

TPK5100 - Applied Project Management

Project Manager Evaluation Tool ____PMET ____

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Table of Contents

Li	st of]	Figures	ii
Li	st of '	Tables	ii
1	Intr	oduction	1
2	Eva	luation of project management effort	2
3	Eva	luation of the impact (Project management)	4
4	Fac	tors that have contributed to failure/success	6
5	Mos	st important lessons from your project	8
6	Ref	ection on learning and unlearning	9
7	Ack	nowledgements	11
Re	eferer	ices	12
Aŗ	openc	lix	13
	А	Link to product website	13
	В	Link to video presentation	13
	С	Product onepager for companies	13
	D	Pre-report	17

List of Figures

1	Risk assessment matrix			•	 •	•			•	•					•			3	

List of Tables

1	Evaluation of project management effort	4
2	Evaluation of the quality of the final result	6

1 Introduction

A project manager brings leadership and direction to a project; hence, it is crucial for an individual in this position to possess some essential skills. In order to acquire and improve these skills, feedback and evaluation of the project manager's performance is crucial. When it comes to the evaluation of a project manager's performance it is often assessed externally as a reflection of the project; if the project was successful, so was the project manager and vice versa. This is however a poor metric since a poor-performing project manager can still lead a successful project if the team is willing to compensate for the lack of skill on the project managers part. Furthermore, existing evaluation tools such as surveys answered by stakeholders, often need to be more concise by asking fewer open-ended questions as they require substantial effort from the evaluator. This design leads to vague and repetitive responses and contradicting feedback due to misunderstandings. Reviewing a project manager this way can be redundant as it needs to be clarified what areas require improvement and fail to demonstrate an indication of progress.

Enforcing a tool that offers quantitative rather than qualitative feedback could significantly impact the development of a project manager. This may also prevent inefficient project management from continuing despite a project's success by indicating the project manager's attainment in different skill areas. Likewise, it serves as a form of competitiveness, as the project manager can complete self-evaluation, become aware of their weak points, and compare their scores to other users.

As a solution, we aim to develop a website that serves as a Project Manager Evaluation Tool (PMET). Project stakeholders can evaluate their project manager by answering questions designed to capture the essential skills required in the trade (Birt 2022). A website is straightforward to navigate and always available, allowing frequent feedback iterations. Our project aims to give project managers an overview of their work efforts by offering insight into how their team feels they are performing, revealing their weakest and strongest skills, and a comparison to the performance of other project managers.

The twelve questions formulated for the project management evaluation cover the following six dimensions: communication, helping, personal, managerial, risk-taking, and cognitive. The questions weight each skill on a scale from 1 to 10, depending on the skills' applicability to the specific question. The evaluation has three input formats: checkboxes, sliders, and text, requiring minimal time and effort from the evaluator to submit an accurate answer. The website also holds a leaderboard, displaying the project managers with the highest average scores. In addition, the website includes a login functionality, which redirects the project managers to their private profile. The profile page displays quantitative information regarding a user's score for each skill section and how many reviews they have received. This solution has the potential to solve the feedback problem and serves as a tool for progress, efficiency, fairness, and exemplary teamwork.

2 Evaluation of project management effort

Organization

We spent the first two meetings defining the project's end goal, reanalyzing stakeholders based on feedback from the pre-report, and specifying project requirements. The availability of resources and requirements for decision-making influences a project's organization (B. Hussein 2018, p.121); therefore, it was essential for the group to discuss technical and design competencies, preferred tasks, and expected work efforts at an early stage. Next, by utilizing the project WBS we defined in the pre-report, we could easily break the project into more manageable work packages, simplifying the assignment of roles and responsibilities (B. Hussein 2018, p.131). The project consisted of four separate deliverables:

- Subgroup one was responsible for researching essential traits required in a project manager, defining questions based on this, and formulating informative text and instructions on the website.
- Subgroup two were responsible for designing the website as a paper prototype and finalizing this design in Figma.
- Subgroup three were responsible to define the project's technology stack, program the website, and testing.
- The whole team was responsible of giving internal feedback, making the final report and doing the video presentation.

