



**Master's Thesis**

Business implications of agile vs. traditional project management methods in  
the German IT industry

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## Declaration of authorship

I hereby declare that I have prepared this Master's thesis "Business implications of agile vs. traditional project management methods in the German IT industry" independently and without the use of any aids other than those specified, have used only the sources specified and have identified the passages taken from the sources used verbatim or in terms of content as such. The work has not been submitted in the same or a similar form to the same or any other examination authority.

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## **Abstract**

This study looks into the contrasting impacts of agile and traditional project management methodologies within the ICT sector in Germany, it analyzes how they affect project efficiency, stakeholder collaboration, innovations and satisfaction of customers. The study is mostly focused on the evolving landscape of IT in Germany to explain how these methodologies influence the timeframe of projects, relationships among stakeholders, team adaptability and the general success of a project. The study highlights the critical role of efficient project management methodologies in shaping competitiveness and outcomes.

Drawing from the vast literature on project management methodologies and how they are applied, this study pinpoints the nuanced differences between agile and traditional methods. It places emphasis on the need to comprehend individual implications within the context of IT sector in Germany, where adaptability, innovation, and efficiency are critical.

By using the mixed method approach, this study uses quantitative insights from experts in the IT industry to define the diverse business implications of every methodology. Through questionnaires with stakeholders and professionals in IT, the study looks into factors like team dynamics, adaptation to change, satisfaction of stakeholders and project success rates.

Understanding the distinct business implications of agile and Traditional project management methods is important for organizations seeking to navigate the vast landscape of the German IT industry. This study aims to offer important insights and practical guidance for organizations that aim to tailor their project management approaches, to ensure they align with the evolving IT industry demands and foster sustainable competition.



### List of Abbreviations

AI	-	Artificial Intelligence
APM	-	Agile Project Management
AR	-	Augmented Reality
CPM	-	Critical Path Method
HR	-	Human Resources
ICT	-	Information and Communication Technology
IT	-	Information and Technology
LPM	-	Lean Project Management
PERT	-	Program Evaluation and Review Technique
PM	-	Project Management
PMBK	-	Project Management Body of Knowledge
PMI	-	Project Management Institute
QA	-	Quality Assurance
TPM	-	Traditional Project Management



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## 1. Introduction

The chapter discusses the background of the topic, problem statement, objectives of the study, research questions, and structure of the thesis.

### 1.1. Background and relevance of the topic

The Information Technology (IT) is a critical sector within the economic space of Germany. It acts as a driving force for innovation, efficiency, and global competition. In this dynamic landscape, deciding between agile and traditional methods in project management is a crucial decision for firms and organizations that wish to navigate the complexities of IT projects.

The background of this study is based in the realization that project management methodologies have a significant influence on the outcomes of IT initiatives. Agile project management methods, known for their adaptive and iterative approach, stands in contrast to the traditional project management methods, which usually follow a very predictive and linear model. The choice between these two methodologies has a direct implication for stakeholder cooperation, project efficiency, customer satisfaction and innovation within the ICT sector in Germany. These outcomes are attained through the handling of innovative projects that, at the onset, are not understood<sup>1</sup>.

The evolving landscape of the IT sector in Germany underscores the importance of this study. Companies are focused on attaining innovation, adaptability, and efficiency targets by redefining their approach to product development. Competitive edge and business sustenance are imperative aspects that IT companies must implement to achieve success. Successful operation is impeded by the project management approaches selected by companies. These companies are grappling with the decision to implement an effective and efficient project management strategy that offers long-term success. Information regarding the implementation of agile and traditional methodologies is scarce, making it impossible for IT companies to achieve intended outcomes.

IT projects are efficiently handled by understanding the sophisticated differences between agile and traditional methodologies of project management. This study provides an in-depth analysis of agile and traditional methods of project management, bridging the knowledge-gap regarding their operations. Similarly, addressing the notion of a one-size-fits-all approach to project management is

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<sup>1</sup> Lenfle (2008), p. 2.



addressed to minimize misconceptions and assumptions. Projects have different dimensions and requirements and maintaining the idea of a one-size-fits-all perspective on project management can lead to disappointments. German IT companies must understand the importance of making a distinction between agile and traditional methodologies of project management to understand their implications. Therefore, this study provides tailored insights to guide how organizations align their project management methodologies with the arising needs of stakeholders as well as the evolving landscape of the IT sector.

Furthermore, the study discusses how these management methodologies are redefining competitiveness and project outcomes. Through a mixed-methods approach, qualitative and quantitative insights are incorporated into the study. Focusing on IT experts in Germany provides a detailed analysis of the methodologies, focusing on their benefits and drawbacks regarding team dynamics, adaptation to change, project success rates, and stakeholders' satisfaction. The use of questionnaires has enhanced how comprehensive data on the topic is gathered from targeted IT experts.

In conclusion, the importance of this study is based on its dedication to identifying specific business implications associated with agile and traditional methodologies of project management within Germany's ICT sector. Delving deeper into the matter provides a clear perspective on the methodology that companies must implement pertaining to their overall targets. Overall, the study strives to provide valuable insights that are beneficial to organizations through the provision of guidance that influences decision-making. Ultimately, appropriate selection of project management strategies ensures that growth and development are attained, leading to sustainable competition.

## **1.2. Problem statement**

The IT industry in Germany faces a critical decision between adopting agile or traditional project management methodologies, making a crucial juncture that suggestively affects efficiency and success of IT projects. The industry recognizes the importance of implementing efficient project management methods in order to maintain an aggressive and adaptable environment, but there is lack of thorough information regarding the specific commercial implications of adopting agile versus traditional methodologies. Organizations struggle with the dilemma of selecting an acceptable approach to project management, and the consequences of this





decision are not well examined within the context of German information technology sector<sup>2</sup>.

The study seeks to address the gap in knowledge by carrying out a precise investigation into the unique business implications of agile and traditional project management methodologies within the IT industry in Germany. By outlining the impacts on project efficiency, customer satisfaction among other factors, this research aims to offer clarity and important insights important for IT firms striving to make informed decisions in aligning their project management methodologies with the evolving industry demands.

Additionally, the study carried out by Stefan in the article "Traditional and Agile Project Management: Comparison and Combination"<sup>3</sup> dives deeper into the nuances of both agile and traditional methods of project management. He argues that "a clear understanding of these methodologies is crucial for efficient project management." Whilst agile methods provide quick response and adaptability to change, traditional methods offer predictability and stability. Nevertheless, the IT industry does not have a comprehensive analysis of how such qualities translate into actual business implications in German IT industry.

The importance of this research is further emphasized by the lack of clear information concerning specific commercial implications of using agile versus traditional methodologies within the IT sector in Germany. Firms in the industry are confronted with the challenge of choosing an appropriate project management approach, and the results of these decisions are not explored well within the unique context of the German IT landscape. Efficient cost management is a critical concern for IT organizations, thus understanding how agile and traditional methods affect estimations, budgeting and the actual expenditure of a project is critical for financial stewardship. Additionally, the research recognizes that the German IT industry may fail to benefit uniformly from a one project management strategy from its wide number of stakeholders and projects. Therefore, tailoring insights to the specified needs of a number of projects offers a very comprehensive understanding of the dynamic landscape.

As the IT industry struggles with this dilemma, it is critical to unravel the specific business implications of agile and traditional project management methodologies. The study looks forward to provide a clear understanding of these approaches and

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<sup>2</sup> Jakoby (2021), p. 3.

<sup>3</sup> Cf. Burgameaier (2017), p. 2 f.



how they influence the efficiency of IT projects, collaboration with stakeholders, adaptability and creativity or impact to customer satisfaction. In doing so, it gives aspirations to equip firms in the German IT sector with clear insights, making it possible to make informed decisions that are in line with the evolving demands of the IT sector and foster sustainable competition.

Lastly, the introduction of agile principles via the Scrum basis offers a chance for enhanced collaboration, quicker response and iterative development to changing needs. Nevertheless, its implementation needs a thoughtful approach tailored to specified needs of German IT projects, putting into considerations factors like organization culture, stakeholder expectations and complexity of the project.<sup>4</sup> The problem currently facing the IT sector is how to adopt the Scrum and developing a training concept together with follow-ups which equip professionals with insights and skills required to successfully put into place agile project management methods in their organizations. Therefore, this study will also look into the challenges and advantages German IT firms encounter while implementing the Scrum. It will be very important research to help decision makers and professionals as a guide to make informed choices on the types of management approaches to use.

### **1.3. Objective of the work**

- To analyze and compare the effects of agile and traditional approaches to project management on the efficiency of projects.
- To investigate the impact that agile and traditional project management play in improving creativity, flexibility, and adaptive capacities within project teams.
- To explore the consequences of agile and traditional project management methodologies on the collaboration and communication of stakeholders, as well as to all customer's satisfaction.

### **1.4. Research questions and Hypotheses**

#### **Research Questions**

- What are the distinct impacts of agile and traditional project management on project timelines and time-to-market requirements in the German IT industry, and how do they differ in terms of efficiency?

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<sup>4</sup> Cf. Thomas et al. (2016), p. 270



- To what extent does agile project management foster innovative, flexible, and adaptive capabilities within project teams, compared to the predictability and rigidity offered by traditional project management in the German IT sector?
- How do agile and traditional project management approaches affect stakeholder collaboration, communication, and customer satisfaction? What is their impact on relationships with project stakeholders?

### **Hypotheses**

H0: There is no sufficient difference in project timelines and marketing time requirements between traditional and agile project management methods in the German IT industry.

H1: There is sufficient difference in project timelines and marketing time requirements between traditional and agile project management methods in the German IT industry, with agile methods categorized as the quickest and adaptable form.

H2: Agile project management fosters a very flexible, innovative and adaptive features in team projects compared to the traditional method in German IT industry.

H3: Agile project management methods have a positive impact on collaboration among stakeholders, customer satisfaction and improved communication, leading to strong relationships with project stakeholders compared to the traditional project management methods.



## **2. Basics of project management**

This section looks at the definition of project management, historical development of project management and an overview of the project management methods.

### **2.1. Definition and meaning of project management**

Project management is a systematic method of planning, organizing, executing and controlling activities and resources to attain a certain objective within a specified time frame<sup>5</sup>. The major objective of project management is to ensure a project is completed successfully while meeting the intended goals whilst adhering to constraints like cost, scope and time.

