

The Project Management Assistant that Never Sleeps

Using Generative Artificial Intelligence to Support Project Management Activities

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Abstract—Over the past few years, people have become accustomed to using a variety of digital tools in their work environment, e.g., for collaboration, knowledge management and task management. Recently, people have become aware of a new type of digital tool: Generative Artificial Intelligence (AI) assistants, such as ChatGPT, Gemini or Copilot, which are capable of generating text as well as other forms of content, such as images, music, and even code in response to user queries in natural language. These tools have a huge impact on the way we work. New application scenarios are constantly being explored and Generative AI assistants are being used in fields such as marketing, medicine, and education. This paper discusses a use case in the field of project management. It analyzes how Generative AI assistants could support project management tasks performed by project managers and project management assistants. It also discusses the new skills that these persons must acquire in order to interact with the tools in an efficient way and to use the results provided responsibly. An extensive case study shows how selected project management tasks, i.e., stakeholder management, can benefit from the support of a Generative AI assistant. The case study covers a wide range of project-related activities, including its use in brainstorming, creating a stakeholder matrix, writing meeting invitations, and sentiment analysis. The results of the GenAI assistant for each task are evaluated while special attention is given to the aspects of trust and control in such settings.

Keywords—Large Language Model (LLM); generative Artificial Intelligence; project management; stakeholder management; prompt engineering.

I. INTRODUCTION

As in almost every area of our personal and professional lives, tools based on generative artificial intelligence (AI) have been explored in the field of project management over the past year. There is a wide range of application scenarios in project management and the need for project managers and project management assistants to become proficient users of these tools to increase not only their productivity but also their creativity [1]. Project management professionals already use a variety of digital tools in their daily work, ranging from project planning, and monitoring to stakeholder and risk management [2]. Some of these tools are highly specialized, such as project management software, while others are not limited to project management, such as video conferencing software, instant messaging applications, cloud-based

document sharing, or digital whiteboards. These digital tools have fundamentally changed the way people work. Recently, a new technology has emerged that has the potential to have a profound impact on modern work culture, including project management: Generative AI (GenAI), which is able to create different types of content, such as text, images, music and videos. GenAI assistants provide an easy-to-use interface to this technology. They simulate human-like conversations and provide meaningful responses to user queries [3]. Due to recent advances in AI, these AI assistants are becoming increasingly powerful.

As the use of digital tools is already widespread in project management, it can be assumed that many project managers will use generative AI in their daily work. They are likely to adapt these new virtual assistants easily and quickly [4]. Various blog posts, and “cheat sheets” showcase examples of how to interact with these tools [5]. However, there are many differences in the way of interacting and interpreting the results obtained by an GenAI assistant in comparison with classical tools in project management. The project manager and the project team should be aware of them and possess certain skills to use them in a productive way. Moreover, despite all the new and exciting possibilities that GenAI offers, there are risks involved that need to be mitigated, such as ethical challenges like discrimination, information hazards, misinformation harms and human-computer interaction harms [6], [7].

To this end, the paper is structured as follows. Section II provides the required theoretical foundation on GenAI and the new skill “prompt engineering”. Section III discusses how project management professionals can benefit from GenAI assistants in their daily work. Therefore, it structures AI-assisted project management tasks in six categories and analyzes the required skills. As a concrete case study, Section IV demonstrates how a GenAI assistant can support the activities around stakeholder management. Useful prompts will be introduced. Recommendations will be given on how to fine-tune these prompts to improve the quality of responses and their appropriateness to the particular project context. Based on the experiences with the case study, Section V discusses potential and risks of the use of generative AI in project management. Section VI concludes the paper and outlines areas for future research.

II. GENERATIVE AI AND PROMPT ENGINEERING

A. Generative AI

Since OpenAI released ChatGPT to the public in November 2022, GenAI gained much attention. The term GenAI denotes a subfield of AI that specializes in developing models that are capable to create new, original content [8]. Based on the resulting media, we can differentiate four domains of GenAI: text generation, image generation, audio generation and video generation [8]. Each of it uses specific models and algorithms to generate the desired output based on learned patterns.

Large Language Models (LLMs) are the common architecture for text generation [9]. LLMs such as GPT4 from OpenAI have been trained on vast amounts of text data from the Internet. Their development has been made possible by the recent advances in AI, especially deep learning and transformer architectures, the rapid growth in computational power and the large amount of data available on the Internet that could be used as training data [10]. LLMs have learnt based on this extensive training set to generate text sequences that most likely continue a given text [11]. Nowadays, the quality of the text produced by these systems is so high that it is difficult to distinguish whether a text was written by an AI or by a human [12].

In image generation, diffusion models are commonly used for text-to-image generation [9]. Tools such as DALL-E offer the possibility to create new images based on textual descriptions or to modify existing images in novel ways. Audio generation employs models to synthesize speech, music, or other sound effects that can mimic real-world audio. Video generation combines techniques from both image and audio domains to create or modify video content.

End users nowadays benefit more and more from models that take different types of input and are capable of generating output in various forms. These models are referred to as multimodal [9]. There are user-friendly interfaces that allow end users to benefit from the capabilities of such GenAI models without the need for advanced AI or programming knowledge. Examples are ChatGPT from OpenAI, Google's Gemini or Microsoft's Copilot. Users can formulate their input in natural language (or even provide images) and, as we know from chatbots, these models generate coherent answers, simulating a conversation between human beings [3]. By providing easy-to-use interfaces, the model-specific capabilities are extended so that these models can be used in a variety of real-world use cases [9]. We refer to these tools in the following as GenAI assistants.

It is important to know the differences between LLMs and search engines. They are distinct technologies, as they are characterized by different capabilities. LLMs generate context-sensitive text based on a given input, formulated in natural language [3]. In contrast, search engines take a keyword-based query as input and retrieve information from indexed web pages or databases. They do not generate new

content but provide access to existing information. This is not the case with LLMs, which might "hallucinate" facts and references [3]. Moreover, LLMs cannot provide information on recent events without being integrated into other tools that have access to up-to-date information (such as search engines) [3]. Users must be aware of these limitations.

B. Prompt Engineering

The instructions given to a LLM are called prompts. In the prompt, the user provides the LLM with the context of the conversation and defines how the intended output should look like in terms of content and format [13]. For instance, a user might specify the desired output as an essay with approximately 1500 words. The process of constructing these prompts is referred to as *prompt engineering*, i.e., "the art of fine-tuning the questions or commands provided to AI models in order to optimize their performance and guarantee that they produce the desired results" [14]. In consequence, to collaborate efficiently with LLMs, users need to have a good knowledge of prompt engineering [3].

III. GENAI ASSISTANTS IN PROJECT MANAGEMENT

A. Usage of GenAI in Project Management and Project-Related Tasks

GenAI can be applied to the discipline of project management in a variety of ways in order to assist typical activities such as project planning [4], [15], stakeholder management [1] or risk management [4]. An example is the use of GenAI in project estimation [16]. As result to a first prompt, a list of possible tasks is created as Work Breakdown Structure (WBS). For each WBS task, the required time was then added manually. Then, the extended list was handed over to the GenAI together with a list of available resources (such as the number of developers) and their average salary. Based on this information, the GenAI calculated the total effort for the project. In this very simple example, the calculations made by the GenAI were correct. However, project managers should be aware that LLMs might have problems with solving more complex mathematical tasks [17].

Further examples of how GenAI can assist tasks performed within project teams include idea generation [18], assistance in requirements gathering [16], digital prototyping [18], and coding [19]. These use cases indicate a shift in the perception and application of AI. Traditionally associated with more analytical tasks, AI, and particularly GenAI, is now being used more and more for creative tasks.