Each subgroup had to conform to an internal deadline based on the resource chart defined in the pre-report. This arrangement ensured the project was completed by the due date, with a few days remaining to finalize the report. Although each subgroup stood responsible for a specific deliverable, there were several group discussions to ensure that the end product resulted from all members' input and that there was an equal feeling of ownership. The project organization follows a matrix structure, as there was high flexibility, frequent communication, and cross-collaboration between subgroups (B. Hussein 2018, p.125). However, due to different technical competencies in the group, there was little cross-collaboration with the subgroup developing the product, which resulted in workload differences. In order to avoid this unequal distribution, the other two subgroups were responsible for extra tasks, such as the evaluation deliverable, which involved contacting project managers to evaluate our product.

Our project group pursued a flat structure, and although this encouraged everyone to contribute equally, it was sometimes the source of conflict. For example, some subgroups had conflicting ideas about the end product, resulting in slower decision-making than initially planned. This issue is common in projects following the matrix structure (B. Hussein 2018, p.127); a potential solution is implementing a functional structure. This way, a group leader would provide a form of vertical communication and contribute to solving these conflicts if they arise.

Risk Management

Project risk management is a core knowledge area; the risk management process significantly influences project success and management. Hence, all group members should be aware of these risks. Together, the group defined seven project risks in the pre-report, illustrated in Table 2 in Appendix D, as a risk assessment matrix in Figure 1 to enhance the severity of each factor.

- A. Disagreements within the team
- B. Loss of work
- C. Unexpected task dependencies
- D. Difference in technical skill level within the team
- E. Team members are not committed to the project
- F. Team members are absent (could be due to illness, personal reasons, etc.)
- G. Team members lack the necessary skills to deliver a satisfactory product



Figure 1: Risk assessment matrix

The risk identification process occurred in the project planning stage, where we identified high, medium, and low-risk factors. Correspondingly, the group discussed potential measures to avoid or reduce the impact of these factors. Most identified risks were due to people-related or organization-related factors, which stemmed from uncertainty as several group members did not know each other prior to the project's start. Early in the project life-cycle, the group discussed product-related factors and constructed alternative plans; consequently, these factors became low-risk.

All members of the group conformed to deadlines and completed designated tasks. As we split into subgroups, it was easy to conform to one another's time plan, including sickness and travel. However, finding a suitable meeting time proved challenging when meeting as a group due to colliding time plans. This made it difficult to perform risk monitoring and control the process; as a result, it took time to discover the unequal work distribution between subgroups. If the group had, for example, implemented a risk register, this risk factor could have been identified earlier. An essential risk factor we should have remembered to identify, which reoccurs in several project cases, is lack of time (B. Hussein 2018, p.153). Our initial Gantt chart was far too ambitious, and it was unrealistic to complete the tasks in the estimated time. The group could have avoided this by seeking feedback during the project start.

The group identified critical risk factors that can significantly impact the project's success. However, we were too confident in our planning stage and overlooked potential risk factors relating to our project choices and requirements.

Communication plan

Communication within the project team and with external partners and stakeholders is important for a smooth project implementation and the ultimate success of a project. A regulated communication plan should prevent anyone from being ignored and ensure that all relevant information is always available to everyone (Bassam Hussein 2021). Communication requires a sense of mutual trust, transparency, and responsibility shared by all the parties involved in the decision-making process. The communication flow within the project team was effective. We used a group chat for general communication, we set meetings on a regular basis and then increased their frequency in view of the final project delivery. We all pursued the common goal by working together and supporting each other. More specifically, the group chat was a key element in providing feedback and suggestions on everyone's work and enabling the project to move forward. Rewriting paragraphs or adjustments in the website design are just two examples of the effectiveness of the communication plan for internal purposes. On the other hand, the communication plan for stakeholders turned out to be fragile and less effective. We contacted several companies to get first impressions and suggestions on our idea but the responses we received were very poor. This can be explained by the lack of time in conducting well-structured research as the project could not be delayed and there was no possibility to wait for the response time. Another reason that delayed the collection of impressions was related to the issue of who could take our survey since most of the team members are unfamiliar with the local area in which the project was set up. So, we moved on to the implementation of the project without receiving any feedback. As a result, we perceive that the lack of stakeholders' support may add an element of uncertainty and weakness to our project.

Planned vs actual results

The group delivered the product as planned - any alterations made were to add new functionalities or features based on internal group feedback. For example, we had not originally planned to implement a leaderboard but did so to increase internal competition and project relevance. It can be argued that the project management was successful as the product was delivered on time and achieved more than expected. Regardless, we did not receive any external feedback on our idea, which would have allowed us to modify the product to satisfy end users better.