PM is applied in different sectors and industries from IT, construction, marketing and healthcare among others. It offers a structured foundation to manage projects of different complexities and sizes making sure that their resources are used efficiently, meeting the expectations of stakeholders and delivering successful results.

Effective PM involves blending communication, leadership, skills in problem solving and risk management. Project managers play a critical role in guiding the team, manage stakeholders and overcome challenges to ensure the successful completing of a project. The financial stability of any company depends on the successful management of its resources aimed at completing projects within a budget which is predetermined.

The basic steps in project management include scheduling, planning and controlling. PM starts with planning where formulation of flexible alternatives is made to accommodate any changes needed during execution. Scheduling on the other hand is done once a project plan is complete, followed by a certain level of control and lastly execution.

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<sup>5</sup> Bansal (2024), p. 18.



Figure 1 project management triangle<sup>6</sup>

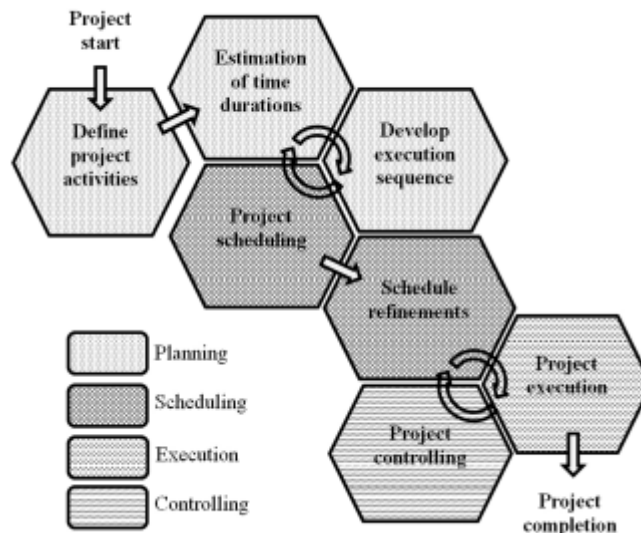


Figure 2 Basic steps of Project Management<sup>7</sup>

## 2.2. Historical development of project management

The idea of project management has been practiced for many years and it was brought by Laszlo in 1991<sup>8</sup>. He made comments on the roles and responsibilities that project managers have to assist firms meet global problems. This perspective has been advanced by different scholars and changes have gone beyond timeliness, cope and budget to the impact of work as humans face inevitable

<sup>6</sup> Bansal (2024), p. 18.

<sup>7</sup> Bansal (2024), p. 19.

<sup>8</sup> Pasian/Williams (2023), p. 17



challenges like climate change. In the fifties, the navy used to employ modern PM methodologies in their Polaris projects. During the 60's and 70's, NASA and other engineering firms used the principles of project management and tools to manage big budgets and schedule-driven projects. In the 80's, software development and manufacturing began adopting and implementing sophisticated project management practices. In the 90's, PM theories, techniques and tools were widely used by different industries<sup>9</sup>.

In the 20<sup>th</sup> century, Henry Gantt continued the idea of PM through his handy chart<sup>10</sup>. World wars and the internet all depended in one way to the development of PM. Modern project management stems from the development of Critical path methods (CPM) and the Program Evaluation and Review Technique (PERT) that offered tools for coordinating, scheduling and controlling difficult projects. These math techniques assisted in managing activities and dependencies in big projects.

### **2.3. Overview of project management methods**

The PM methods are approaches and platforms used in guiding the execution of projects. Several projects may need unique methodologies based on their nature like complexity and size. The following are a number of PM methods:

- Agile- a flexible and iterative approach in which every phase should be finished before moving to the next. It is suitable for projects with stable needs.
- Scrum- a unique part of agile framework which focuses on providing a product incrementally in sprints or short iterations. It includes roles such as product owner, scrum master and development team.
- Waterfall model- a linear, traditional approach where every phase should be completed before the next step. It is suitable for projects with stable needs.
- Kanban - a visual management method that places emphasis on continuous delivery and workflow optimization. It emanated from lean manufacturing but is currently used in many industries.
- Critical Path Method (CPM) – a technique that uses mathematics to schedule and manage complex projects by determining crucial tasks that might impact the timeline of the project.
- Lean Project Management (LPM) – derived from lean manufacturing principles, it is aimed at eliminating waste, optimizing efficiency and improve processes continually.

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<sup>9</sup> Kwak (2003), p. 1.

<sup>10</sup> Kniberg (2007 ).



These methods provide some of the approaches addressing the unique needs and challenges of different projects, offering PM managers with tools to navigate through the complexities of executing a project.



### **3. Agile project management methods**

This section looks into the meaning of agile project management, the methods it uses like Kanban plus core principles and practices of Scrum.

#### **3.1. Introduction to agile methods**

Agile Project Management (APM) is a flexible and iterative approach used in project management that places priorities on collaborations, adaptability and customer satisfaction. Since its inception, APM has since been embraced across different industries because of its efficiency to the changing needs and fostering a very collaborative and customer-centric project management. APM enables project teams in firms to work collaboratively and quickly on a project whilst being in a position to adapt to the changing needs in development. Additionally, it enables teams to quickly react to feedback, so they can make changes at each project cycle and sprint.

APM breaks projects in small pieces that can be completed in sprints that could take a few days or weeks. These piece sessions start at the initial stage of design and quality assurance. The agile methodology makes it possible for teams to release segments as they are finished. This progressive release schedule makes it possible for teams to demonstrate that these segments are successful and if they are not, the flaws can be fixed immediately. The belief is that it is beneficial in minimizing the chances of large-scale failures since there is continuous improvements through the lifecycle of the project.

APM give faster response, is continuously adaptive and QA best practices within its iterations. They adopt practices like continuous integration and deployment though technology that automates steps to speed-up the use and release of products.

Moreover, APM calls for teams to keep evaluating time and costs as they progress in their work. They utilize burndown, velocity and burnup charts to measure their work instead of project milestones and Gantt charts in tracking progress.

APM does not need he participation and presence of a project manager. Even though a project manager is critical for the success under the traditional project delivery method, the role of the project manager in APM is disseminated among members. For example, the owner of the product sets goals of the project whilst members of the team allocate schedules, determine quality of tasks and progress reports. In agile methods, team members are need to know how to work within the framework. They should be able to collaborate with one another and with users.





They should communicate well to ensure projects are on track. Additionally, the project managers and teams should find comfort in taking the required actions at the right time to be up to date with delivery dates or schedules.

### **3.2. Core principles and practices of SCRUM-**

Scrum is an agile framework used to manage and organize work, mostly in software development. It is based on sets of major principles and practices<sup>11</sup>. It is also a new system development approach based on the black box and defined process management. Scrum is an enhancement, management, and maintenance methodology for an existing production or system prototype. It assumes a code and design that already exists and is usually the case in object-oriented development because of the availability of class libraries.

#### **3.2.1 Roles in SCRUM**

Within the scrum framework, delineating roles is pivotal to orchestrating an efficient and seamless development process. The product owner, serving as the liaison between stakeholders and the development team, assumes the crucial responsibility of maximizing the value of a product. Within the IT industry, Scrum is a keystone for orchestrating agile development methodologies. The product owner assumes the critical responsibility of aligning development efforts with stakeholders' expectations. They carefully curate the products backlog, an evolving repository feature in IT and improvements, prioritizing items to ensure the team addresses the most important needs first.

Complementing this, the Scrum acts as a facilitator, guiding the IT team through the complexities of the Scrum process. They aim to remove the impediments and foster an environment conducive to highly performing IT teams. It is critical to emphasize that Scrum does not create a direct authority but empowers the team to self-organize and enhance their processes continually<sup>12</sup>.

The IT team of professionals form the backbone of Scrum in the IT sector. Since they are responsible for delivering possibly shippable increments in software at the end of every sprint, this team seamlessly collaborates to tackle difficult challenges in IT. Their self-organizing nature makes it possible to adapt to the changing needs and techniques.

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<sup>11</sup> Schwaber (1997), p. 1 f.

<sup>12</sup> Schwaber (1997), p. 4 ff.



Within the IT industry, these roles of Scrum establish a basis that promotes responsiveness and agility. The product owner makes sure that IT solutions align with the objectives of the business, the Scrum facilitates a smooth development, and the team creates and delivers high-quality IT solutions ceaseless. This collaborative approach within the IT industry highlights the effectiveness of Scrum in navigating the dynamic landscape of IT development.

### **3.2.2 CRUM artifacts**

In the ground of Scrum, artifacts are critical components that improve transparency and act as a guide in the development process. The product backlog is the main among them, a meticulous and dynamic ordered list of enhancements, features, and bug fixes that act as a basis for project planning. Managed by the project's owner, this artifact unfolds in response to the changing needs, ensuring that the team focuses continuously on the most valuable items. It offers a comprehensive overview of the work to be done, promoting alignment and transparency between the development team and stakeholders.

The Sprint backlog complies with the product backlog, a subset targeted for a unique sprint during the sprint planning event. Owned by the development team, this artifact is a roadmap for guiding the team and iteration on what work has to be finished. It plays as a living document, subject to adjustments as the team traverses the intricacies of the development process within the IT industry.

Increment is integral to the scrum. This is not simply a compilation of features, it represents a possible usable and releasable product increment. The increment portrays the tangible progress made during the stands and sprints as a testament to the collaborative efforts of the team.

All together, these artifacts within the scrum basis offer a structured and clear approach to product development. They foster transparency making it possible for stakeholders to track progress and make informed decisions. The backlog of the product sets a strategic direction, the sprint backlog is a guide to the teams tactical actions, and the increment is a representation of tangible outcomes, collectively embodying the incremental and iterative ethos of scrum in the pursuit of offering valuable products.

### **3.2.3 SCRUM events**

Within the IT industry, Scrum events are critical in ensuring an iterative and structures approach to software development. These events, integrated to scrum



framework offer an important touchpoint to planning, collaboration and reflection among the IT teams.

Sprint planning holds specific significance in the IT sector. Within this session, the team collaborates selected items from the product backlog, aligning the development efforts within the IT needs and features. This tense planning ensures that the IT team is well prepared to confront certain tasks and challenges which lie ahead of the upcoming sprints.

During the sprint planning, the team collaborates to choose items from the product backlog, aligning efforts in development with a high priority. This careful planning ensures that the IT team is ready to tackle the specific challenges and tasks lying in the upcoming sprint. The daily scrum, becomes an important event for IT professionals. In this session, members of the team synchronize discuss progress, their activities, and discuss any impediments that may interfere with IT development. The daily nature of such an event promotes communication within the IT team, creating faster adaptation to evolving project dynamics.