To assess whether a GenAI assistant's results are really helpful, or even as impressive as some AI enthusiasts claim [20], Barcaui and Monat conducted a qualitative study comparing the content as well as the structure of a project plan created by an experienced project manager and a GenAI [15]. The human project manager and the GenAI were provided with the same information about a planned beauty app and given the task to plan the project. They had to define

the scope, develop the timeline, estimate costs, assess resources, and analyze stakeholders, etc. Barcaui and Monat compared a large amount of data generated by the human project manager in about three weeks and by the GenAI assistant in 15 rounds with elaborated prompts. In order to benefit from the strengths of both humans and GenAI, they recommend a collaborative approach. This is also recommended in this paper. GenAI can produce remarkable results very quickly, but it may lack the necessary domain knowledge and understanding of the particular environment, in which the project is taking place. Therefore, it is important that human project managers enrich the prompts with context and carefully review the results. As discussed in the previous section, excellent prompt engineering skills are required.

B. Patterns of AI-Assisted Project Management Tasks

In the following, six patterns are introduced that represent “meta-tasks” performed by project managers within typical project management activities such as project planning, project estimation, stakeholder management or risk management. Figure 1 provides an overview of the defined patterns, sorting them by project duration and showing the degree of interaction between humans and GenAI assistants. For greater clarity, each pattern is only shown for the primary area of application. It goes without saying that patterns can also be used repeatedly during the course of a project. The intensity of the interaction can vary widely, ranging from a basic information exchange to collaborative partnerships where humans and GenAI assistants work closely together on creative or problem-solving tasks.

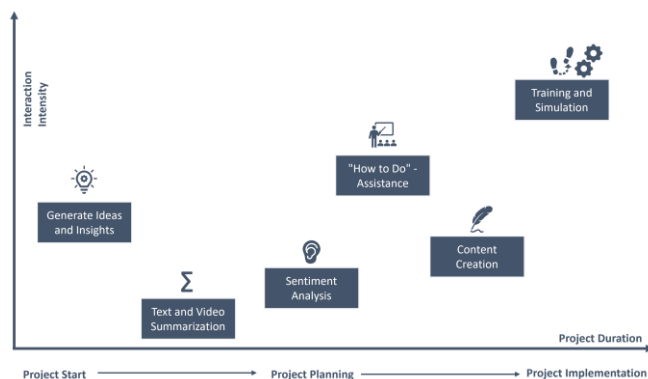


Figure 1. Patterns of AI-Assisted Project Management Tasks

Given the rapid advances in generative AI, the following overview is not meant to be exhaustive. Rather, it aims to provide a framework to structure practical AI-assisted project management tasks.

1) *Generate Ideas and Insights*: A GenAI assistant can support idea generation and brainstorming by suggesting topics or themes based on user input or some predefined categories. Combined with search engines, they can retrieve information from a variety of sources, such as articles, research papers, or databases. However, users need to check

the output generated by the GenAI assistant for their correctness [3], as a high likelihood of the generated content is no guarantee that it is correct [6]. A project manager could, for example, ask a GenAI assistant to generate a list of risks or ideas for risk mitigation strategies.

2) *“How to Do”- Assistance*: Users can ask a GenAI assistant for guidance on a certain task, for instance, how to write a project proposal or how to plan and estimate the project. The GenAI assistant typically provides a list of steps for the user to follow, often like a recipe, e.g., certain aspects that need to be clarified for the project proposal. It should be noted that, if the prompt is too general, the result will also be unclear or inaccurate [21].

3) *Text and Video Summarization*: GenAI assistants are able to summarize or extract key aspects of large texts. This ability could save time for a project manager who needs to compile and summarize project data for a status update. Instead of reviewing numerous documents and reports, they could focus on interpreting the results. However, this task requires a significant level of trust in the GenAI assistant. New application scenarios came up with the integration of GenAI in video conferencing systems. GenAI can be employed to listen to or read through transcripts of discussions and automatically generate summaries or highlight critical aspects. For instance, Microsoft included a feature called Intelligent Recap into Microsoft Teams, which allows you to create meeting minutes including follow-up activities [22].

4) *Content Creation*: GenAI assistants can support in generating content for various purposes, such as articles, blog posts, social media updates, or product descriptions [3]. Based on a given topic, they can, for example, offer relevant keywords, suggest headlines, or write complete articles. In project management, different types of content are relevant, such as official documentation like project proposals, one-pagers, reports, internal working documents, as well as any communication with stakeholders. In addition to generating new texts, GenAI assistants can improve existing text. On the one hand, it can correct a text in terms of spelling, punctuation, and grammar. This is especially helpful for non-native speakers. On the other hand, it can rewrite a text and change its writing style based on the desired tone and target audience. For instance, it could turn a formal and technical text into a conversational and engaging one. This could be useful when preparing two communications about a milestone achieved in the project, one for the project steering committee, and the other for future users.

In addition to generating text, advanced GenAI assistants now have the ability to generate images and other forms of media. These systems are able to process and interpret information not only in the form of text, but also in multiple modalities, including images, audio, and video. In project management, for example, a GenAI assistant could create visualizations of project data, such as graphs or charts, based

on text prompts. A project manager preparing a presentation for the steering committee could use the virtual assistant to create visualizations of the project's progress.

5) *Training and Simulation*: A GenAI assistant can help users explore different perspectives by simulating to be someone else. By pretending to be a particular persona (“role prompting”) with certain opinions, experiences, or expertise, the chatbot can provide responses from that particular perspective. This allows users to gain insights that they might not have considered otherwise. In project management, this could be useful in stakeholder management. A variation would be a flipped interaction, where the GenAI assistant asks questions and the user has to answer. This could be used to train difficult situations.

6) *Sentiment Analysis*: GenAI assistants can identify sentiments or emotional tones expressed in a given text [23]. They can assist users in gaining insights into the overall sentiment or mood of the content. This capability could be used in stakeholder management, for instance, to analyze comments posted by stakeholders on social media or other online communications.

C. Required Skills

To interact successfully and effectively with GenAI assistants, humans need certain skills. With the previously described tasks in mind, these skills are explored below. Figure 2 provides an overview of these skills.

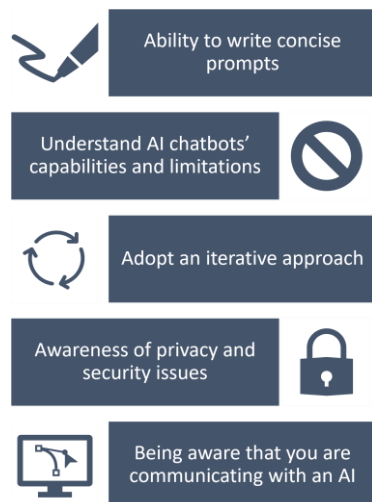


Figure 2. Skills required for efficient collaboration with GenAI.