We evaluate our project management effort as successful:

Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Your response				X	

Table 1: Evaluation of project management effort

3 Evaluation of the impact (Project management)

The goal and the output of our intended new product development project are: to design a website that allows project managers to evaluate their working methods and knowledge regarding project management based on clearly defined criteria. The outcome, measured in expected benefits that the project will accommodate, could be resumed in increasing awareness of the project manager about their working position and operations. Thanks to feedback and self-assessment, there will be

an improvement in the company's performance in the future, considering the potential reduction of overtime and the deliveries on budget. The tool will increase the quality of project management and a higher likelihood of project success.

Target audience

Besides project managers, the main addressees of the project, the target group of the digitalization project also includes other stakeholders, such as employees and supervisors within an organization. Employees can be considered critical stakeholders since they have direct access to the website and can provide an evaluation of their project manager. Moreover, they are the ones that contribute the most to the outcome of the project.

The results of our project affect not only groups of individuals but also entire organizations. The website offers to rank registered project managers, allowing organizations to become more aware of the quality of their project management department. The higher the score of their project managers, the higher is the competitive advantage that the company has. This is because the company has a strategic resource within its human capital.

The dissemination of this product within the project management scenario can bring many benefits in addition to those already mentioned. It can also be used to search for qualified personnel and as a "headhunting tool" for companies. Thus, its potential impact and usefulness could be very high.

Quality assessment

On the actual impact of the project, the considerations we can make both on the quality of the result achieved and the possible success or failure of the project are as follows. By analyzing the level of each project characteristic (Organizational complexity, Constraints, Uncertainty, Change or transformation, Impact on business), we can state that there was a limited impact on the project organization. The complexity of the product-development project could have been higher, and there were a limited number of constraints, mainly related to limits in time and budget. In addition, the project showed a certain level of uncertainty, especially in the start-up phase, derived from the newness of the project and the initial ambiguity of the project's scope. Thus, according to the analysis of project characteristics, we can say that this project has a positive impact on the organization, but its magnitude is not radical but incremental.

Other evidence can support the assessment of the quality of our project. For example, we shared a survey (Appendix C) about PMET with several companies that are familiar with the term "project management", i.e. consulting companies. We chose them because they are experts in the field, and many operate in different industries; they could provide us with more meaningful insights. However, we only communicated by email, and as already mentioned in section 2, there was no direct and effective communication between the companies and us. Not receiving a response is definitely a weakness in our project that weakens the quality of our product. Being aware that to assess the usability of a product, we need feedback from those who will use it, i.e. the end users, we have come up with a way to make it flexible and more suitable for changes after the project delivery. With the "contact us" section on the website, we offer the possibility for early users to add an opinion and suggest changes that could add value to our product. In this way, we could balance the quality of the overall output.

The project's final deliverable is the website, available via the link in Appendix A. We have yet to administer the final product to any project managers and organizations to measure the usefulness

of our output. However, we have reason to believe that this new tool may prove helpful despite the absence of support from the companies we tried to reach.

At the same time, we cannot clearly state that this project is a success or a failure because it has yet to be implemented in full; just the deliverable was respected in terms of expected outcomes. In this view, we can only identify some critical ground rules that must be adhered to throughout the project life cycle to increase the probability of success.

We evaluate the quality of our final results as:

Scale	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Your response			X		

Table 2: Evaluation of the quality of the final result

4 Factors that have contributed to failure/success

Success factors describe the ground rules in a project regarding project planning and execution. That represents a framework of what successful fulfillment means, but also requires measures to transfer the ground rules into concrete activities and decisions (B. Hussein 2018). According to Davis 2014, success factors can be distinguished into three different success groups.

- **Project management success** requires effective project risk management, a clear division of roles and responsibilities, and sufficient organizational authority. In addition, there should be a system for change and deviation control to ensure successful change management. Finally, performance measurement and reporting schemes are essential for project management success.
- **Project success** includes close cooperation between users, owners, and the conducting organization. Gapless involvement and effective communication is the key to project success.
- Long-term success in a business consists of effective program and portfolio management, and project success links to corporate success. To keep project management standards high over a long period, learning plans and transferring experience are essential for improvement.