The sprint review, carried at the end of every sprint, is critical in the IT industry. This event brings together stakeholders such as the end-user, and IT managers to inspect the development increment. For IT projects, this review is an important checkpoint to collect feedback, make critical adjustments and assess IT goal alignments to the product backlog for the coming sprints. The retrospective of the sprint makes it possible for the IT team to make reflections on their processes and outcomes. Suh an introspective session determines areas for improvement within the development cycle in IT. promoting a continuous culture of learning.

In the German IT sector, Scrum events offer a collaborative and structured framework for software development. These events cater to the dynamic and fast-paced nature of IT projects, making sure that efforts in development remain aligned with the goals of the business and the team is equipped to respond promptly to the changing needs. The iterative nature of scrum events in IT increases collaboration, agility and contributes to the successful delivery of quality IT solutions.



#### **4. Traditional project management methods**

This section discusses TPM methods within the ICT sector in Germany. TPM methods impact business operations for ICT companies, impacting project efficiency, stakeholder collaboration, innovations, and customer satisfaction. Over the years, technological advancements in the IT sector have influenced how ICT companies implement TPM methods to impact business operations<sup>13</sup>. Apart from digital transformation, ICT companies in Germany are faced with the climate crisis, pandemic, and other global issues that require new ways of handling projects, especially their complexities and developing sustainable solutions. For companies, relying on project management methods ensures that conflicts are properly managed, project team appropriately engages, and psychological security in Scrum Teams is sustained<sup>14</sup>. The TPM methods discussed in this section include waterfall mode, Gantt charts, and PERT.

##### **4.1. Characteristics of the waterfall model**

The waterfall model of project management refers to a sequential method used to handle projects<sup>15</sup>. It facilitates how various phases of a project are handled. ICT companies in Germany use the waterfall method based on their unique needs. Through the waterfall model, these companies address the analysis, design, development, and testing of projects as initially intended. The successful implementation of the waterfall model is based on various characteristics. To begin with, the waterfall model is based on a sequential structure. The model's sequential structure supports how its stages are addressed one at a time. The stages of the waterfall model include (a) requirements, (b) design, (c) implementation, (d) testing, and (e) maintenance<sup>16</sup>. The successful handling of these stages involves adopting a process that advocates for a chronological execution. Once a stage has been addressed, there is no going back<sup>17</sup>. Going back to a previous stage will involve scratching the project, a process that can lead to time wastage, loss of resources, and poor handling of business transactions. Based on this characteristic, it is essential for project managers to properly guide their teams to ensure that errors are minimized. Minimizing errors indicates that projects are handled within the set scope, schedule, budget, and timeline.

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<sup>13</sup> Pasian/Williams (2023), p. 1.

<sup>14</sup> Zumsteg (2019), p. 3.

<sup>15</sup> Reichert (2019), p. 178.

<sup>16</sup> Reichert (2019), p. 178

<sup>17</sup> Cf. Drews et al. (2021), p. 25.

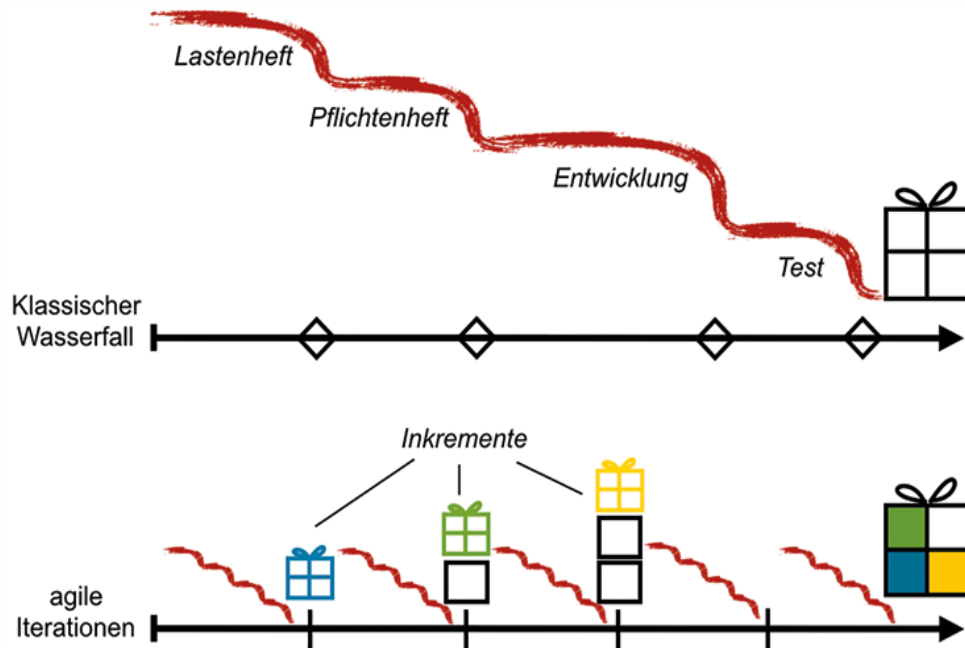


Figure 3 . A comparison indicating rigidity in the waterfall model<sup>18</sup>

In addition, the waterfall model is characterized by effective planning. Effective planning is based on the model's rigidity. The model has fixed requirements, detailed documentation, and predictable timeline<sup>19</sup>. Thus, emphasis on planning is based on ensuring that these aspects are properly addressed. For example, project requirements are determined during the project planning phase<sup>20</sup>. These requirements are not changed throughout the project process. Project managers are required to ensure that their upfront planning is meticulous to ensure that all the required resources are available<sup>21</sup>. Conversely, detailed documentation is developed when handling each stage. Therefore, it is essential for the project team to ensure that there is clarity and consistency to minimize errors and confusion. Achieving success during the planning phase involves predicting the timeline. Predicting the timeline involves providing a duration for each stage, allowing the project manager to develop an overall timeline of the project.

The waterfall model is also characterized by ease of control. After the planning phase, project managers can predict how each milestone will be addressed. During the planning phase, clear milestones and timelines are developed. Based on the

<sup>18</sup> Preußig (2020), p. 79.

<sup>19</sup> Reichert (2019), p. 179

<sup>20</sup> Preußig (2020), p. 10.

<sup>21</sup> Preußig (2015), p. 45.

timeline and roadmap developed, project managers can control how actions and decisions are executed<sup>22</sup>. The success of ICT companies in handling their projects is based on their understanding of this characteristic. Arising challenges are properly addressed based on early prediction of their occurrences. Furthermore, ease of control is determined by effective leadership<sup>23</sup>. Project managers must exercise precision to ensure they properly assign roles and responsibilities to team members. Team members have unique skills and expertise, and aligning roles and responsibilities with these aspects ensures that there is clarity and accountability. Misuse of resources or poor execution of decisions are easily controlled by aligning team members with distinct roles and responsibilities.

Limited feedback is another characteristic of the waterfall model. Once planning has been finalized and the project management process has been initiated, stakeholders are not allowed to offer their feedback<sup>24</sup>. Feedback is only permitted when the project is completed. Since feedback is limited, making adjustments to the project is impossible. Stakeholders who identify gaps in the project scope, schedule, budget, and timeline can only address them once the project is finalized. Since the waterfall method is sequential, the changes identified can only be implemented through a new project process. The new process is mainly focused on the changes that have been identified. The process will undergo a similar path as the initial process because of the nature of the waterfall model.

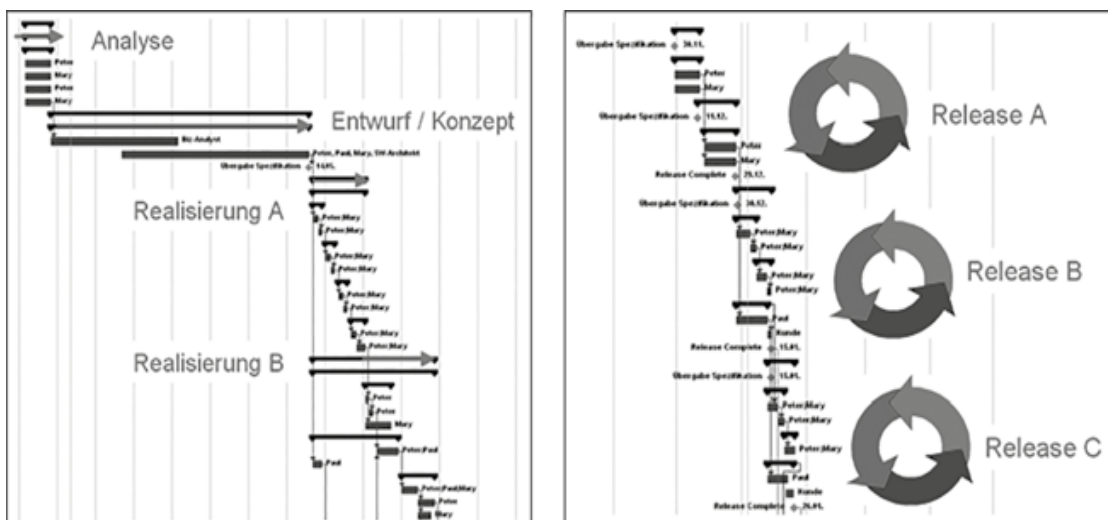


Figure 4. Distinction of the waterfall model compared to APM<sup>25</sup>

<sup>22</sup> Cinnioğlu (2020), p. 408.

<sup>23</sup> Cinnioğlu (2020), p. 408.

<sup>24</sup> Preußig (2020), p. 10.

<sup>25</sup> Reichert (2019), p. 178



An in-depth understanding of technology is also a characteristic of this model. An in-depth understanding of technology is crucial because it facilitates how formal procedures and documentation are addressed. The use of technology also helps in understanding the workflow of the project management process. Other areas impacted by technology are quality assurance and testing, communication, and efficiency. These aspects are crucial in the management of projects, ensuring that the intended outcomes are attained as initially envisioned<sup>26</sup>. The characteristics of the waterfall model indicate why ICT organizations prefer it during project management. The cohesion of these characteristics guarantees the effectiveness and efficiency of the model.