1) Ability to Write Concise Prompts

When writing prompts, users should ask specific questions and be concise in their wording, as this helps chatbots to better understand user queries [24]. In addition to the use of simple language, the questions, as well as the provided content should be clearly structured [14]. By learning to provide GenAI systems with clear, unambiguous prompts, users can guide the model to produce more accurate, relevant, and useful outputs. This skill involves not only

understanding what to ask, but also how to ask it in a way that matches the AI's processing capabilities and limitations. Various guidelines and learning paths on prompt engineering can be found online. It should be noted, however, that these were typically compiled for a certain tool in a certain version, e.g., GPT-4. Because of the rapid development in the field of GenAI, prompts that yielded excellent results with an earlier version of a model might not work as effectively with a newer version, which may have been trained on more data, utilize different algorithms, or have altered processing mechanisms. Moreover, a prompt that works well for one tool may not give good results for another tool. This might also be the case for all prompts discussed in the following. However, some basic prompting techniques that will be applied within the case study are presented.

a) *Use multi-turn prompting*: First, users should think about whether they want to integrate several tasks into a single prompt or to split them into multiple prompts. For instance, a GenAI assistant could be asked in a single prompt to generate four ideas about a certain topic and to discuss them in a short blog post. Alternatively, a first prompt could ask for four ideas, and a second one to write a blog post based on idea 1, idea 2, and so on. The advantage of using multiple prompts is that the output can be reviewed, and if necessary, adjusted or extended. This technique, also referred to as “chain of thought prompting” or “multi-turn prompting” takes into account the potential complexity of certain tasks and aims to facilitate more interactive and collaborative interactions with the GenAI [25], [26].

b) *Provide context information*: A second important technique is to incorporate context information, such as background knowledge, domain-specific knowledge, or insights about the target audience, into the prompt. Using such knowledge-augmented queries supports the LLM to generate more informed and accurate responses, because the model gains a more complete understanding of the specific requirements, nuances, and the users' expectations [21], [27]. However, users should be careful about providing sensitive or private information.

c) *Provide behavioral instructions*: In addition to providing context information, it is a good practice to add some behavioral instructions, which frame the conversation with the GenAI assistant and offers a clear direction for the AI in terms of tone, style, and content. Including behavioral instructions serves as a valuable starting point for prompts. An example is a role prompt (“act as”), for instance, “act as an experienced project manager”. Some GenAI assistants offer the possibility to provide this information, also referred to as “system prompt” in a separate chat window (see e.g., the custom instructions in ChatGPT or the system prompt in the OpenAI playground). This approach is particularly beneficial when a user wants the GenAI assistant to respond in a manner consistent with a specific role or scenario. With the use of a system prompt, there is no need to repeat the same instruction in different conversations [28].

d) *Apply multimodal prompting*: Multimodal prompting means to provide a GenAI assistant with inputs or prompts in different modalities, such as text, images, audio and video. For example, Google's Gemini multimodal model is able to leverage the entire context of a conversation and combine written and visual information to generate its answer [29]. This technique is useful not only in tasks such as content creation, but also in complex decision-making scenarios, where input and output in various modalities provide a more complete view of the situation.

2) *Understand GenAI Assistants' Capabilities and Limitations*

It is important that users are aware of the actual capabilities of GenAI assistants, i.e., to know what tasks they can perform, what knowledge they use to answer queries, and how they differ from search engines. This will help users to frame their questions and expectations accordingly. Awareness of limitations and potential difficulties, such as bias in the underlying data, is also extremely important, as it is a prerequisite for users to write appropriate prompts and interpret the results provided by GenAI assistants in a responsible manner. For instance, users should be careful to write prompts that are free of pre-existing biases or assumptions about gender, race, or other sensitive factors to avoid reinforcing bias [21]. Users should think critically, verify the results with their own expertise and conduct further research in trusted sources [21].

3) *Adopt an Iterative Approach*

Users should be prepared to take an iterative approach when interacting with a GenAI [3]. It may be necessary to phrase the prompt in a different style or add information. Being flexible and adapting to the GenAI assistant's conversation flow will ensure a smoother conversation. Sometimes users need to be patient and try different approaches. While this can be considered a form of learning, users need to be aware of the chatbot's limitations and should consider whether not using the chatbot might be more efficient in specific situations.

4) *Awareness of Privacy and Security Issues*

When interacting with GenAI assistants, users should critically evaluate what information they are willing to share. They need to be aware of whether the question or contextual information provided in a prompt reveals sensitive data. This applies to both personal and business-related data. For example, users should be careful about writing project-specific details, financial information, or proprietary data. They should always formulate such information in a generalized and anonymized manner, and consider the need to disclose sensitive information.

5) *Being Aware That You are Talking to an AI*

Users need to be aware that they are communicating with an AI, not a human. Because of the conversational interface, users tend to think of a GenAI assistant as a human, or at least attribute some human-like characteristics to it. This can be observed in users' prompts where they use phrases like

“please”, “thank you”, even though they know that they are talking to a bot. Anthropomorphizing the GenAI assistant poses several dangers, such as shifting accountability to the GenAI assistant or overestimating its capabilities [6].

Project managers using GenAI assistants should be aware that GenAI assistants may not be able to handle complex or nuanced situations that require human judgment and decision-making. They operate based on data and patterns, which may not always account for a specific situation or in unforeseen circumstances. Users should think critically and consider the limitations of GenAI assistants when relying on their advice or recommendations. Project managers should also understand that not only can they be misled by a GenAI assistant's response, but so can their team members.

IV. CASE STUDY ON INCORPORATING GENAI ASSISTANTS IN PROJECT MANAGEMENT

The following case study demonstrates how GenAI assistants can increase the efficiency and effectiveness of project management. It considers a digitalization project at a European manufacturing company, which aims to introduce a new software for recording the working time. This system should simplify and automate current processes. The project encompasses the vendor selection, the customization of the selected solution, the process redesign, and the training of the future users. Note that scope and objectives of the project considered in the project management case study are already defined as it would be the case in any project in an enterprise context. A conversational AI could have been used in this preliminary step, too. For instance, it could support the project initiators to better formulate the objectives or assist other tasks in project definition.

Within the case study, concrete activities in project management should be performed with the help of a GenAI assistants, namely one of the project performance domains described in the PMBOK Guide published by the Project Management Institute (PMI) [30]. A project performance domain is defined as “a group of related activities that are crucial for the effective delivery of project outcomes” [30]. The PMBOK Guide outlines eight performance domains that should be considered during the implementation of a project. These domains play a crucial role in driving the project towards its intended outcome. In the case study, the focus will be on the stakeholder performance domain.

This performance domain emphasizes that it is important to maintain alignment with the stakeholders of a project and to engage with them a positive relationship [30]. Stakeholders are persons or groups of people who affect the project and its outcomes, or who are affected by the project and its outcomes. They all bring their own ideas, values, qualifications, and prior experience [31]. The PMBOK Guide identifies several activities in the context of the stakeholder management as shown in Figure 3.

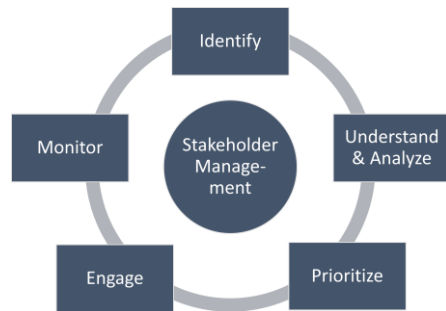


Figure 3. Activities to ensure stakeholder engagement based on [30].

A first try could be to write a single prompt that asks the GenAI assistant to perform the stakeholder management, such as “Do the stakeholder management for a digitalization project in a German manufacturing company that aims to introduce a new digital system for recording the working time.”. The result is, according to ChatGPT, a “comprehensive stakeholder management plan for your project”. It contains eight steps that can be mapped to the activities named in the PMBOK Guide. For each step, a type of deliverable is presented, such as a list of stakeholders, or a communication plan. However, a closer look at the results reveals that they are rather general. For instance, one recommendation for managing stakeholders’ expectations is to highlight the benefits of the new system, such as accurate time tracking, improved efficiency, and reduced paperwork. This is true, but too superficial to be useful in day-to-day work. This example highlights the need for more sophisticated prompts. For instance, each of the eight steps could be refined with the help of individual prompts, each focusing on specific aspects of stakeholder management. Such prompts are shown below for each stakeholder management activity.