Applying these to our project, it is evident that this is a project management success; we are, however, currently unable to evaluate if this is a project success. The project is considered a project management success because the work packages, defined in the pre-report (Appendix D), were completed in time and did not delay another dependent activity. All phases in the project life cycle were finished successfully. The schedule was adhered to, and the tasks and responsibilities were completed as planned and conformed to internal deadlines. The defined requirements for the product were met, possible risks were identified, and the involvement of all stakeholders was evaluated. The project had a good communication plan as a prerequisite.

Receiving positive feedback on the product's relevance via the PMET industry surveys would still not guarantee project success. The actual relevance, and consequently, the project's success can only be judged after the tool has been used. The product allows end users to assess the working methods of their project manager in the form of a questionnaire to get feedback and identify areas for improvement. If the same respondents perform the evaluation again later, e.g., on the next

project, their improvements can be identified. The final success of this project can be measured based on general feedback from the respondents and the result differences, optimally in the form of an increase in performance. This provides information about how useful the tool itself and its operation are.

For the development of an evaluation tool for project managers, the following success factors can be mentioned as the most important:

- The **clarification of the project purpose** was discussed in detail that we can provide the biggest benefits and outcome in the end for the user. This is an important starting point for project development.
- **Precise planning** of the project is another basic prerequisite for its success. To this end, the pre-report served as the basis for recording all planning phases, requirements and other important aspects. Adequate planning provides more structure for the whole project and all upcoming tasks.
- The **clear division of roles** within the project can be seen as a further important aspect of success. For the development of this product, the team was divided into groups of two, each responsible for programming, website content development, and website design. Thus, roles were assigned based on capabilities to make the product the best it could be.
- **Communication** within the team and reporting on each task and milestone is mentioned as another factor. It turned out that communication in this team was a crucial factor, especially in the initial phase when the purpose and goal were clarified. This could have led to failure if this point had not been revised again. In this respect, some improvement approaches could be gained retroactively for further projects, as also described in section 6.
- The product itself only **required resources** that were already available in the team. Two of the team members were already familiar with the corresponding website programming, making the success factor of the necessary technology a less critical aspect. This success factor was easy to fulfill because of the existing technology, but it is the basis of the product and thus a significant aspect for success.
- Throughout the entire project, **motivation** in the team was consistently very high. There was no compromising of the project due to dissatisfaction with the distribution of tasks or the setting of internal deadlines. Even if this factor belongs more to the soft skills of a team, it is the driving force for the entire product design and development process. It is also the basis for the attractiveness of the final product and a key aspect for the success.

The list of success factors could be much more detailed and longer at this point; we have limited ourselves here to the most important ones. If we now compare the factors with those of B. Hussein 2018, we can see many similarities. However, he divides the term general success factors into case-specific, structural and cultural factors. Compared to the factors mentioned above, the most important success factors of the present project also come from these three categories. The technology needed to support the product can be considered a case-specific factor, while the clarity of project purpose, appropriate project planning, human resource management (including roles and responsibilities), and effective communication are more likely to be structural factors. Team motivation and transparency can be considered as cultural factors.

In summary, it can be stated that the identified factors could be implemented successfully, although some can also be described as critical, which could have led to failure. When cross-comparing with Hussein's listing (B. Hussein 2018, p.92), further factors can be found which also occur in

this project but are not listed above as the most important factors. These include, for example, flexibility, decision loyalty, or the selection of optimized solutions with regard to the design of the website (e.g. selection of the optimal question model). Unfortunately, since the project team had never worked together in this way before and had never conducted a project of this type, it was not possible to draw on experience from previous projects. Likewise, no routine for change control was introduced, as this was not considered necessary for the project scope at hand.

5 Most important lessons from your project

The following section provides advice to consider for running future projects. It is a collection of our most important lessons learned based on our experience and can be used as a guideline.

Do not stress the planning phase

At the early phases of our project all the team members were eager to start working on the project, but it is important to take the time to make a good plan before starting on the individual tasks. One of the things we found particularly useful was to map the prior knowledge and skills of each team member. By doing this we could assign each task to the team member with the most relevant competence. In this way we managed to utilize the strengths of each team member which is crucial to ensure the quality of the delivered product.