#### **4.1.1 Phases of the waterfall model**

The waterfall model has five phases. These phases are requirements, design, implementation, testing, and maintenance. In the requirements section, there is an assumption that a project is properly handled when required resources are promptly sourced. Before sourcing for these resources, it is essential for an analysis to be conducted. An analysis allows the project manager and the project team to understand the system specifications<sup>27</sup>. Understanding system specifications impacts how product models are generated. ICT companies must understand the target of their projects, specifying their intended outcomes once integration has been completed. Based on this analysis, the requirements of the project are properly developed. The analysis process is founded on factors such as user stories, cases, process and data models, and prototypes. Before conducting an analysis, there are several considerations that must be envisioned. Envisioning these factors allows ICT companies to avoid uncertainty and risks that might be experienced in the later stages of addressing the project<sup>28</sup>. Thus, stakeholders should be involved in the requirements phase to ensure that they help with analyzing the resources, assumptions, and risks associated with the targeted project.

The project manager and team must have an upfront understanding of the project they are conducting<sup>29</sup>. An upfront understanding of the project allows these stakeholders to align their actions and decisions with the preferences of sponsors.

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<sup>26</sup> Böhm (2019), p. 2.

<sup>27</sup> Böhm (2019), p. 3.

<sup>28</sup> Böhm (2019), p. 12.

<sup>29</sup> Kröger/Marx (2020), p. 58.



Partnerships with stakeholders allows for auditing to be conducted to understand the viability of the project. Generally, the requirements of a project based on this phase are captured in a single document. Other aspects that are captured at the requirements phase are costs, risks, assumptions, metrics for measuring success, and dependencies<sup>30</sup>. ICT companies in Germany that base their projects on this phase of the waterfall model succeed in sourcing resources required in managing the projects.

The design phase is handled by software developers. In this phase, these project team members are tasked with providing a technical solution to address the identified problems. Similarly, software developers are tasked with providing a well-defined project purpose and scope<sup>31</sup>. A properly developed purpose and scope allow the project team to understand the project's concept<sup>32</sup>. A logical design indicates the general traffic flow expected in each component until integration is attained<sup>33</sup>. For example, software developers are crucial in identifying programming languages, data sources, hardware, services, and other essential resources that will be used to handle the project<sup>34</sup>. Furthermore, this team identifies wireframing and prototyping as aspects that create low- and high-fidelity mockups that represent the user interface. Through this interface, stakeholders are allowed to visualize the project and generate feedback based on their user experience. Understanding the interactions consumers will have with a system is crucial for ICT companies. These systems must be aligned with consumers' preferences.

The implementation phase involves the launch of technical integration. The operations executed in this phase make it the shortest in the waterfall model. The phase is short because much work has already been done in the requirements and design phases. An issue like research is extensively addressed in the requirements section to ensure that the required materials are properly identified and sourced<sup>35</sup>. In the design phase, research is also conducted to ensure that issues like language, system design, interfaces, and algorithms are identified and selected. Therefore, the focus of implementation is to develop a tangible product. Developers take center stage and utilize their skills and expertise to ensure that the product's features and components align with consumers' aspirations.

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<sup>30</sup> Fiedler (2010), p. 110.

<sup>31</sup> Fiedler (2010), p. 227.

<sup>32</sup> Cf. Moder et al. (1983), p. 195.

<sup>33</sup> Fiedler (2010) p. 21.

<sup>34</sup> Nyamsi (2019), p.4.

<sup>35</sup> Bansal (2024), p. 6.





The testing phase involves identifying errors that might have developed as codes are written. There are several activities that are conducted during the testing phase. These activities help in identifying errors or bugs within the system. The first activity in this phase is coding. Coding involves the development of the actual code for the intended software product. ICT companies in Germany use specific languages to develop their codes. Furthermore, the developed codes are written based on specific frameworks, tools, and other elements that determine success.

The second activity in this phase is initial testing. As the developers continue to generate codes, they conduct unit tests to determine functionality. Through this initial testing process, isolation is executed. Bugs are identified and promptly fixed since the waterfall model is sequential. The third activity is integration testing. As the codes are developed and tested, they are integrated, and their functionality is tested. Through this activity, parts with issues are identified. The parts must have an effective interaction for the project to flow seamlessly. The fourth activity is system testing. Once the functionality of the codes and parts have been ascertained, the effectiveness of the system is determined. A successfully developed system must be of high-quality, working without any mishaps. The final activity in this phase is user acceptability testing. ICT companies must ensure that their final products are acceptable in the market. Thus, the activities in the implementation phase are necessary to ensure that the flow of the project is sustained.

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#### 4.1.2 Areas of application and limits

The waterfall model can be applied in various areas. Specifically, the model is applicable for well-defined projects<sup>36</sup>. Well-defined projects have clear, stable, and rigid characteristics. In the ICT sector, the model is applied in project management, software development, and construction and manufacturing. In project management, the model is used to develop clear phases and deliverables. The success of the model in achieving project management targets is aligned with the experience of project managers, efficient communications with stakeholders, and rigorous and consistent testing and quality control. The model is appropriate for project management because clients do not change their scope in the middle of the project. In software development, the waterfall model is used to write codes, conduct tests, and release products that address the unique preferences of clients. Construction and manufacturing are positively impacted by improved creativity and innovation. For example, the model is crucial in the handling of government projects. German government projects are usually large and complex and require creativity and innovation for the intended outcomes to be attained. Success is attained when requirements are well defined. Similarly, success is attained when deadlines are strict and the scope and budget are rigid. For embedded systems, the use of the waterfall model ensures that small, dedicated computers are rigorously tested to ensure that their procedures are safe and reliable. Embedded systems are mostly used in cars and medical systems, and their reliability and safety parameters are of great importance.

The waterfall method was launched in the 1970s and has succeeded in helping organizations to improve their project management process. However, the implementation of the model is limited. One of the issues impeding the implementation of this model is its rigidity. Due to the sequential process, the model is rigid, meaning that changes cannot be implemented in the course of project management. The changes can only be implemented once the project has been finalized. This characteristic is problematic because it exposes ICT companies to increased costs of handling their projects<sup>37</sup>. The changes are integrated in projects through new projects. Consistently handling projects exposes ICT companies to a rigorous project management routine that disrupt other organizational functions. Overall, delayed feedback makes it hard for these companies to address the arising needs and preferences of consumers.

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<sup>36</sup> Cf. Kuster et al. (2019), p. 6.

<sup>37</sup> Schmid (2018), p.177.



The waterfall model is also limited in terms of collaboration. Most of the tasks and responsibilities handled in the various phases of the model are siloed. This approach indicates that each phase is handled by a specific team. This approach is problematic because it impedes the communication of feedback. Feedback is crucial in identifying and reporting errors and bugs. If an error or bug is identified in the later stages of the project, they have to wait for finalization before they are addressed. This limits the utilization of the model in time-limited projects. These projects are time conscious and must achieve the intended outcomes once they have been implemented.

German ICT companies are also focused on timely marketing to attract and retain customers<sup>38</sup>. Relaying timely marketing messages is crucial to attain this outcome. Using the waterfall model limits the timely development of marketing messages. The release of products is delayed due to the sequential nature of the model<sup>39</sup>. Therefore, the model is limited in instances where German ICT companies need to handle their project in a timely manner. For some companies, breaking down tasks is considered problematic, indicating that the nature of the waterfall model will be attained<sup>40</sup>.

#### **4.2. Other traditional methods (e.g. Gantt charts, PERT)**

Apart from the waterfall model, there are other TPM methods that German ICT companies can utilize. These methods include Gantt charts and PERT. Gantt charts are used to provide visual representations of projects<sup>41</sup>. These visual representations are used to understand the requirements of projects, detailing processes, resources, costs, and other necessary parameters. Through Gantt charts, project managers develop an appropriate schedule that governs how organizations handle their projects. Conversely, a PERT refers to a tool that facilitates how the time required to handle a project is developed<sup>42</sup>. Companies that successfully handle their projects must develop realistic timelines. Through PERT, project managers can coordinate the skills and expertise of project team members to achieve success. Furthermore, PERT facilitates how deliverables are scheduled to ensure that project targets are attained. Therefore, this section discusses the use of Gantt charts in project planning and PERT and network planning technology.

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<sup>38</sup> Kröger/Marx (2020), p. 58.

<sup>39</sup> Cf. Kuster et al. (2019), p. 1.

<sup>40</sup> Kniberg (2007), p. 36.

<sup>41</sup> Bansal (2024), p. 8.

<sup>42</sup> Cf. Moder et al. (1983) p. 18.



#### 4.2.1 Gantt charts in project planning

Before developing projects, there is a need to determine the resources required to achieve success. Companies are successfully determining the resources required to handle their projects through the use of Gantt charts. These companies are also using Gantt charts to develop and schedule milestones<sup>43</sup>. Through Gantt charts, project managers can determine the start and end dates of their projects. Additionally, Gantt charts are used to illustrate the dependencies that tasks have among each other, ensuring planning and tracking are properly handled. When utilizing Gantt charts, there are several considerations that project managers must be aware of before initiating their projects. The first consideration is complexity. ICT projects can be very complex, requiring extensive planning to achieve success. For example, large projects are very complex due to their milestones, required resources, and deadline pressures. Thus, project managers are required to consider simplifying their charts to minimize information that can cause confusion.

The second consideration when using Gantt charts is the dependencies of tasks. Identifying and defining dependencies between tasks is essential in projecting errors that might arise from the developed schedule. Failing to consider the dependencies of the tasks can lead to errors that might impact how projects are handled. Thus, the developed schedule will cause problems for project managers. The third consideration is flexibility. Project managers must understand that projects are not always smooth. Understanding the complexities of projects allows project managers to implement changes that streamline processes and operations. Using Gantt charts requires project managers to understand that projects are affected by various issues that will require them to adjust to sustain progress. Focusing on these considerations allows project managers to have better management of their projects using Gantt charts.

Gantt charts facilitate how projects are planned by focusing on specific aspects<sup>44</sup>. Gantt charts facilitate visualization by allowing project managers to develop clear and visual overviews of the projects that they are intending to address. Through the visualization of their projects, appropriate timelines are developed. Through these timelines, relationships between tasks are developed, helping to understand the risks that might be experienced during the course of the projects. Gantt charts facilitate how communication is implemented. Information and feedback are shared

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<sup>43</sup> Cf. Moder et al. (1983) p. 27.

<sup>44</sup> Cf. Moder et al. (1983), p. 19.



between stakeholders, allowing the project to be properly handled. Communication is essential in sharing information and feedback on changes that must be implemented for the project to align with the developed schedule and timeline.