In addition to the individual prompts, we define for this case study in ChatGPT a system prompt as shown in Table I. It frames the conversation with the GenAI assistant in the scope of this project management case study.

TABLE I. SAMPLE SYSTEM PROMPT

Intent	Let the GenAI assistant act as an experienced project manager
Type of prompt	System prompt
Required input	Description of the desired behavior
Prompt	You are an experienced project manager with certifications in various project management standards, which you are able to apply in practice. You are now responsible for the following digitalization project and you have experience with this type of project.

By specifying that the GenAI should act as an experienced project manager, we aim to increase the accuracy of its responses. For instance, the GenAI will use concepts and terminology that are specific to the field of project management.

A. Identify Stakeholders

First, it is necessary to identify all potential internal and external stakeholders of a project. While certain stakeholders can readily be identified, there might also be stakeholders that are only indirectly affected by the project [30]. They are more difficult to identify. In practice, the activity of identifying stakeholder is often performed by the project manager and some team members in a brainstorming session [32]. A GenAI assistant can support this task. To enable the GenAI assistant to generate a list of stakeholders that is specific to the project at hand, some context about the project must be provided. It is recommended to describe the project in a short but precise way. By doing this, it has to be taken care that no confidential information is passed to the AI-based system. Table II shows such a prompt.

TABLE II. SAMPLE PROMPT TO STAKEHOLDER IDENTIFICATION

Intent	Identify the stakeholders of a project
Type of prompt	Brainstorming
Required input	Context information about the project
Desired output	List of stakeholders including a brief description of how they are connected with the project.
Prompt	<p>Consider the following project and identify the different stakeholders involved in this project: The digitalization project in a German manufacturing company aims to introduce a new digital system for recording the working time. This new system should simplify and automate the process of recording working time. This project encompasses the vendor selection, the customization of the selected solution but also the process redesign and the training of the future users.</p> <p>Identify the internal and external stakeholders for this project. Consider the broad scope of the project, including technical, compliance, and user adoption. For each stakeholder, provide a brief description and explain how it relates to the project.</p>
Excerpt from the result (gpt-turbo-4-preview)	<p>**Company Management and Executives**: These are the top-level decision-makers in the company who have approved the project. They are interested in the project’s alignment with the company’s strategic goals, such as increasing efficiency and reducing operational costs.</p> <p>**HR Department**: The human resources department is a key stakeholder, as they are directly involved in labor management, including working time recording. They will be concerned with how the new system impacts labor regulations compliance, employee contracts, and overall employee management.</p> <p>**Employees (Users)**: [...]</p> <p>**IT Department**: [...]</p> <p>**Works Council (Betriebsrat)** [...]</p> <p>[...]</p>

Before further using the results within the project, it is necessary to carefully check the plausibility in the specific context of the project. As the GenAI assistant generates the answer based on the information seen during the training of the LLM, relationships could be created that are not relevant in the current project. However, it may also be the case that the GenAI assistant identifies stakeholders that one has not thought about oneself. So, one should carefully think about them before excluding them from the list of stakeholders. In addition, the list of stakeholders might be incomplete and might need to be extended “manually”. This could be done in an AI-assisted video conference with the project team. With GenAI, key discussion points, such as specific aspects about a particular stakeholder or discussions about an additional stakeholder, could be automatically summarized. GenAI technology can also identify and attribute specific points of discussion to participants, allowing for the tracking of contributions and where participants are in agreement or disagreement.

B. Understand and Analyze Stakeholders

To be able to effectively engage and communicate with stakeholders, it is important to understand their “feelings, emotions, beliefs and values” [30]. A GenAI assistant can help to analyze the stakeholders’ perspectives. In a first step, it could be asked in a rather general way to gain additional information about the stakeholders, their connection to the new system and to the project. Such a prompt could be “Provide more information about the stakeholder ‘work council’.”. Note that GenAI assistants remember the information given within one conversation. So, the prompts can build upon each other. Including good practices from project management in the prompt can improve the output as shown in the prompt in Table III.

TABLE III. SAMPLE STAKEHOLDER ANALYSIS PROMPT

Intent	Understand the stakeholders of a project
Type of prompt	Generate insights
Required input	The stakeholder to be analyzed. If available, context information about the stakeholder or past experiences with this stakeholder should be added.
Desired output	Information about each of the key aspects required in the prompt. Note that without providing the key aspects in the prompt, the result would be more general.
Prompt	Discuss for the stakeholder "work council" its power, impact, attitude, beliefs, expectations, degree of influence, proximity to the project and its interest in the project.
Excerpt from the result (gpt-turbo-4-preview)	The Works Council (Betriebsrat) plays a significant role in German companies, acting as an intermediary between the employees and management. [...] Let's break down these attributes: ### Power [...]

This example shows how certain aspects that the PMBOK Guide recommends to consider can be added as desired

outputs to the prompt. In the stakeholder analysis, the PMBOK Guide specifically advises reviewing the stakeholders' power, influence, attitudes, beliefs, expectations, degree of influence, proximity to the project, and interest in the project [30]. The project team should review the results of the prompt as it might be necessary to refine them based on project specific information.

To deepen the understanding of the stakeholders' perspectives, fictional characters, so-called personas, who represent the respective stakeholder can be used [32]. Persona analysis is also known in marketing and innovation management. Bilgram and Laarmann demonstrate the generation of a marketing persona in their ChatGPT use case from the automotive industry [18]. In our case study, the GenAI assistant could be asked to describe typical personas that represent the stakeholder “employees”, including their names, their professions, and the impacts that the new system would have on them. Then, the virtual assistant could be asked in a follow-up prompt what a certain persona would tell us about the project providing insights into the individual perspectives, concerns, and expectations. In the results we obtained, it was necessary to ask explicitly for critical perspectives. The answers to our first prompts rather sounded coming from a marketing brochure of time tracking systems and every persona was said to be happy with the system. Table IV shows a prompt that provides us with a more critical perspective.

TABLE IV. SAMPLE PROMPT WITH PERSONAS

Intent	Explore different perspectives
Type of prompt	Generate insights
Required input	Additional information about the personas, such as their current way of working and potential concerns
Desired output	Differentiated opinion from the persona's perspective
Prompt	What would persona <A> say about the time tracking system when she was formerly used to start and stop working whenever she wished, only being judged by her results, not her time spent on them?
Excerpt from the result (gpt-turbo-4-preview)	[...] Here is a possible reflection of their perspective: [...] “My initial concern is that it shifts the focus from the quality of work produced to the sheer hours logged, which feels like a step backwards in terms of workplace modernization and individual autonomy. I've always valued the trust placed in me to manage my time effectively, working when I feel most productive—whether that's early in the morning or later in the evening—without being tied to a conventional 9-to-5 schedule. [...]”

Alternatively, we could have prompted the GenAI assistant with a clear instruction about the persona's feeling towards the project such as “Create a persona for the stakeholder group employee who is quite critical with regard to this new project.” Based on these results, a follow-up prompt could be to generate ideas on how to address potential concerns, such as “What incentives could be used to raise acceptance?”.