Clear communication and a common understanding of the product

During the planning phase, we had long discussions regarding what kind of product we were going to produce. At the end of the planning phase everyone in the group agreed on the product. When we started developing the product we quickly realized that the team did not have a common understanding about the exact details of the product. Even though the differences were subtle, it slowed down the process a bit. We immediately scheduled a meeting to clear up any misconceptions about the product and create a common understanding of what we were going to deliver. This could have been avoided with even clearer communication within the group.

Adapt quickly to elements hindering progress

No matter how much time and resources you invest in the planning phase, sooner or later you will encounter something unexpected that is hindering the progress of the project. When this happens it is important that the team is able to adapt quickly to continue the progress of the project. This was evident in our project when as mentioned there was some misunderstandings about the implementation details of the project. This was however solved quickly by having a meeting where we managed to clear up misunderstandings and create the common understanding that is so important in order to deliver a high quality product.

Make changes to the plan if necessary

In our pre-report, we initially planned to use Firebase as the back-end. Firebase is using Cloud Firestore for storage which is a NoSQL, document-oriented database. During the development

of the product, we realized that we need to be able to enforce some constraints on the data in the database. This is one of the weaknesses of NoSQL databases. In order to deal with this we decided to switch to PostgreSQL for the database since it makes it way easier to enforce constraints on the data. In hindsight this was clearly a better choice and it shows that it is important to be flexible with the plan.

6 Reflection on learning and unlearning

Although we are students from different universities, we are nearly at the same point in our educational careers. During our studies in Mechanical Engineering, Industrial Engineering, and Computer Science, we learned a lot and have a lot left to learn. Based on the insights of the previous sections, the following points show what we learned and unlearned during the entire process of the project assignment.

Things we learned

• Communication/Information is key

Several decisions were made during the project, resulting in important information necessary to be shared with all group members. As a result, we established a group chat to ensure frequent information flow and project updates. Besides this online communication tool, we also held physical meetings on campus, where face-to-face communication could occur. These group meetings were valuable and necessary to create an arena for discussing projectrelated topics and solving unexpected issues. This communication is a crucial factor for the success of a project, as no critical information is overlooked or misinterpreted.

• Schedule frequent meetings

As we started our project assignment, we followed no strict meeting schedule due to contrasting lecture plans. As a result, the group struggled with communication problems that had to be solved urgently. Therefore, we agreed on weekly meetings to prevent miscommunication in the project team. It was also helpful to have short meetings, just for quick feedback and responses, when there was no possibility of meeting for a longer time. In addition, it contributed to our team building.

• Soft skills are important

We knew in the beginning that problems or conflicts could occur and that these problems would affect our project result. The importance of soft skills was demonstrated in our weekly meetings and collaboration sessions. A part of our project was to identify essential soft skills required by a project manager; problem-solving and teamwork are also skills that a good project manager should have or respectively learn.

Have a clear project organizational structure

The course lectures reflect on the importance of a solid project organizational structure. In the early phase of the life cycle, we struggled to assign a structure as we were unsure if it was best to follow a functional or matrix structure. Finally, however, we structured our project to follow a matrix structure due to the slow decision-making process and silo mentality in a functional structure (B. Hussein 2018). After the planning phase, we realized the significant dependencies between tasks and decided to set deadlines for the different phases of the project. This helped us a lot, not only to see our progress but also to complete our tasks on time.

During this project assignment, one situation was critical for the success of the project:

Due to the initial lack of communication, our group faced a big misunderstanding regarding our product topic. Some group members thought we agreed on a project management tool where the project manager could evaluate their knowledge of project management. Other group members thought this tool was there to evaluate the project manager and their work by a second person. In retrospect, this misunderstanding was unexpected, but it would be critical to the success of our project. This further proves the essential nature of communication and information as success factors in a project.

Things we unlearned

• Excessive discussion is good discussion

Discussions are healthy and necessary to reflect different angles of a project. However, these discussions can result in wasted time and resources. As our group had split into smaller subgroups, it was sometimes unnecessary for the entire group to be present in discussions if only a few felt they could contribute. At times, discussions became circular, with no apparent answer to the discussed question or indication of when the discussion had moved on.

• Updating the Resource chart is a waste of time

Due to our optimistic Gantt chart, the distribution of work was unequal as some tasks required much more time than initially planned. Consequently, there was little control over the efforts of the other subgroups. This could have been avoided by restructuring the Gantt chart to be more realistic for our project.