Gantt charts also influence the planning of projects by influencing coordination. Through Gantt charts, team members can coordinate their work to ensure that they understand their roles and responsibilities. The coordination of tasks is critical to understanding the timeline for each milestone. The successful completion of projects is based on addressing individual milestones. These milestones must be finalized within the set deadlines to ensure the project process flows smoothly. In case of errors or malfunctions, changes are promptly implemented to stay on course with the project. Conversely, coordination also allows for team members to be guided on how to execute actions and decisions. Some project processes are very complex and require partnerships between team members to consolidate solutions. Coordination improves how vital information and feedback are shared among team members to improve effectiveness and efficiency of decision-making and problem-solving.

Gantt charts also influence planning by improving how project progress is monitored. Monitoring progress allows for the progress of tasks to be assessed and evaluated to ensure that risks, assumptions, and unwarranted outcomes are avoided. For example, delays are promptly addressed when changes are implemented. Unlike the waterfall model, changes are implemented when using Gantt charts to plan for projects. Gantt charts can be developed through various programs. The allocation of funds is attained using a Gantt chart. Adequate allocation of funds to tasks ensures that the intended outcomes are attained as intended. Errors, confusion, and low motivation are addressed by providing adequate resources to project team members. Overall, the use of Gantt charts in project planning is crucial. Through appropriate planning, ICT companies in Germany properly handle their project to address the needs of their clients.

#### **4.2.2 PERT and network planning technology**

Another TMP-planning method is PERT. This method is vital in project planning because it handles complex projects. These complex projects are properly handled through appropriate estimation and scheduling. Network diagrams are used to visually represent project tasks. PERT is aligned with network diagrams, ensuring that the dependencies of tasks are properly handled<sup>45</sup>. The estimation of project

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<sup>45</sup> Dresden (1967) p.1.



deadlines is addressed through three timelines. Optimistic timing involves the shortened deadline by which a project can be handled. Most likely, timing involves the accurate time that can be used to handle the project. Pessimistic timing involves the longest time that can be used to finalize the project. Based on the provisions of these timing methods, PERT helps to develop an average that is used to determine the amount of time required to handle the project. Using the average of the three timings helps factor in project variabilities and uncertainties. In addition, developing a realistic approach to handling a project ensures that team members' actions and decisions align with the needs and preferences of targeted clients. The project areas impacted by PERT are the development of schedules, identification of critical paths, evaluation, mitigation of risks, and allocation of resources.

Networking planning technology is also a TPM tool that is used to develop a graphical approach to addressing projects. German ICT companies can use networking planning technology to determine a single time estimate. Determining a single time estimate involves indicating the specific time each duration will last<sup>46</sup>. Combining the use of PERT and networking planning technology is beneficial. This combination allows for the determination of a probabilistic time for handling a project. The time estimates generated by PERT are consolidated by the network planning technology, leading to a critical path analysis. Similarly, resources are properly allocated based on the analysis provided by these TPM methods. Generally, combining PERT and network planning technology leads to increase accuracy, better risk management, early detection of issues, efficient management of resources, and effective communication. These benefits are crucial in handling project. German ICT companies that implement these TPM methods have a better chance of attaining the intended project outcomes.

Nonetheless, these TPM methods should be approached cautiously. Caution is based on the limits of utilizing these TPM methods. Combining PERT and network planning technology has its challenges. These challenges include increased complexity, inaccurate data generation, and poor software selection. Furthermore, the shifts in project management and technology also present a big challenge for German ICT companies. Thus, the implementation of PERT and network planning technology must be approached cautiously.

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<sup>46</sup> Dinsmore/Cabanis-Brewin (2011) p. 8.



### **4.3. Advantages and disadvantages of traditional methods**

In general, TMP methods have their pros and cons. The selection of these methods is based on the specific needs and aspirations of German ICT companies. Today, companies must focus on global operations to achieve growth. However, the focus on growth should be approached cautiously. The use of TMP methods should be handled properly to ensure projects generate the intended outcomes. The advantages of using TMP methods include clear structure and planning; reduced risks and assumptions; efficient documentation; predictable outcomes; and strong control of the project. These benefits are associated with projects that are large in scale, complex, consist of clear scope and milestones, and influenced by regulatory compliance.

Conversely, TPM methods are marred by several drawbacks. These drawbacks include the inability to adapt to change, ineffective communication, reduced project team morale, and a major focus on documentation. These drawbacks explain why global companies are focusing on shifting to APM methods to minimize the hassle associated with TPM. German ICT companies are also aligning their project management processes with the shifting trends, focusing on lean project management<sup>47</sup>. Based on these drawbacks, these companies need to conduct an in-depth analysis of TPM methods before implementation. Understanding the benefits and drawbacks of the specific TPM methods will ensure that these companies handle their projects as intended.

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<sup>47</sup> Cinnioğlu, (2020), p. 35.



## 5. Business perspectives

This section discusses various business aspects associated with implementing APM and TPM. These project management approaches have different impacts on product development and marketing. These project management approaches also influence the perspective of consumers differently. Agile and classic project management strategies impact business operations. These project management strategies influence various aspects of product development, including conceptualization, design, engineering, mechanics, and informatics<sup>48</sup>. Organizations are selecting a project management strategy aligned with their business needs<sup>49</sup>. Organizations use APM because of its flexibility. APM has responded to the shifting trend of incorporating changes during the course of project management<sup>50</sup>. Additionally, APM is allowing companies to incorporate feedback from stakeholders. For example, companies are succeeding in attaining the preferences of consumers by incorporating feedback into their project management endeavors. The business environment is very competitive, and successful companies must align the features of their products with the needs of their targeted customers. These companies are also succeeding in minimizing costs associated with making adjustments after project management processes are finalized.

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<sup>48</sup> Pennypacker/Cabanis-Brewin (2011), p. 285.

<sup>49</sup> Jugdev (2011), p. 291.

<sup>50</sup> White (2011), p. 467.



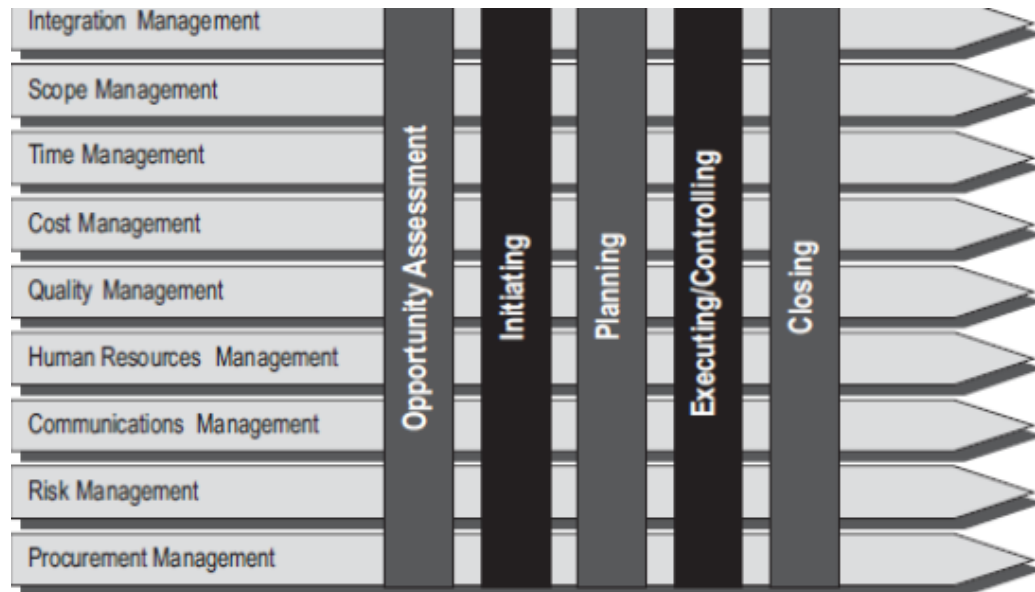


Figure 5 Typical APM methodology used in project management<sup>51</sup>.

Conversely, companies are using TPM based on available resources and timelines. These companies are developing concise and precise scopes and milestones to ensure that they minimize errors and risks. These companies are also ensuring that each phase of TPM is properly addressed to avoid developing other projects. Issues like climate change, the COVID-19 pandemic, a shrinking talent pool, and technological advancements have redefined how organizations handle their operations. Implementing TPM is to ensure that available resources and timelines are adhered to to achieve lean production. Maintaining competitive advantage and business sustenance requires organizations to develop sustainable approaches to product development, manufacture, and marketing.

For ICT companies, the decision between APM and TPM is based on the benefits that are set to be attained. These project management strategies have pros and cons. Understanding these concepts allows these companies to efficiently execute decisions when developing their products. ICT companies that select APM, for instance, are focused on prompt marketing of their products. They achieve this by incorporating change as they handle their project to minimize time wastage. These companies also refine their communication strategies to ensure that vital information and feedback required for executing actions and decisions are provided. ICT companies that choose TPM, on the other hand, are focused on

<sup>51</sup> White (2011), p. 467.



having complete control over the project management process<sup>52</sup>. This aspect involves adhering to various compliance guidelines to minimize unintended outcomes. The business perspectives discussed include costs and budgeting, time management and deadlines, quality and customer satisfaction, and team dynamics and employee motivation.

### **5.1. Impact on costs and budgeting**

The implementation of APM and TPM has an impact on costs and budgeting. To begin with, APM has an impact on costs and budgeting based on the actions and decisions executed when handling scope and milestones. ICT companies are tasked with handling various projects, both for private and public entities. For example, these companies are tasked with handling projects for the German government and SMEs. The magnitude of these projects differs based on scope and milestones. The positive impacts of APM on costs and budgeting include reduction of waste developed from reworking, enhanced delivery of value, prompt identification of errors and risks, and increased team collaboration<sup>53</sup>. ICT companies using APM reduce waste by ensuring that reworks are not initiated. Through its iterative approach, APM is allowing companies to seek early feedback from stakeholders to determine the course of the project management process<sup>54</sup>. Similarly, early detection of errors and risks are preventing the abandonment of the project in the later stages, an aspect that will lead to increased costs and budgeting problems when developing new projects<sup>55</sup>.

Reworking is problematic because it forces companies to constantly purchase resources to address their project management needs<sup>56</sup>. Some of these resources are very expensive. For example, technological devices are very expensive, and purchasing them for an extensive project team can be daunting for organizations. Furthermore, compensating skilled project management team members is also pricey. Developers attract high fees for their skills and expertise. Reworking means that organizations have to define new contracts for these professionals to work on the new projects. Nonetheless, APM minimizes rework by ensuring that errors and risks are promptly identified in the early stages of project management. Early detection of errors and risks also allows for the set budget to be adhered to. Additional processes and resources are avoided, ensuring the project is promptly

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<sup>52</sup> Levine (2011), p. 428 f.