C. Prioritize Stakeholders

Due to limited resources, projects normally need to focus on the most important stakeholders [30]. Therefore, it is common to evaluate all stakeholders with respect to their attitude to the project, i.e., whether they have a positive or negative interest in the project and its outcomes, and whether they have a high or low influence on the project's progression, i.e., their power [30], [31]. Besides of interest and influence, other criteria can be used, such as whether the stakeholders have already determined their opinion (and we will find it difficult to change it), or whether their opinion is still open and can be influenced. Discussing different criteria for a stakeholder matrix is beneficial because it allows for a more nuanced and comprehensive analysis of stakeholders and their attitudes towards the project. On this basis, appropriate measures can be taken to effectively involve these stakeholders in the project. Prioritizing the project's stakeholders is also important for managing conflicting interests.

Having analyzed the stakeholders according to such criteria, a so-called stakeholder matrix or stakeholder map can serve as a tool to provide an intuitive visual overview [33]. The x- and y-axes of the stakeholder matrix are labelled with the criteria, e.g., interest and influence, and the stakeholders are placed into one of the four quadrants. Other common visualizations can also include four quadrants and positive/negative criteria values. Figure 4 shows an example of a stakeholder matrix.

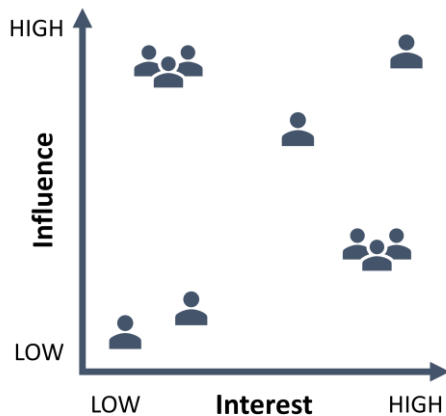


Figure 4. Sample stakeholder matrix.

In the following, we show a step-by-step approach that aims to create such a graphical representation with the help of GenAI. Note that you could also use a simple prompt such as “Classify the stakeholders identified for this digitalization project in the different quadrants of a stakeholder matrix” to get first results and to create the stakeholder matrix manually. This typically leads to a classification that uses the most common factors, i.e., interest and power.

The following tables demonstrate how such a stakeholder matrix can be created in several steps. Table V uses the GenAI assistant to get some advice, which criteria might be appropriate for the stakeholder matrix in the project at hand.

TABLE V. SAMPLE PROMPT SELECTING PRIORITIZATION CRITERIA

Intent	Select axes for the stakeholder matrix
Type of prompt	Get advice
Required input	Clear instructions regarding the required output, i.e., suggestions for the axes of a stakeholder matrix. Instruction that the choice of the axes should refer to the project in order to avoid a general statement.
Desired output	Two combinations, where for each combination the two axes are explained and the combination is motivated
Prompt	We have identified the stakeholders for this project. Now, we want to create a stakeholder matrix. Identify at least two appropriate combinations of x- and y-axes for the stakeholder matrix and explain for each combination why it is well suited to the project at hand.
Excerpt from the result (gpt-turbo-4-preview)	<p>[...]</p> <p>### Combination 1: Influence (Y-Axis) vs. Interest (X-Axis)</p> <p>[...]</p> <p>**Why This Combination?*</p> <p>This matrix helps prioritize stakeholders based on their power to affect the project and their level of concern about the project's outcome. It is particularly suited for this project because:</p> <ol style="list-style-type: none"> 1. It identifies stakeholders who need close management (high interest, high influence) versus those who need merely to be kept informed. 2. It aids in developing a nuanced communication plan that balances the needs and concerns of all stakeholders, ensuring that those who could potentially derail the project are managed proactively. <p>### Combination 2: Support (Y-Axis) vs. Impact (X-Axis)</p> <p>[...]</p> <p>**Why This Combination?*</p> <p>This orientation offers insight into managing stakeholder relationships and resistance to change, crucial for a project that involves significant process alteration and digital adoption:</p> <ol style="list-style-type: none"> 1. It highlights stakeholders who could be leveraged as change agents versus those who might require targeted change management interventions to mitigate resistance. 2. It is instrumental in the planning phase to ensure that those most affected by the project are adequately supported, and their feedback is incorporated into the project design, thus enhancing user adoption and project success.

In the next step shown in Table VI, we define the x- and y-axes and ask the GenAI assistant to classify each stakeholder according to these criteria and explain the reasoning behind the classification. The resulting prioritization can be used as a basis when planning measures for engaging and communicating with stakeholders. For instance, it is important to address any concerns that stakeholders with high power and high interest have. Note that the prompt provides quite detailed instructions about the matrix, the scale of the axes and the quadrants, in which the

stakeholders should be classified. The prompt asked for concrete values as we wanted the GenAI assistant to provide its response in a structured format that can be easily compared, analyzed, and visualized.

TABLE VI. SAMPLE PROMPT TO CLASSIFY STAKEHOLDERS

Intent	Create a stakeholder matrix
Type of prompt	Create project documentation
Required input	<ul style="list-style-type: none"> List of stakeholders and their concerns Dimensions of the stakeholder matrix Scale of the axes
Desired output	Classification of the stakeholders in the four quadrants of the predefined stakeholder matrix.
Prompt	<p>I want to classify the stakeholders identified for this digitalization project in the four quadrants of a stakeholder matrix. The first dimension (x-axis) should be the interest and the second dimension the influence (y-axis). The scale is for each axis from 0 to 10. Provide for each stakeholder the values for both dimension and explain your reasoning. Group the stakeholders per quadrant, i.e., High Influence, High Interest; High Influence, Low Interest; Low Influence, High Interest; Low Influence, Low Interest.</p> <p>The response format is as follows for each stakeholder:</p> <pre># Stakeholder ## Interest: <value> < provide a detailed reasoning here > ## Influence: <value> < provide a detailed reasoning here ></pre>
Excerpt from the result (gpt-turbo-4-preview)	<pre>[...] ### Low Influence, High Interest **6. Employees (Users)** - **Interest***: 9 The new system directly impacts their daily work routines and job satisfaction. - **Influence***: 4 Despite their direct interaction with the new system, their ability to influence project decisions or outcomes is limited. [...]</pre>

Interestingly, the GenAI assistant classified stakeholders with a value of 6 (on a scale from 0 to 10) in the dimension influence into the quadrant with low influence. For instance, the AI GenAI assistant assigned to the stakeholder work council an interest of 8 and an influence of 6, and positioned it in the quadrant Low Influence / High Interest. Asking the GenAI assistant for the reasoning behind this classification, it explained that the classification reflects a comparative assessment rather than an absolute measure. Stakeholders with scores in the upper quartile (e.g., 8, 9, 10) were classified as high interest/influence. In contrast, stakeholders with scores in the lower quartile (e.g., 1, 2, 3) were classified as low. Those in the middle were classified depending on the overall distribution of scores. Without further explanation, this approach can be very disconcerting for project participants working with the stakeholder matrix.

The step presented in Table VI could easily be repeated with a different combination of x- and y-axes in the stakeholder matrix by adjusting the prompt. To continue working with this information, i.e., with the values that are determined for the different axes, it might be useful to ask the GenAI to sum it up in a table or to provide the information as comma-separated values (CSV).

The goal of the next step was to create a visual representation of the stakeholder matrix based on the detailed information generated in the previous step, placing each stakeholder name or group in one of the four quadrants. Within the case study, different options were evaluated.

The first option was the creation of a visual representation with the help of an GenAI assistant that is combined with image generation tools (such as ChatGPT 4.0 Plus with Dall-E or the Microsoft Copilot, which includes the Image Creator from Designer, formerly Bing Image Creator). The results, however, were far below our expectations. Figure 5 shows one of the generated images. For instance, the labels are not correct but contain many spelling errors. The stakeholders, which were specified in the prompt with exact coordinates were not included in the stakeholder matrix but only generic representations of persons.