• It is best to only contribute to the sections you are most confident

Our project tactic was to split into subgroups to focus on the deliverables we could most strongly contribute. However, in hindsight, we could have exchanged competencies, where members could learn from one another and be able to contribute to other parts of the project. Although we felt our structure worked well, it did not allow us to learn as much from each other. Another criterion here is time; due to the project's due date, more time was required to realize this efficiently.

• Do the project only for a grade

After our studies and starting work life, we will no longer receive a grade or feedback on work. However, this project has given us insight into the challenges we will face when working on a project, in a team, and in a specific role. It is clear that we have to find an alternative form of motivation to work towards a successful outcome in the future. Therefore, for this project, we have unlearnt motivation to complete a project only due to a grade.

In contrast to the critical situation in the "what we learned" part, we had no situation where unlearning was critical for the project's success. However, the points mentioned in unlearning increased the project's workload, uncertainty, and required effort. For example, the mentality "Excessive discussion is good discussion" leads to unawareness, which occasionally does not allow us to be open to new information (Raelin 2001). This can be the source of conflict due to inadequate discussion and poor group dynamics. Therefore, the points mentioned in unlearning are essential, as they can result in significant conflicts and problems that can cause project failure.

7 Acknowledgements

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Appendix

A Link to product website

Link to the PMET website: http://46.101.114.14/

B Link to video presentation

Link to the video presentation for PMET: https://youtu.be/YkqX8wK9r10

C Product onepager for companies

The following slides show information material in the form of an onepager sent out to companies. This also includes an additional survey slide to get feedback on our idea and to illustrate the significance and relevance of the product.

Project Manager Evaluation Tool





Project Manager Evaluation Tool

Our goal is to design a website that allows project managers to evaluate their working methods and knowledge regarding project management based on clearly defined criteria.





Project Manager Evaluation Tool



Would you use this evaluation tool for your projects? (2-3 sentences, why or why not)

How many years of working experience do you have in project management?

D Pre-report

The following pages show the pre-report as submitted on Blackboard.

Pre Report Group 39

Type of product and benefits

The role of a project manager is very diverse. His experience and previous knowledge should be broad in order to be able to exploit the maximum potential in each project phase. He should have both hard and soft skills. The right handling of time, costs, scope, quality, and other business skills are mentioned as essential skills. On the human level, a leader is needed who is also identified as a team member by the rest of the team. These are all factors that ultimately determine the success or failure of a project.

In summary, this results in a complex profile of requirements for a project manager. Moreover, it is often difficult to look at these requirements and the work as a project manager objectively and assess them quantitatively. At the end of a project, only the end result, i.e. success or failure, measured in terms of sales or customer satisfaction, decides whether the project management methods applied are chosen correctly. Thus, it is difficult for the project manager to receive personal feedback on the individual project phases. The characteristic of self-reflection can therefore not really be tested. However, this comparison of self-assessment and evaluation by an external observer could enormously increase the personal and professional development of a project manager. At the same time, this can prevent inefficient project management from continuing despite a project's success [1].

Based on the initial problem described above, the goal is to design a website that allows project managers to evaluate their working methods and knowledge regarding project management based on clearly defined criteria. The tool will provide detailed questions about the following topics related to different project phases.

- Project scope statement supposed benefits
- Requirements and project objectives
- Stakeholders and their project involvement
- Project risk assessment plan
- Project breakdown structure
- Project schedule
- Success factors
- Roles and responsibilities in the project
- Quality assurance plan
- Communication plan
- Other required skills (Material procurement, resource allocation etc.)

Additionally, the tool can also be used by the stakeholders and the customers of a project to evaluate the project manager's work. The benefits and product outcome are shown in figure 1. The results can then be compared with the project manager's self-assessment. From this, a

ranking can be derived that maps the qualities of a project manager in the context of customer satisfaction and stakeholder involvement. In the future, this enhanced application could serve as a hiring platform for companies looking for project managers, with the ability to filter by any criteria the person should meet. As a further step, complementary certification offerings could be provided through the website to standardize the classification of project managers by experience and skills.



Figure 1: Visualization of benefits to project managers, companies, and others.

Stakeholder

The project involves several stakeholders that show different levels of interest and influence. It is important to identify who they are and which kind of relationship links each of them with the project.