<sup>53</sup> Institute (2023), p. 30 f.

<sup>54</sup> Cabanis-Brewin (2011), p. 486.

<sup>55</sup> Wagner/Grau (2013), p. 74 f.

<sup>56</sup> Wagner/Grau (2013), p. 23 f.



addressed<sup>57</sup>. Reworking can be ineffective if the new product does not align with consumers' preferences. This outcome only compounds problems for companies, leading to extensive expenses.

Another positive impact of APM in project management is focusing on valuable aspects of the process and features of the product<sup>58</sup>. This aspect allows companies to focus on implementing resources in areas that promise to offer efficiency and effectiveness. The project manager has an easier task when selecting a project and project team that promise to offer a return on investment. Furthermore, continuous planning allows ICT companies to develop budget flexibility. In the event of changes, the project team can successfully conduct implementation. Adaptation is one of the benefits of the successful handling of a project<sup>59</sup>. Through adaptation, companies can implement essential priorities that promise to offer benefits in the long term<sup>60</sup>. Slightly refining the budget ensures that the project management process is perfected.

Companies that implement APM also detect errors and risks promptly. APM allows these companies to initiate collaborations with stakeholders, leading to prompt delivery of feedback. Early detection of errors and risks allows these companies to adhere to the provisions of their budgets and timelines. Since there is flexibility, reworking is entirely avoided, as the project manager influences how communication takes place within the team. Collaboration is attained when team members work together. Increased collaboration is attained when team members understand the uniqueness of their roles and responsibilities. They employ the skills and expertise required to execute actions and decisions. For example, the utilization of these skills allows team members to properly allocate resources and ensure that they are utilized as intended. Misappropriation or embezzlement of the funds is avoided since each team member is aware of the need to act and behave professionally. This approach reduces costs and budget overflow.

However, the implementation of APM also has its drawbacks. The first drawback of APM is uncertain budget cycles. Due to flexibility, companies are exposed to constant budget changes. These budget changes are aligned with arising errors and risks. Since one of APM's features is flexibility, the project team can experience various errors or risks, forcing it to surpass the initial budget plan<sup>61</sup>.

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<sup>57</sup> Jakoby (2021), p. 208.

<sup>58</sup> Institute (2023), p. 15.

<sup>59</sup> Wagner/Grau (2013), p. 171 f.

<sup>60</sup> Kusay-Merkle (2018), p. 2.

<sup>61</sup> Kusay-Merkle (2018), p. 14 f.



Monitoring also increases changes in the budget. Monitoring identifies errors that must be addressed before a product is released to the market. The second issue with APM is scope creep. Uncontrolled scope can lead to expansion, broadening the roles and responsibilities of team members, ultimately stalling progress<sup>62</sup>. Scope creep forces companies to increase their budget allocations to address the arising issues.

The third issue with APM is communication overhead. Excess information and feedback water down the initial intent of the project. Team members share extensive information and feedback that causes confusion. Ultimately, the intended target of communication is lost, and organizations are forced to incur more costs in trying to implement corrections. The fourth drawback of APM is the increased cost of training team members. Flexibility allows for novel processes and technologies to be included in the project management process. Thus, companies are required to train their team members to properly use these novel processes and technologies. Training increases costs and budget allocations, leading to unintended losses.

The implementation of TPM also has its benefits and drawbacks based on costs and budget. The benefits of implementing TPM regarding costs and budget include efficient planning and scheduling, a clear definition of roles and responsibilities, and efficient risk management. These benefits allow organizations to adhere to the set budget, reducing the cost of operation. Efficient planning and scheduling are attained through an upfront, detailed analysis of the project, including the required resources and duration<sup>63,64</sup>. Organizations that implement TPM successfully identify operations that drive up costs, ensuring resources are efficiently allocated. In general, this approach allows organizations to attain better predictability and control over the costs and budget of the project. The focus is on minimizing expenses while also addressing the needs of customers.

Defining roles and responsibilities clearly ensures that team members are aware of their impact on the project<sup>65</sup>. Team members must develop accountability and responsibility to complete tasks within the defined costs and budget. Similarly, the project manager must develop and incorporate a comprehensive risk management approach to minimize errors and other issues that can cause cost and budget

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<sup>62</sup> White (2011), p. 468.

<sup>63</sup> Pepels (2017), p. 82.

<sup>64</sup> Fiedler (2010), p. 158.

<sup>65</sup> Institute (2023), p.142.



overload. Based on these pros, companies that implement TPM successfully address their project management targets.

Nevertheless, companies that have implemented TPM will experience increased costs and budget overload due to the characteristics of this project management method<sup>66</sup>. The increased costs and budget overload are associated with TPM's limited flexibility, communication, and reaction to errors and approaches. TPM is rigid, and initiated projects must be finalized before feedback is consolidated from stakeholders. This characteristic is problematic because it forces companies to initiate reworks to implement change and attain the intended outcomes. Constantly reworking increases the costs and budget, defeating the purpose of the project. The costs and budget of a project are increased due to poor communication. Poor communication inhibits how vital feedback is shared among team members. The rigidity of this approach means that identified errors and risks cannot be communicated, impeding how corrective measures are implemented. Conversely, misunderstandings arise from poor communication, affecting how the budget is developed and allocated. TPM also advocates for a reactionary approach to arising issues. A reactionary approach means that these issues are addressed after the completion of a project. This aspect only increases the chances of reworking. Reworking increases costs and budgets, leading to poor returns on investments.

## **5.2. Impact on time management and deadlines**

Time management and deadlines are also affected by the implementation of APM and TPM. The impact on time management and deadlines is also based on the characteristics of these approaches to project management. The utilization of APM positively impacts time management and deadlines through its flexibility, operating through a broken-down structure, improved transparency and communication, and better overall team efficiency<sup>67</sup>. Flexibility ensures that the companies adapt to changing needs, working with the project manager to broaden the budget and extend deadlines<sup>68</sup>. New priorities are accommodated to ensure that the entire project is not derailed. Similarly, flexibility influences creativity and innovation. Team members are accorded longer deadlines to develop high-quality features and components that enhance the quality of the product<sup>69</sup>. Through creativity and innovation, companies are minimizing how their products are becoming obsolete

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<sup>66</sup> Cho (2010), p.1.

<sup>67</sup> Cf. Kuster et al. (2019), p. 12.

<sup>68</sup> Institute (2023), p. 15.

<sup>69</sup> Institute (2023), p.142.



in a short period of time. These products can also become obsolete during the project management process, leading to extensive losses.

Breaking down the schedule leads to the development of milestones. These milestones can be attained through practical deadlines. As organizations focus on the changing needs of consumers, increments are successfully added to the overall project, leading to time management and adherence to the developed deadline. Overall, iterative delivery minimizes delays as companies successfully implement changes<sup>70</sup> as they arise. APM also improves time management and adherence to deadlines through improved communication and transparency. Transparency allows team members to properly execute actions and decisions to achieve intended outcomes. Through transparency, errors, and risks are minimized, allowing team members to work within the specified deadlines. Transparency is crucial because it enhances how information and feedback are shared among team members. Similarly, transparency enhances collaboration by allowing team members to engage in an in-depth analysis of issues, sharing ideas, opinions, views, and perspectives required for project management efficiency. Predictable time management and deadlines are developed based on collaboration. For instance, task completion is reduced when team members share critical ideas on how to handle tasks and responsibilities.

The implementation of APM also has its drawbacks regarding time management and deadlines. Unrealistic planning is one of the issues that organizations that have implemented APM must contend with<sup>71</sup>. Unrealistic planning arises when sprint deadlines are developed and implemented. Sprint deadlines are generated without an accurate estimate of the time required to handle each task. Based on this aspect, several commitments can be missed, causing scheduling pressure. Team members are also demotivated by overly ambitious deadlines that push them to work extra hard to achieve the intended outcomes. Poorly motivated team members approach tasks and responsibilities haphazardly, failing to address the intricate aspects of the project. Overreliance on individuals is another drawback that impedes the successful implementation of APM in project management. Companies that use APM rely on the successful development of project teams. Individuals with problematic skills and experiences delay how tasks and responsibilities are handled. Combined with sprint timing, the overall management of projects becomes a catastrophe.

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<sup>70</sup> Reichert (2019), p. 194 f.

<sup>71</sup> Cho (2010), p. 117.



Companies implementing APM also struggle with documentation<sup>72</sup>. Extensive documentation leads to lagging as gaps develop. Iterative reactions lead to the handling of certain project aspects while others are left unattended. In this case, a comprehensive approach to documentation is missed, leading to confusion, misrepresentation of facts, and overall delay in the handling of milestones. Thus, companies that implement APM must be aware of the shortcomings of this project management approach. Failing to capture these shortcomings will lead to constant failure, resulting in project delays or abandonment.

Implementing TPM also impacts time management and deadlines. The positive impacts of implementing time management include predictability, structured planning, and enhanced accountability. Predictability is attained when tasks are handled through a sequential approach. A sequential approach allows project managers to conduct research and properly allocate and forecast the time required to address the project<sup>73</sup>. Project managers successfully develop roadmaps that help team members execute appropriate actions and decisions that minimize bottlenecks. Predictability is complemented by structured planning. Structured planning involves defining tasks, timelines, and dependencies<sup>74</sup>. Once a roadmap has been defined, team members are required to adhere to it without making any changes. Arising changes are implemented after the finalization of the project. Accountability allows team members to track the progress of their actions and decisions, facilitating how problematic areas are promptly identified. Based on these aspects, TPM allows companies to promptly handle their projects, leading to satisfaction with time management and adherence to deadlines. Companies implementing TPM based on these benefits reduce expenses, achieving a return on their investments.

Companies implementing TPM must also contend with the approach's drawbacks. The rigidity of the project management approach makes it hard for changes to be promptly implemented. Arising issues can be experienced during the project. Due to rigidity, these issues are only permitted at the end of the project. In general, rigidity leads to overestimation of tasks, poor sharing of critical information and feedback, and limited response. Time management and deadlines are negatively affected by these vices. Team members are unable to focus on crucial aspects of the projects due to misunderstandings or misalignments of resources. Unforeseen

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<sup>72</sup> Cho (2010), p. 116.