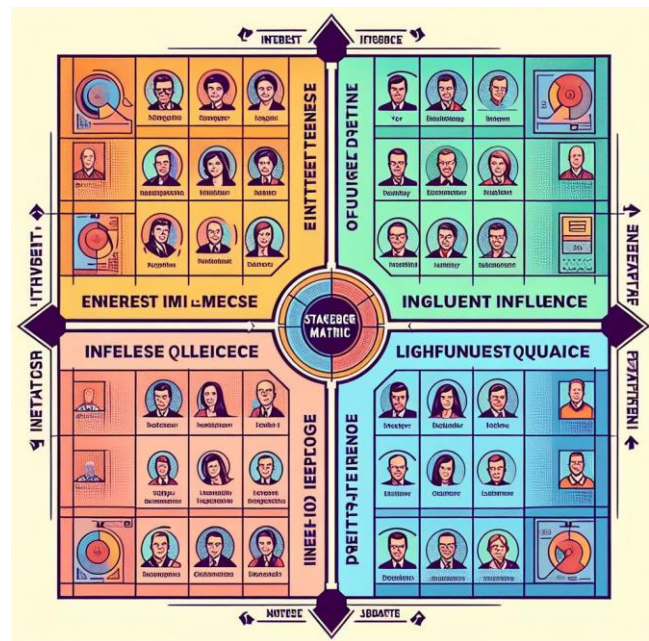


Figure 5. Stakeholder matrix generated by Bing Image Creator (created 12/02/2024).

The second option that was evaluated in the case study was to ask the GenAI assistant to generate the diagram based on given data in Microsoft Excel. We selected Microsoft Copilot as tool because, in contrast to ChatGPT, it is able to generate an Excel file. We tried different prompts, but Copilot was not able to create the diagram directly in the Excel file but only the table that can be used as a basis for creating a diagram. Table VII shows the approach.

TABLE VII. SAMPLE PROMPT TO GENERATE A CHART IN MICROSOFT EXCEL

Intent	Create diagram for the stakeholder matrix in Excel
Type of prompt	Create project documentation
Required input	<ul style="list-style-type: none"> The tool to be used, i.e., Excel Data to be visualized
Desired output	Excel file with a chart
Prompt	<p>Create a chart in Excel that is appropriate to represent the following information as a stakeholder matrix. The x-axis represents the interest and the y-axis represents the influence. The scale goes from 0 to 10. We have these data points:</p> <p>Stakeholder (Interest,Influence) Project Management Team (10,10) Company Management and Executives (9,9) HR Department (8,7) IT Department (8,7) Employees (9,4) Works Council (8,6) External Vendors/Consultants (5,4) Training Providers (4,3) Regulatory Bodies (3,8) Unions (6,5)</p>
Excerpt from the result (Microsoft Copilot)	<p>Certainly! Let's create a Stakeholder Matrix Chart in Excel based on the provided data points.. [...]</p> <ol style="list-style-type: none"> Open Microsoft Excel. Enter the data points in three columns: Column A: Stakeholder names [...] <p>Here's how your data should look: [Embedded Excel]</p> <ol style="list-style-type: none"> Highlight the data (including headers) in columns A, B, and C. Go to the "Insert" tab and choose "Scatter" from the "Charts" group. Select "Scatter with Straight Lines" (the first option). <p>Your scatter plot will now be displayed. You can customize the chart by [...]</p>

At a first glance, the answer seems to be useful. The GenAI assistant creates a downloadable Excel file as shown in Figure 6. Copilot briefly describes the steps needed to create a what it calls "stakeholder matrix chart". It seems to efficiently guide us through the process, even though it is unable to create the chart itself. However, a closer look at the steps reveals that the GenAI assistant recommends using a scatterplot with straight lines. This is neither a common nor a useful representation of the stakeholder matrix. A scatter chart without lines or a bubble chart would have been a better choice. Moreover, when creating the scatter chart, one should not select columns A, B and C, but only B and C in order to display interest and influence as x- and y-axes. The values in column A must be selected in an additional step as labels for the bubbles.

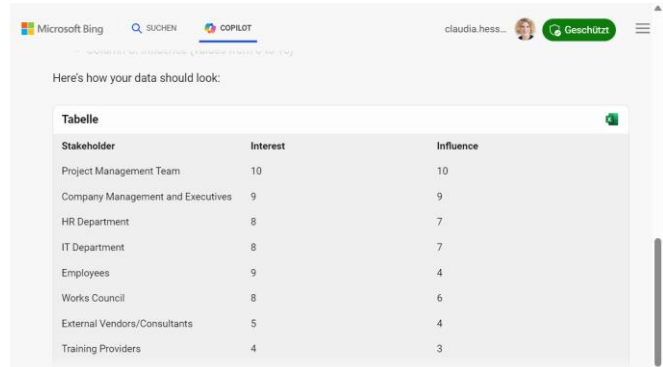


Figure 6. Excel file by Bing Image Creator (created 12/02/2024).

A further option could be to ask the GenAI assistant to generate a MATLAB script to create a chart visualizing the stakeholders in the described stakeholder matrix format. When discussing such alternatives, it is important to keep in mind that in order to serve as a communication tool, the visual representations need to be visually appealing. Therefore, we recommend that you make a manual effort to customize them to suit your needs.

The list of stakeholders and the stakeholder matrix are important artefacts created within project management and which are used during project meetings, presentations, or when sharing project updates. All project documentation regarding the stakeholders should be reviewed throughout the course of the project, and, if necessary, be updated because on the one hand, stakeholders might change their opinions and, on the other hand, influencing factors might change [30]. In addition, misvaluations can be corrected. A further idea is to use the GenAI assistant to prepare the information for a so-called onion diagram, which shows the relationship between the stakeholders and the solution that is developed in the project [32]. Like the layers of an onion, the stakeholders in the center of the graphic are those who are directly involved in developing the new solution. Stakeholders on the outer layers are less affected by the solution.

Summarizing the experiences in this step, we can say that while GenAI assistants help us analyze and prioritize stakeholders, they fail to provide us with a graphical representation of the stakeholder matrix for the time being. However, this would be very important as it is an effective tool to communicate complex information about stakeholders in a clear and concise manner.

D. Engage Stakeholders

Successful stakeholder engagement requires different communication approaches [30]. Depending on the audience and the type of information, a verbal or written communication should be preferred. Moreover, the communication might be formal or informal. An example for a formal written communication is a progress report, while a social media post or an instant message is an example for a written informal communication.

A GenAI assistant can support project managers in preparing an appropriate communication artefact. This might include several steps, in which the content of the communication is elaborated, the type of communication is determined, and the actual text is written. By doing this, users need to take care that the communication does not remain superficial and that it does not appear to be artificially generated. The time saved by utilizing a GenAI assistant can be used to create customized communications for each stakeholder, which can also be supported by the GenAI assistant.

In the following, we show different steps to create content targeted at the communication with a certain stakeholder. First, we should think about the communication strategy. Table VIII shows the first prompt, which provides the project management with ideas and advice regarding the communication with a certain stakeholder. Note that the results generated by the GenAI assistant are very detailed due to the precise instructions that were given in the prompt, i.e., the four questions.