The stakeholders involved are:

- *Project managers intended as final users*. They are supposed to be the main users of this new product-service and those who will benefit most. The level of interest is high because of the purpose of the project itself that will increment the managers' performances. The level of influence is high as well, in that without them the project becomes meaningless.
- *Product owner* represent a key stakeholder who make available the website with its new functionalities
- <u>Professors and the student assistants</u> show not so high interest in the project but at the same time they give directions and guidelines. They exert critical influence on the project giving support and establishing guidelines
- <u>Students that want to apply for project management positions</u>, they are interested in the project outcome but their influence is very low. They need to be informed about the product development because in the future they could become essential end users
- <u>Companies</u> can show high concern for the project because if it is successful they could use it as a resource for their own business and hiring more qualified employees. The influence that they have is still low.

	Small Interest	Large Interest
Critical Influence	G2 The professor of our course: Bassam Hussein Lecture assistants	G1 Project Managers as end user Product owners
Marginal Influence	G4	G3 FutureProject Manager students Companies

Table 1: Stakeholders in their respective groups.

Risk Assessment

Most of the risks in this project will fall into the category of internal risk for things that can happen within the team, and technical risks. There aren't really any financial, legal or commercial risks associated with the development of the product.

Nr:	Risk:	Consequence:	How we will address:
1	Team members are not committed to the project.	The progression of the development will suffer. More to do for the remaining team members.	Try to motivate team members who are not committed. If necessary, talk to teaching assistants or teachers.
2	Team members are absent (could be due to illness, personal reasons, etc.)	The progression of the development will suffer. More to do for the remaining team members.	Check if it is possible for team member to do it later. If not, redistribute workload to other team members.
3	Team members lack the necessary skills to deliver a satisfactory product.	The progression of the development will suffer. Team members need to spend time learning new skills instead of working on the product.	We need to assign time for the team members to learn the required skills. The team members with more technical skills need to help the other team members.
4	Disagreements within the team.	Can lead to irritation between team members. Can lead to delays in progression if team members are not able to deal with disagreements.	Solve disagreements by majority vote.
5	Loss of work.	Will be catastrophic in later stages of the project. The team might not be able to deliver a product at all.	Always have backup of work. Use version control software like git.
6	Unexpected task dependencies.	Will make it difficult to utilize the whole team. Delay in product development.	Try to identify dependencies as early as possible.

7	Difference in technical skill level within the team.	Can lead to frustration within the team which again can lead to disagreements.	Try to utilize all the competence of the different team members.

Table 2: Risk assessment analysis

Required skills and how we will acquire them:

When developing a website there are a lot of technical skills that are needed in order to create a good product.

<u>General programming</u>: Since we will be making a website it will be necessary for the team to program. Fortunately all the team members have some earlier experience with programming.

<u>Typescript</u>: Typescript is the programming language that is used on the web. Some of the team members already have experience with typescript while some have not. For the team members who are lacking experience there are a lot of tutorials online to learn the basics.

<u>HTML(Hyper Text Markup Language)</u>: The content of a website. Some of the team members already have experience with this. The team members who have experience with this should try to help the others to learn. There are also a lot of online resources for learning the basics of html.

<u>CSS(Cascading Style Sheets)</u>: Used to style a website. Some of the team members already have experience with this. The team members who have experience with this should try to help the others to learn. There are also a lot of online resources for learning the basics of css. Could also use external libraries to style components in addition to css.

<u>React</u>: React is a framework for frontend development. Some of the team members have prior experience with this. They should try to learn the basics of React to the other team members. There are also a lot of online resources to learn React

<u>Git</u> - Version control system. Some of the team members have experience with this and they should teach to the others. A lot of online resources are available.

<u>Firebase</u>: Firebase is a database service that offers NoSQL databases and real time hosting. There are a lot of tutorials online and one of the team members has previous experience with firebase.

Besides the technical skills to program the website we need to acquire soft skills like communication, decision-making and conflict management. These soft skills are required to succeed in the project. In this context we hope to improve our organizational growth.



Project breakdown structure

Figure 2: WBS diagram

The breakdown of software projects can vary greatly and consist of all deliverables, sub-deliverables, and work packages that define the project. Figure 2 is a WBS diagram to visualize what we consider the most critical components required to reach our project end goal. The overall project under development is at the very top of the WBS diagram, representing the final website and all the work put into the project. Each WBS element should represent a tangible delivery[2]. In order to start producing anything physical, the group must first create a plan to follow.

