularly those responsible for education and sustainability initiatives. They can use the findings to inform the development of new policies, regulations, or incentives that support the adoption of sustainable practices in project management.
Researchers and academics	scholars in the fields of project management, education, and sustainability can use the findings to build upon existing knowledge, identify gaps in the literature, and explore further research opportunities.

Table 3: Relevant stakeholders for the investigation report

In conclusion, the target audience is a wide range of individuals and groups who are interested in promoting sustainable project management practices in Norway, and who can benefit from insights and recommendations on how education can play a role in achieving this goal.

To evaluate the quality of our final results we have compared our results against existing literature. Comparing the findings of the study with the existing literature on sustainability in project management helped to identify any inconsistencies or gaps in the research. By situating the findings within

the broader scholarly context, the quality of the final results increased.

We also reflected on limitations and future research in our study. Acknowledging the limitations of the study and suggesting areas for future research can help to provide a more nuanced understanding of the final results. By addressing these limitations and identifying areas for further exploration, the study's credibility is enhanced, and the quality of the final results is increased.

The study was also handed over for peer review by other students in the field of project management. This provided valuable feedback on the quality of the final results.

Through literature study and interviews with a range of experienced project managers, we have mapped the current situation of the role of education in promoting sustainability in project management in Norway in a way we have not found through a literature study. We have compared the results with previous research and added information into the field that we feel can help universities and businesses to understand more about the role of education in promoting sustainability in project management. It's a wide field of study and only a few papers on it, this made it hard to contribute as much as first intended. We still find our contribution to new research a success.

We evaluate the quality of our final results as outstanding:

Scale	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Our Response			X		

Table 4: Evaluate the quality of the final results

4 Factors that have contributed to failure / success

Throughout the course of our project assignment, various factors have played a significant role in determining the level of success we achieved. By reflecting on these factors, we can better understand the aspects of project management, processes, and project success that contributed to the outcomes of our work. In this section, we will elaborate on the most influential factors and compare them to those outlined in the textbook.

Effective leadership and team dynamics: Strong leadership and healthy team dynamics were key factors contributing to the project's success. Our project leader exhibited excellent communication, organization, and decision-making skills, which helped guide the team toward our goals. Additionally, the team members were supportive, collaborative, and committed to the project, fostering a positive and productive work environment. Our pre-existing social connections as friends from the same academic program helped to establish a comfortable and trusting dynamic. This facilitated open communication and collaboration, allowing individuals to freely share opinions and ideas early on in the project phase, contributing to effective team dynamics. The textbook emphasizes the importance of leadership and teamwork in project success, and our experience aligns with this notion.

Clear goals and objectives: Establishing well-defined goals and objectives at the onset of the project helped the team maintain focus and direction. By using the SMART criteria to create achievable and realistic targets, we were able to efficiently allocate resources and prioritize tasks. The textbook also highlights the importance of clear goals and objectives for successful project management.

Clear scoping of the project: Establishing a clear and concise scope for the project is essential

for successfully achieving its objectives Westland 2007. However, we found difficulty in narrowing the scope down to a more specific research question, resulting in what we believed to be a somewhat broad scope. This made it hard to conclude with something specific and point back to good facts. With such a wide scope, it was impractical to consider all relevant parameters and variables, potentially hindering the accuracy and validity of our findings.

Risk management: Identifying, assessing, and mitigating potential risks was a key factor in our project's success. By proactively addressing potential challenges and developing contingency plans, we were able to minimize the impact of unforeseen issues and maintain progress. Spending a good amount of time developing the risk assessment plan in the Pre-Report helped avoid many negative impacts that could have occurred. The textbook underlines the significance of risk management in ensuring project success.

Time management and organization: Adhering to a detailed project timeline, breaking down tasks into manageable sub-tasks, and consistently monitoring progress allowed us to effectively manage time and resources. This organizational approach contributed significantly to the project's success, as it ensured that all team members were working cohesively and efficiently. The textbook recognizes the importance of time management and organization in project management. While the time management throughout the semester was generally seamless, there were still opportunities to enhance efficiency by improving organizational parts including delegating responsibilities according to WBS. The focus during meetings could also have been better, as explained in Section 1.

Stakeholder engagement and communication: Engaging with stakeholders and maintaining open lines of communication throughout the project was crucial in ensuring that their needs and expectations were met. The textbook also emphasizes the significance of stakeholder engagement and communication in project management.

As the interviewees were essential stakeholders in our project, our communication with them could be improved. For example, we only held one interview with them, and in retrospect, we should have had follow-up interviews and conversations with them. Despite this, we made the most of the interviews by having a high priority on effective communication with the interviewees. To achieve this, we prepared thoroughly beforehand by researching the interviewee's background and relevant topics and drafting a list of pertinent questions.

Another group of stakeholders we considered were the professors and teaching assistants. At the beginning of the project, we maintained communication with one of the professors by seeking his approval for the investigation idea. Upon completion of the investigation phase, we had a goal of submitting a first draft to the professor or a teacher assistant but failed to do so. Stakeholder engagement is something we would have liked to be better at.

Continuous improvement and learning: Throughout the project, we remained committed to learning from our experiences and improving our processes. This growth mindset allowed us to address challenges and adapt our strategies when necessary, ultimately contributing to the project's success. The textbook supports the idea of continuous improvement and learning as essential factors in project management.

In conclusion, our project's success was influenced by a combination of factors that align with the textbook's recommendations on effective project management. By understanding and addressing these

factors, we were able to navigate the challenges and complexities of the project, ultimately achieving our desired outcomes. We failed to have the level of communication with stakeholders we wanted and should have been addressed better in risk management. This reflection emphasizes the importance of strong leadership, clear goals, risk management, time management, stakeholder engagement, and continuous improvement in ensuring project success.