TABLE VIII. SAMPLE PROMPT ABOUT THE COMMUNICATION STRATEGY

Intent	Plan how to communicate with a specific stakeholder group
Type of prompt	Brainstorming
Required input	Additional information about the stakeholder and the topic to be communicated
Desired output	Ideas as basis for planning communication measures
Prompt	<p>We have identified the stakeholders in this project. An important stakeholder are the employees. They are the end-users of the new system. Their cooperation is vital for the successful adoption of the system. Their concerns would typically revolve around ease of use, accessibility, privacy issues, and how the system might affect their daily routines and job responsibilities.</p> <p>We want to engage the employees by a targeted communication. Generate ideas based on the following questions.</p> <p>#How should the rationale behind the new system be communicated to the employees? # How should the communication be realized? # Who should communicate in which way? # How often?</p>
Excerpt from the result (gpt-turbo-4-preview)	<p>In implementing a successful communication strategy for introducing the new digital time recording system to the employees of the German manufacturing company, consider the following comprehensive approach:</p> <p>### **1. Communicating the Rationale Behind the New System:**</p> <p>- Initial Announcement: Start with an all-hands meeting (either in-person or virtual, considering the size and location of your workforce) to announce the introduction of the new system. The announcement should convey the benefits clearly, such as increased accuracy, transparency, reduced</p>

Intent	Plan how to communicate with a specific stakeholder group
	<p>administrative burden, and how it aligns with broader organizational goals like efficiency and digital transformation.</p> <p>- Q&A Sessions: Follow up with Q&A sessions where employees can express their concerns and get immediate responses. This will help in addressing misinformation and easing anxieties right from the start.</p> <p>### **2. How the Communication Should Be Realized:**</p> <p>- Multichannel Approach: Utilize various communication channels to ensure the message reaches everyone effectively. This includes company-wide emails, intranet posts, newsletters, and physical posters in common areas. Tailoring the message for each medium increases engagement and comprehension.</p> <p>- Transparent and Continuous Updates: Provide ongoing updates about the project's progress, what stages are completed, and what's coming next. This transparency builds trust and keeps the project on everyone's radar.</p> <p>### **3. Who Should Communicate and in Which Way:**</p> <p>- Leadership Involvement: The message should first come from the top - the CEO or the Plant Manager can introduce the initiative, underscoring its importance to the company's future. This shows the company's commitment from the highest level.</p> <p>- Project Team and Department Heads: Regular, detailed communication should come from the project team, facilitated by department heads. They are closer to the employees' daily operations and can provide a more relatable context. Department heads can also gather feedback and concerns to be addressed by the project team.</p> <p>- Dedicated Champions: Identify and train 'system champions' from among the employees who can assist their peers, offer additional training, and act as a feedback loop to the project team.</p> <p>### **4. Communication Frequency and Feedback Loops:**</p> <p>[...]</p>

Based on this information, concrete communication measures can be planned. It is of course possible to go into more detail on certain aspects with further prompts. In the case study, we follow the recommendations by the GenAI assistant. An all-hands meeting should be organized, in which the new system is announced. The GenAI assistant can also help with this. Table IX shows a prompt that prepares the text for invitation to be sent to the employees. The resulting text could be used as base. The GenAI assistant provided some placeholders to be filled with the actual date, location etc.

TABLE IX. SAMPLE PROMPT TO GENERATE COMMUNICATION MATERIALS

Intent	Engage stakeholder by a targeted communication
Type of prompt	Create communication materials
Required input	Additional information about the stakeholder and the topic to be communicated
Desired output	Text
Prompt	The employees should be invited to an all-hands meeting to be held in person at our office. Write the invitation email for this meeting on behalf of the CEO.
Excerpt from the result (gpt-turbo-4-preview)	<p>Subject: Invitation to All-Hands Meeting: Introducing Our Next Big Step Forward</p> <p>Dear Team,</p> <p>I hope this message finds you well. As we continue on our journey of growth and improvement, it's crucial that we stay connected, informed, and aligned with our company's mission and the innovative strategies that drive us forward.</p> <p>In line with our commitment to innovation and operational excellence, we are excited to embark on a new project that promises to enhance our efficiency and streamline our processes - the introduction of a new digital system for recording working time. This system represents a significant step towards modernizing our operations, ensuring accuracy in time management, and providing everyone with a more intuitive and user-friendly way to record their working hours.</p> <p>To share more about this pivotal project, discuss its benefits, and address any questions you may have, I warmly invite you to an All-Hands Meeting:</p> <p>**Date:** [Insert Date] **Time:** [Insert Time] **Venue:** [Insert Venue Name/Location at the Office] **Agenda:**</p> <ol style="list-style-type: none"> 1. Introduction to the New Digital Time Recording System 2. Rationale and Benefits 3. Implementation Plan Overview 4. Training and Support 5. Q&A Session <p>This meeting will also be an opportunity for us to come together as a team, share our thoughts, and ensure that everyone feels supported and heard as we move forward with this change. Your input and engagement are invaluable to us, and I encourage each one of you to attend.</p> <p>Please RSVP by [Insert RSVP Deadline] to ensure we have adequate arrangements for everyone. Should you have any preliminary questions or topics you'd like to see covered, feel free to reply directly to this email or reach out to [Insert Contact Person's Name and Email].</p>

Intent	Engage stakeholder by a targeted communication
	<p>Your dedication and hard work is what drives our success. Together, I am confident we'll make this transition smoothly and continue to achieve great things.</p> <p>Looking forward to seeing all of you there and embarking on this exciting journey together.</p> <p>Best regards,</p> <p>[CEO's Name] CEO [Company Name]</p>

Note that the better the AI chatbot knows someone's writing style, the better it could adapt the wording and the tone. So, it might be a good idea to provide some sample texts. However, these should only be openly accessible texts if you are using a public GenAI assistant to avoid inadvertently revealing sensitive or personal information. An alternative that could use multimodal models would be to generate ideas and illustrations for physical posters in common areas, as suggested by the GenAI assistant in the sample prompt in Table VIII about the communication strategy.

A further application scenario in stakeholder engagement is the training and simulation of difficult situations. For example, a GenAI assistant can help the project manager to prepare for a project presentation with stakeholders who express many concerns about the project. The project manager can role-play a discussion about the project, try out different lines of argumentation and train to respond to difficult questions. Moreover, role-playing with a GenAI assistant could include scenarios that specifically aim to better understand certain perspectives and to foster empathy. Using AI-driven simulations for training will evolve beyond text-based interactions to include video-based scenarios, making the training experience even more realistic.

To continue with the example from our case study, the project manager could use the GenAI assistant to prepare for the Q&A session at the all-hands meeting. Talking to the GenAI assistant provides a safe and controlled environment for training. Table X demonstrates such a prompt. We explicitly ask the GenAI assistant to act as a stakeholder who has a highly critical and skeptical view of the project and therefore asks critical questions and follow-up questions. The GenAI assistant could also be prompted to act as a stakeholder who becomes very emotional. This setup can simulate scenarios where emotions run high, such as discussions about project goals, resource allocations, or changes that significantly impact stakeholder interests. As we can see in this short dialog, the GenAI assistant did not accept the first, very superficial answer given by the project manager and asked for more details. The project manager responds by referring to an ISO standard that is not about IT security, but about project management. The GenAI assistant, trained to be a friendly assistant, continues in a very professional tone and requests more details.