The first deliverable, planning, consists of four sub-deliverables. The first is define need, which can fragment into two work packages: Interviewing PM's and Search. Gathering information about end users' needs and wants clarifies what the final product should include and ensures that the product is one that end users are willing to use. The following sub-deliverable is to specify requirements, symbolizing everything that the team must agree on before development. The corresponding work packages are Technology, Group Roles, and Tools. Developing software requires technologies that the team is familiar with or capable of learning. For an efficient workflow and to ensure deliveries on time, team roles such as developer, scrum master, and quality assurance have to be defined. Finally, the group must agree on tools such as communication or collaboration and meeting times. Another essential sub-delivery is Training;

the chosen tools and technologies require learning through work packages such as tutorials or collaboration. The final sub-delivery under planning is design; to define what the final product will look like, as well as software architecture. The corresponding work packages are Research and prototyping to create graphs, views, and a user interface.

The subsequent project deliverable is implementation, where the team uses the planning deliverable to commence product development. This deliverable consists of three separate sub-deliverables that build on one another: Installment, Programming, and Deployment. The Testing deliverable consists of sub-deliverables such as Testing code and User testing. Testing code is essential for code quality and maintainability, and user testing is critical to ensure the end users can use the produced product. The final project deliverable is Evaluation. This deliverable has two sub-deliverables: documentation and surveys. The group must document so that the product can be maintained and enhanced by others, and surveys consider what went well with the product and potential improvements.

ID	Activity	Duration (Hours)	Predecessor
А	Planning	3	
В	Training	5	А
С	Design	10	А
D	Installment	10	А
Е	Programming	30	A, B, D
F	Testing	2	A, B, D, E
G	Evaluation	5	A, B, C, D, E, F

Project schedule

Table 3: Estimated time and predecessors for project activities.

Table 3 displays the project's task along with their estimated duration in hours and predecessor activities. The hours mentioned in the duration column reflect the time spent by each team member. The planning phase involves everything concerning the project's purpose and identifying end users' needs and wants through research and surveying.

Important success factors

To adhere the success in our project during the project planning and the execution we should identify the most important success factors for our project:

- Support/ Feedback from lecture team (professor, student assistant)
- Clarity of the task and responsibilities/roles in the project group
- Knowledge about project management, skills and competence from students
- Technology to support the (digital) project (PC, internet)
- Equal involvement from all group members and effective communication (big project group)
- Detailed and realistic plan/schedule for completion of the project
- Trust in the project group
- Staying in the constraints of the project owner specifications regarding the project

Roles and responsibilities in the project

To reach the goals of our project every group member should be aware of her/his role and the given responsibility coming alongside with this role for the success of the project. Differing with "real projects" in our university project all group members are all project managers with the same rights and responsibilities (shared leadership). This fact requires a fitting communication plan (see therefore Communication plan) to make sure that each project manager is equally informed and included in every decision the group is making. The role and responsibilities of a project manager are diverse. In our project the project managers are responsible for the planning, organization and execution of the project in context with the formulated success criteria. Furthermore, the project managers have to execute the different stakeholder strategies described in the stakeholder mapping. Additionally, to every group member's role as project manager each group member is also an owner of different work packages from the WBS (see Figure 2). Hence we are so early in our project lifetime the distribution between the work packages from the WBS and the group members is at this moment not fixed. However, what is clear is that every group member gets the same workload to complete the project and make the evaluation in the end through the professor as fair as possible.

Communication plan

Communication within the project team and with external partners and stakeholders is important for a smooth project implementation and the ultimate success of the project. The basis for this is a sense of responsibility, mutual trust and transparency towards all parties involved in the decision-making process. A regulated communication plan should prevent anyone from being ignored and ensure that all relevant information is available to everyone at all times.



Regular team meeting

Figure 3: Visualization of the communication plan

The core team to implement this project consists of six people who have equal rights within the project. As it is shown in figure 3 various options were introduced to enable communication. A team chat has been established for general communication and is used for this purpose. In addition, a shared file was created to which all participants have access and in which the tasks are to be processed so that the other team members can view the work progress at any time. Depending on the phase of the project, meetings are usually held every two weeks to discuss progress and execution of work packages. If necessary, additional meetings can be scheduled with an extended group of stakeholders. Towards the end of the project implementation, the frequency of meetings can also be increased again in order to agree on final topics.

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List of figures

Figure 1:

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Figure 3:

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