<sup>73</sup> Fiedler (2010), p. 158.

<sup>74</sup> Cf. Kuster et al. (2019), p. 20.



challenges that arise in the course of the projects also create confusion, disrupting how tasks and responsibilities are addressed. Therefore, TPM negatively impacts time management and deadlines based on these issues.

### **5.3. Quality and customer satisfaction**

APM impacts quality and customer satisfaction. The potential for APM to improve quality customer satisfaction is very high. Nonetheless, the impact of this project management approach is not always definitive. There are benefits and drawbacks associated with implementing APM to control quality and achieve customer satisfaction. The benefits of APM are associated with its prompt impact on the delivery of operational products. ICT companies using APM successfully deliver effective working software to customers. The use of sprint timing allows these companies to break down processes into manageable chunks<sup>75</sup>. Breaking down processes allows ICT companies to work with the feedback from targeted customers. Since the project management approach is flexible, team members can easily implement the feedback generated from interactions and engagements with targeted customers<sup>76</sup>. Implementing these changes has allowed these companies to develop quality products that meet the operational needs of customers. Furthermore, attaining high quality allows these companies to adhere to governments' operational regulations. The German government values the development of high-quality products based on its drive to revolutionize the technological industry.

Implementing APM in quality and customer satisfaction is also based on the approach's enhanced collaboration. Collaboration allows for team members to collaborate and develop essential processes and operations that build operational products. APM supports continuous improvement and collaboration guarantees that quality measures are promptly identified and implemented. Collaboration creates trust between team members, elevating their confidence levels, and creativity and innovation. They develop quality products that align with the preferences of customers, leading to satisfaction. Collaboration also ensures that project managers guide how their team releases products to the market. Releasing products to the market within the specified timelines builds customers' trust, leading to loyalty.

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<sup>75</sup> Cf. Raeesinejad et al. (2023), p. 64.

<sup>76</sup> Jakoby (2021), p. 160 f.





Testing and feedback are other aspects promoted by APM. This project management approach supports how team members conduct tests to guarantee the operational efficiency of the developed products. Defects are identified and resolved, sustaining the quality of the products. Testing and feedback are influential when partnered with team ownership and motivation. Giving team members the autonomy to engage in creativity and innovation leads to greater responsibility. Improved engagement, ownership, and focus are considered great aspects of influencing the actions and decisions of team members<sup>77</sup>. Ultimately, products are refined to meet the preferences of customers.

Despite these benefits, APM has drawbacks in meeting quality and customer satisfaction. The issues causing these drawbacks are poor upfront planning, a scope that is constantly changing, ineffective measurement of quality in an iterative environment, and differing skills and culture within the team. These factors poorly influence how quality targets are attained, meaning that the preferences of customers are unmet. Ultimately, customers develop a resentment for the products, seizing business interactions and engagements with ICT companies. For example, poor upfront planning leads to serious gaps in documentation. The collection of diverse information and feedback creates confusion, leading to team members executing unnecessary actions and decisions. A result of this is poorly developed products that are subpar and do not align with the specific preferences of customers.

On the other hand, TPM also has its benefits and drawbacks regarding attaining quality and customer satisfaction. The benefits of implementing TPM to achieve quality and satisfaction are based on adequate planning and documentation, predicting and controlling arising errors and risks, and standardizing processes to achieve best practices. These processes revolutionize how team members handle their actions and decisions. On one hand, adequate planning and documentation allow team members to develop comprehensive plans for the milestones and deliverables of the project<sup>78</sup>. These factors create clarity, facilitating how requirements, processes, and specifications are understood. Ultimately, intended quality is attained and sustained, achieving customer satisfaction. Conversely, predicting and controlling errors and risks and standardizing processes ascertain that the established methodologies are properly utilized. Complex projects with stringent measures are easily handled through these methodologies, allowing the

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<sup>77</sup> Cf. Raeesinejad et al. (2023), p. 66.

<sup>78</sup> Cho (2010), p. 1.



developed features and components to be incorporated into the final product<sup>79</sup>. The focus of implementing TPM is to ensure that the needs and preferences of customers are attained, leading to satisfaction.

Similar to the drawbacks discussed for APM, TPM has issues that limit its implementation when seeking to attain success with quality control and customer satisfaction. The issues with TPM are limited adaptability, poor access to and implementation of feedback, inefficient testing, focus on deliverables rather than value, and reduced accountability and responsibility. Based on these issues, ICT companies are struggling with meeting the quality standards and the preferences of customers. For example, companies are having problems with testing because TPM operates sequentially. A sequential approach indicates that once a phase has been handled, corrections cannot be implemented until the whole project has been finalized<sup>80</sup>. Based on the shortcomings of TPM, companies must implement caution when utilizing it to manage projects. Failing to exercise caution will ultimately lead to unintended quality and customer satisfaction outcomes.

#### **5.4. Effects on team dynamics and employee motivation**

The final aspects related to the implementation of APM and TPM are team dynamics and employee motivation. APM influences team dynamics and employee motivation by improving collaboration, communication, autonomy and self-organization, sharing of continuous feedback, and accountability and responsibility<sup>81</sup>. Team members are highly motivated when they can share information, feedback, skills, expertise, ideas, perspectives, and opinions. These factors influence team dynamics and motivation by ensuring that actions and decisions are handled as intended. Additionally, these factors influence how team members are visible. Constantly offering feedback on processes and operations allows team members to understand the importance of properly handling their roles and responsibilities.

Albeit these benefits, APM has various drawbacks when it pertains to team dynamics and collaboration. These drawbacks include work overload, poor focus, and constant conflicts. Due to these factors, team members are constantly demoralized. They fail to focus on the set timelines and deadlines, leading to extended project completion dates. Extended timelines lead to continued conflicts as team members struggle to handle their roles and responsibilities. The struggle

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<sup>79</sup> Reichert (2019) p. 185.

<sup>80</sup> Fernandez/Fernandez, (2008-2009), p. 15.

<sup>81</sup> Cf. Raeesinejad et al. (2023), p. 36.



emanates from long working hours and poor work-life balance. The pressure associated with these aspects leads to poor implementation of actions and decisions, leading to unintended outcomes.

Companies that implement TPM experience the following benefits regarding team dynamics and employee motivation: structure and clarity, appropriate risk management, and accountability. These benefits are attained when team members understand their roles and responsibilities and focus on attaining them. They execute actions and decisions aligned with their roles and responsibilities. Errors and risks are avoided when team members understand their roles and responsibilities and focus on meeting clarity when executing actions and decisions. Team members must also understand the importance of being accountable for their actions and decisions. Workplaces comprise individuals from diverse cultural backgrounds. Efficient project management involves developing cultural awareness and sensitivity to understand the importance of working closely with members from diverse cultures to achieve positive progress in project management. Developing cultural awareness and sensitivity improves interactions and engagements, leading to better development of team dynamics and employee motivation.

TPM also has its drawbacks. Companies that implement TPM to achieve success in team dynamics and employee motivations fail based on the following aspects micromanagement, poor communication, and ineffective adaptation<sup>82</sup>. Micromanagement arises from TPM's inflexibility. Team members are required to adhere to the conditions of their roles and responsibilities without raising concerns. Errors and risks are stifled until the project is finalized. This approach derails motivation as team members understand that their views are unvalued. Rigorous upfront planning also creates siloed structures that push for hierarchical communication<sup>83</sup>. Hierarchical communication is detrimental to team members because it impedes how information and feedback flow. Ultimately, team dynamics are hindered, and employees develop poor collaboration. Siloed structures indicate that deliverables are more important than people. This perspective creates a poor working culture that demoralizes team members. ICT companies that implement TPM are likely to experience high turnover rates as employees look for settings where they are valued. Generally, the drawbacks of TPM derail adaptation for teams, leading to diverse challenges related to change implementation. Team

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<sup>82</sup> Cho (2010), p. 1.

<sup>83</sup> Institute (2023), p. 274.



members become increasingly frustrated for continuously failing in their project management tasks.



## 6. Application in the German IT industry

German IT companies have utilized agile and traditional methods of project management. The selection of the project management strategies is based on the targets of the companies. Additionally, German IT companies select between agile and traditional methods of project management based on their resources and schedule. German IT companies are focused on aligning their operations with shifting technological trends. Aligning operations with shifting trends allows these companies to meet unique consumers' preferences. Currently, customers are very specific with the products they seek. The products must meet specific standards to achieve the intended outcomes in the market. Therefore, German IT companies are motivated to properly handle their projects to achieve market demands. The appropriate management of projects is influenced by choosing an appropriate strategy.

Motivation is one of the issues pushing German IT companies to select appropriate project management strategies. German IT companies with successful financial positions properly manage their resources, focusing on completing projects that are initially predetermined<sup>84</sup>. These companies are also experiencing successful project management by adhering to the initial budget. Project managers are required to motivate their teams to ensure that they handle their roles and responsibilities. Proper handling of these issues minimizes errors and ensures that progress runs smoothly. Schmid also noted that defining tasks and responsibilities energizes team members and allows them to focus on higher targets. Thus, German IT companies focus on selecting seasoned project managers who understand the importance of motivating their teams to achieve the intended outcomes.

The selection of an appropriate project management strategy is based on a vital leadership style. A management style that is being used by companies is participative leadership. A participative leadership approach is allowing German IT companies to influence how team members handle projects. Through the participative leadership approach, team managers are avoiding coercion, a vice that can negatively influence the progress of projects. Coercion leads to the development of power dynamics, which leads to project managers using threats or punishments to try and influence progress<sup>85</sup>. Therefore, German IT companies rely

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<sup>84</sup> Schmid (2018), p. 1.

<sup>85</sup> Schwalbe (2004), p. 3.



heavily on intrinsic and extrinsic sources of motivation to positively influence the implementation of agile or traditional strategies of project management.

One area that the German IT companies are targeting is risk management in construction. These companies are focused on providing solutions to address the arising risks, allowing construction projects to be completed within the budget and timeline. Handling construction projects is hard because of the risks associated with schedules and costs<sup>86</sup>. Similarly, handling the risks requires proper planning to avoid other issues. The German IT companies are developing software applications that are being used to identify, analyze, assess, and control risks. Based on the support offered by IT companies, construction organizations are attaining their set targets. Additionally, these companies are succeeding in planning for services, pursuing set dates, pursuing costs, ascertaining quality, and analyzing contracts.