TABLE X. SAMPLE PROMPT FOR TRAINING

Intent	Train the conversation with a difficult stakeholder
Type of prompt	Training and simulation
Required input	Information about the situation
Desired output	Flipped interaction with questions asked by the GenAI assistant and answers given by the user
Prompt	As the project manager, I want to prepare myself for this meeting. Act as an employee asking critical questions about the project. I want you to have a dialogue with me about your concerns. Start with asking a certain question. Allow me to reply before moving on. If my answer to your question is not convincing, then ask critical follow-up questions. Do not write explanations, and reply only as the employee. Our conversation starts with me. Project Manager: "We're going to start our Q&A session now. What questions do you have about the project?"
Excerpt from the result (gpt-turbo-4-preview)	Employee: "Thank you for the presentation. My first question is, how will this new digital time recording system ensure the privacy and security of our personal data?" Project Manager: "You can be sure that we take all necessary measures to ensure that your data is secure." Employee: "Could you specify what kind of security measures are being implemented? Are there any certifications or standards the chosen system complies with?" Project Manager: "The system will be ISO 21500 compliant. By following this standard, we ensure a wide range of security measures during implementation and when the system is in production." Employee: "I understand the ISO compliance part for project management, but what about data protection specifically? Is the system GDPR compliant, and how are we addressing the right to privacy under this regulation?"

Having completed a conversation with a certain line of argumentation, the project manager can discuss it on the meta-level with the GenAI assistant. The GenAI assistant could provide insights into the effectiveness of different communication strategies, helping project managers identify areas for improvement. Adapting the example from [34], a prompt could be: "Pause the dialogue. For each of my answers, show me how I can improve it in order to make it more convincing."

E. Monitor Stakeholders

During a project, stakeholders might change their opinions, new stakeholders might become relevant while the importance of others may decline. Therefore, it is important to monitor the stakeholders and their satisfaction with the project [30]. GenAI assistants can support by analyzing the sentiments that stakeholders express in their communication. E-mails or any other communication in internal groups or communication platforms about the project could be analyzed

by a GenAI assistant. The aim is to gain an understanding of the attitudes, opinions, and emotions expressed by the communicators. Table XI shows the first step in such an analysis, which is to assess the sentiments expressed in communications, in this example, in social media posts.

TABLE XI. SAMPLE PROMPT TO SENTIMENT CLASSIFICATION

Intent	Classify the sentiment in social media posts
Type of prompt	Get insights
Required input	Communication to be analyzed, here social media posts. Note that we use artificially created social media posts in this example to demonstrate the approach.
Desired output	Categorization of each social media post as positive, negative, or neutral based on the content's emotional tone
Prompt	Classify the sentiment of each of the following social media posts as positive, negative, or neutral. [social media posts]
Excerpt from the result (gpt-turbo-4-preview)	### Post 1: From a Tech-Savvy Young Employee - **Sentiment***: Positive - This post radiates enthusiasm and optimism about moving to a digital system for recording working hours. The mention of "exciting times," the anticipation of streamlined processes, and hope for user-friendliness indicate a positive outlook. ### Post 2: From a Long-Term Employee Resistant to Change - **Sentiment***: Negative - The post reflects resistance to change, skepticism about the efficacy of training, and a preference for the status quo. Phrases like "if it ain't broke, why fix it?" and expressing doubts highlight a negative sentiment. [...]

Based on these results, the GenAI assistant could be asked about the characteristics of the dataset, for example, with the prompt "Aggregate the sentiment scores to quantify overall sentiment for the entire dataset. Determine the proportion of positive, negative, and neutral sentiments." This distribution is an indication of the tendency of people's opinions about the project. To identify the specific themes or issues driving stakeholder sentiment within the highly positive and negative posts, one could analyze with the help of the GenAI assistant the context and content of these posts more closely.

Combining this approach with the capacities of search engines, it would be possible to ask about stakeholder opinions and reactions to specific actions in other, similar projects. It is important to ensure that no sensitive data is entered and that confidentiality regulations are observed.

V. POTENTIALS AND RISKS OF USING GENAI ASSISTANTS IN PROJECT MANAGEMENT

The pattern of AI-assisted project management activities, as well as the examples within the case study have demonstrated that GenAI assistants can indeed be a useful digital tool in project management. However, there are several issues that lead us to conclude that they are "just" a

tool and not yet a digital assistant that is a full member of the project team. First, project managers need to trust that the GenAI assistant has a solid knowledge of project management methods and good practices, for instance, when asking for guidance. To build up this trust, it would be helpful if the GenAI assistant added a reference to established project management standards, such as published by PMI, ISO or PRINCE2 to the answer. As long as this is not the case, it is recommended to provide this guidance to the GenAI assistant in the prompt, such as shown in the prompt in Table II, which explicitly mentions the different aspects to be considered in the stakeholder analysis.

Second, the project manager must be able to review any generated content. For instance, if the GenAI assistant extracts a project status from various documents, traceability is required. In other words, it must be clear what information was used to set the status. To a certain extent, this can be achieved by explicitly asking the GenAI assistant to provide its reasoning in addition to the answer. This can be achieved, for instance, by adding a specific response format that guides the GenAI assistant such as shown in Table XII.

TABLE XII. SAMPLE PROMPT FOR PROVIDING REASONING

Intent	Obtain the GenAI assistant's reasoning in addition to the answer
Type of prompt	Transparency
Required input	Information about the situation
Prompt	[Prompt] Response format: # Reasoning < provide a detailed reasoning here > # Response < Provide your response here >
Result	Answer splitted into two parts, the reasoning behind the response and the response itself

Third, as the example prompts have shown, the more specific details about the project, its environment, and stakeholders are provided, the better the GenAI assistant's responses will be. However, this is likely to conflict with data protection and privacy. Users should be extremely careful about the disclosure of any sensitive information. Not only is there the problem of the GenAI assistant adding this information to its knowledge base and using it to generate answers, but it also provides the GenAI assistant with information to infer ("to guess") further sensitive information. A solution might be to further develop GenAI assistant as business-internal solutions, which are separated from the outside world. In this case, the underlying LLMs could be trained with company-internal data, e.g., on past projects. This would provide the GenAI assistant with company-specific knowledge and push it a step further to a digital assistant.

VI. CONCLUSION AND FUTURE WORK

The paper explored the possibilities of using an GenAI assistant, such as ChatGPT, to support project managers in

their daily work. Patterns of AI-assisted project management tasks were identified, showing the wide range of possible collaborations between project managers and GenAI assistants. Examples include using the GenAI assistant to generate ideas and insights, or to act as a sparring partner. The skills required for successful collaboration were also presented. Special emphasis was placed on prompt engineering. The ability to write concise prompts is crucial to achieving results that are useful and not superficial. A case study demonstrated how a GenAI assistant could be used. Concrete prompts have shown how a GenAI assistant can support stakeholder management activities in a variety of ways. Examples include prompts that make certain tasks easier, such as writing the text for an invitation to a meeting, or asking the GenAI assistant for advice on creating a stakeholder matrix. We also demonstrated how the GenAI assistant can support creative activities and act as a sparring partner in training and simulations. In order to assess whether the 24/7 GenAI assistant is indeed a reliable assistant, potentials, risks and solutions were discussed for all application scenarios.

It would be interesting to follow project managers as they begin to use a GenAI assistant, and see how it evolves. In such a study, the project managers' learning curve associated with the use of GenAI assistants in project management could be analyzed. This could also include reflection activities on the interaction between human and virtual assistants in the project context. Learning activities, for instance with regard to prompt engineering could be developed to facilitate the further use of such digital assistants. A long-term study would also be appropriate to better understand the impact of using GenAI assistants on productivity, project outcomes, team dynamics, and especially on the role of project managers.

Another line of research could be the seamless integration of GenAI assistants with existing project management software and tools. This would change the way project managers interact with project management software. AI-driven insights and recommendations could be embedded directly into project management workflows.

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