5 Most important lessons from your project

Drawing from our collective experience as a group working on an applied management project, we have gathered valuable insights that can guide future students on their journey to success. Here, we present our top recommendations for tackling similar projects, ensuring a smooth and effective process from start to finish:

1. Our advice is to establish clear goals and objectives: Defining the project's purpose and setting specific, measurable, achievable, relevant, and time-bound (SMART) objectives will help guide the team's efforts and maintain focus throughout the project.
2. We learned that fostering a collaborative environment is essential: Encourage open communication, active listening, and the sharing of ideas among team members. This not only enhances the team's creativity and problem-solving abilities but also builds trust and rapport among members.
3. Our experience suggests that effective time management is critical: Develop a realistic project timeline and divide tasks into manageable sub-tasks with clear deadlines. Regularly monitor progress and adjust the timeline as necessary to accommodate any unexpected challenges or setbacks.
4. We also discovered the importance of embracing flexibility: Be prepared to adapt and pivot when new information or changing circumstances require it. This flexibility will allow the team to make informed decisions and remain on track to achieve the project's goals.
5. Our advice is to assign roles and responsibilities: Clearly define each team member's role, taking into consideration their strengths, skills, and interests. This will help ensure that tasks are distributed effectively and that everyone is engaged and accountable for their contributions.
6. We learned that seeking feedback and continuous improvement is vital: Solicit input from stakeholders, mentors, or instructors throughout the project. Regularly assess the team's performance and implement changes as needed to optimize the project's outcomes.
7. Our experience suggests that celebrating small victories is important: Acknowledge and appreciate the team's hard work and accomplishments, no matter how small. This can boost morale, motivate team members, and foster a positive work environment.

Finally, we advise documenting the learning journey: Keep a record of the team's experiences, challenges, and successes. This documentation will not only serve as a valuable resource for future projects but also provide an opportunity for reflection and personal growth.

6 Reflection on learning and unlearning

The journey of a project, from its start to completion, is often filled with opportunities to grow, adapt, and develop as an individual and as a team member. In this section, we will delve into the experiences and lessons acquired throughout the entire process of the project. Specifically, we will focus on the aspects of learning and unlearning that played a pivotal role in overcoming challenges and achieving success.

What we learned	**Explanation**
Practical Application of Management Tools	One of the essential lessons learned was the importance of using management tools not only in theory but also in practice. By actively employing these tools in our day-to-day project work, we were able to streamline processes, improve communication, and ensure a more efficient project execution.
Focusing on the Critical Path	We learned to identify and prioritize the critical path in our project timeline. This allowed us to allocate resources more effectively and ensure the timely completion of tasks with the most significant impact on the project's overall success.
Conducting Semi-Structured Interviews	The project provided an opportunity to refine our skills in conducting semi-structured interviews. This enabled us to gather valuable insights and information from various stakeholders while maintaining flexibility to explore emerging themes and topics.
Rapid Knowledge Acquisition	Throughout the project, we were faced with the challenge of gathering knowledge from multiple sources in a short period of time. Through this experience, we developed techniques for efficiently researching, synthesizing, and applying the information we gathered, thereby improving our ability to make informed decisions.
Risk Assessment	The project also taught us the importance of conducting risk assessments and planning for uncertainties. By identifying potential risks and developing contingency plans, we were better equipped to navigate unforeseen challenges and mitigate their impact on the project's success.

Table 5: Overview of what we learned

Where learning was critical

Throughout the project, there were several instances where learning played a critical role in ensuring its success. Early in the project, we realized that our current organizational system was not sufficient for managing the growing complexity of tasks. This realization prompted us to learn and implement new project management tools, which significantly improved our ability to coordinate work, track progress, and communicate effectively. Learning to do a proper risk assessment was also critical at the beginning of the project. Further into the project, we encountered several unforeseen challenges and uncertainties. Learning to conduct risk assessments and develop contingency plans enabled us to proactively address these issues and minimize their impact on the project. This learning experience

was essential in building resilience and ensuring the project's success, despite the unpredictable nature of the work.

What we needed to unlearn	Explanation
Discarding Rigid Planning Approaches	Traditional, fixed project planning methods were not suitable for a dynamic project with changing requirements. Unlearning rigid planning approaches and embracing more flexible, adaptive methods allowed us to better respond to emerging challenges and opportunities.
Abandoning the "Lone Expert" Mindset	It is crucial to unlearn the belief that only one person holds all the answers.
Reassessing Communication Styles	As communication plays a vital role in project success, unlearning outdated or ineffective communication practices is essential.
Letting Go of Micromanagement	Unlearning the tendency to micromanage team members leads us to increased trust, autonomy, and productivity within the team.

Table 6: Overview of what we needed to unlearn

Where unlearning was critical

Early in the project, we recognized that relying on a single expert to solve problems limited the potential for innovation and creativity. By unlearning the "lone expert" mindset and fostering a collaborative environment, we were able to tap into the diverse perspectives of the team, leading to more effective problem-solving and decision-making. As the project progressed, we identified that certain communication practices were hindering information flow and causing misunderstandings. By unlearning outdated communication styles and adopting more effective methods, we were able to enhance team cohesion, ensure all members were well-informed, and ultimately contribute to the project's success.

7 Acknowledgments

We would like to express our sincere gratitude to all those who have contributed to the successful completion of this investigation paper. First and foremost, we would like to thank Professor Bassam Hussein who arranged the course and the lectures in a way which have been useful for us to expand our knowledge in applied project management. We would like to thank group 3 who contributed with constructive and valuable feedback on our report. We also give our gratitude to all the participants who took part in this study and shared their valuable insights and perspectives with us. Without their contribution, this paper would not have been possible.

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