Agile and traditional project management strategies are being used by German IT companies to influence the design performance process. Product development and innovation influence how the design phase is handled. APM and TPM are being used to provide adequate solutions to integration problems that might arise during the production process. For example, integration problems arise based on innovations<sup>87</sup>. Innovations are developed through exploration. Project managers rely on innovations to develop quality processes and products that align with the unique preferences of consumers. Additionally, production processes and operations are heavily influenced by innovations. Using APM and TPM in these processes and operations ensures that risks are avoided as integration takes place.

Since exploration is uncertain, German IT companies are using APM and TPM to conduct experimentation. Experimentation is being used to determine the importance of the novel ideas and perspectives generated. The waterfall project management strategy allows companies to address large-scale projects. These projects require companies to have well-defined requirements, scope, processes, and risk-averse environments. Overall, the use of TPM strategies is supported by structured phases, well-defined roles, and detailed documentation. However, German IT companies using TPM are required to understand their projects because of the strategy's ineffectiveness<sup>88</sup>. The lack of task breakdown is an issue that is impeding TPM from influencing how experimentation is implemented during

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<sup>86</sup> Schieg (2006), p. 77.

<sup>87</sup> Lenfle (2008), p. 2.

<sup>88</sup> Lenfle (2008), p. 15.

exploration. The lack of prototypes, testing, and customer trials during project management impedes how German IT companies implement novel ideas. The rigidity of TPM makes it hard for these companies to address issues such as risks that might affect how a project is handled<sup>89</sup>. The final products released to consumers might have error and functionality problems, leading to unintended project outcomes.

German IT companies are using APM to implement the lean design. Lean design involves aligning values, concepts, and criteria to properly manage projects. Lean design also supports communication during project management. Communication is an essential process because it facilitates how information and feedback are shared among team members. Sharing vital information and feedback guides the product and design processes, aligning their targets<sup>90</sup>. German IT companies are using APM because of its flexibility. The lean design process relies on flexibility to facilitate how new ideas and concepts are implemented to refine the project process, starting with planning<sup>91</sup>. New opportunities are identified through ongoing research, capturing the arising or changing preferences of consumers<sup>92</sup>. Stakeholder constraints, such as time and money, are also addressed through the lean design. The following image indicates the lean design process and why it is being implemented by German IT companies to handle projects:

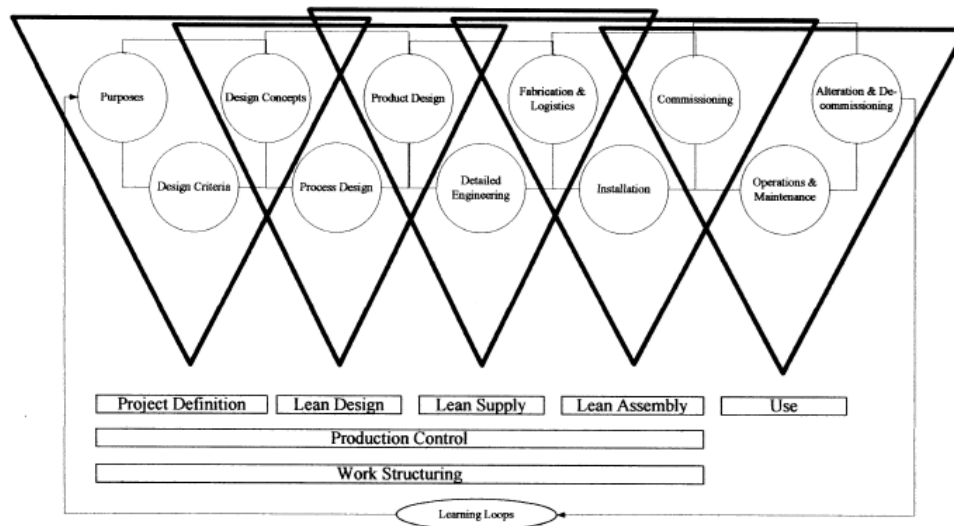


Figure 6 Lean project delivery system indicating opportunities for redefining the project management process <sup>93</sup>.

<sup>89</sup> Lenfle (2008), p.15.  
<sup>90</sup> Ballard/Howell (2003), p. 3.  
<sup>91</sup> Cf. Reinema et al. (2013), p. 114.  
<sup>92</sup> Ballard/Howell (2003), p. 3.  
<sup>93</sup> Ballard/Howell (2003), p. 3.

The flexibility of APM allows companies to implement changes and ideas as they arise. Due to this characteristic, German IT companies are handling projects within the set timeline and budget. TPM differs from APM because it does not allow for change to be implemented during the project management process. Other aspects influenced by APM during project management are lean supply and lean assembly. Lean supply involves detailed fabrication, engineering, and delivery, processes that are essential to product and process design<sup>94</sup>. Through lean supply, these companies are redefining and streamlining the pace and timing of project delivery. On the other hand, lean assembly involves the delivery of materials required to influence various processes of project management. For example, integration is attained through lean assembly. Components are properly integrated to meet the preferences of consumers. Furthermore, errors and risks are reduced to ensure that the developed products function as initially intended.

Startups and tech-driven companies are implementing APM in project management because of its flexibility, better collaboration, and product improvement. The APM strategies mostly being implemented by these companies are Scrum and Kanban. Scrum, for example, is an APM strategy that allows German IT companies to develop their products through major portions<sup>95</sup>. Breaking down the project management process into portions allows initial and additional requirements to be addressed, ensuring quality is enhanced and sustained<sup>96</sup>. The following image indicates how a Scrum methodology is implemented by German IT companies:

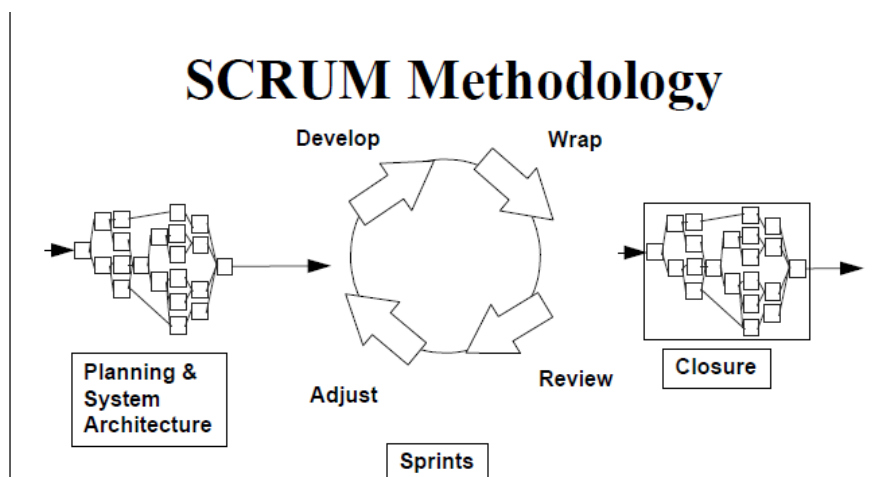


Figure 7 Processes involved in the Scrum methodology<sup>97</sup>.

<sup>94</sup> Ballard/Howell (2003), p. 3.

<sup>95</sup> Schwaber (1997), p. 117.

<sup>96</sup> Möller (2022), p. 73.

<sup>97</sup> Schwaber (1997), p. 126.





### 6.1. Current trends in the IT project landscape

Several trends are currently influencing the IT project landscape. The IT industry is dynamic because of technological advancements. New technologies and changing priorities are influencing the IT project landscape. To begin with, Artificial Intelligence (AI) and automation are technological advancements that have revolutionized how the IT landscape operates. Through AI and automation, companies are automating repetitive tasks. Based on the project management strategy implemented, tasks can be repetitive. Repetitive tasks can be daunting for the project team, requiring additional time and resources for the intended outcomes to be attained. Repetitive tasks are also properly handled by ensuring that their workflows are optimized, enhancing how data is collected and analyzed to provide data-driven insights<sup>98</sup>. The IT project landscape is also characterized by cloud computing. Cloud computing is providing IT companies with scalability, cost efficiency, and flexibility when handling projects. Through cloud computing management tools, companies are properly handling their projects, ensuring that data and findings are properly stored<sup>99</sup>. Appropriate handling of project data and findings allows IT companies to track progress, positively influencing consumers. Another trend in IT project management is cybersecurity<sup>100</sup>. Technological advancements have made IT projects more complex and interconnected. Based on this aspect, data breaches have become a major problem for IT companies. Projects are handled based on in-depth collection and analysis of data. Therefore, IT companies are implementing cybersecurity targets to ensure that they address opportunities for innovation and efficiency without the fear of being breached<sup>101</sup>. Emerging technologies are also influencing the IT industry. Emerging technologies that are influential to the IT industry are blockchain, augmented reality (AR), and quantum computing. These innovations are redefining how projects are being handled in the IT industry. . New possibilities are being developed to enhance how information and feedback are synthesized to offer better outcomes for companies seeking growth and development<sup>102</sup>.

Apart from tech-driven trends, the IT industry is experiencing a shift in the methodological aspect. Agile and traditional methods of managing projects are being influenced by a technological shift in the IT industry. One of the shifts that is happening is the adoption of agile methods of project management rather than

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<sup>98</sup> Guven (2020), p. 72.

<sup>99</sup> Erer/Erer (2020), p. 155.

<sup>100</sup> Cinnioğlu (2020), p. 48.

<sup>101</sup> Erer/Erer (2020), p. 135.

<sup>102</sup> Guven (2020), p. 73.



traditional ones. For example, the waterfall method of project management is being dropped for hybrid methods. The shift is based on attaining flexibility, iteration, and a quicker means of implementing change to attain project targets within the specified timelines. Trends in the methodological aspect of the IT industry are also based on attaining value and ensuring that collaboration and efficient communication are sustained.

The changes being experienced in terms of technology and methodology are based on attaining the specific preferences of consumers. The efficiency of a project management team is based on the appropriate implementation of technology and methodology. On one hand, appropriate implementation of technology and methodology ensures that the wellness and retention of employees are attained. These individuals will execute their roles and responsibilities appropriately, leading to the attainment of high-quality project targets. On the other hand, the implementation of appropriate technology and methodology will ensure that there is a close relationship with consumers, improving how their unique preferences are captured. Through this approach, products with high-quality components and functionalities will be released to the market, allowing IT companies to sustain their business operations. Based on these trends, German IT companies are redefining their approach to project management with the aim of achieving operational efficiency.

The emerging trends are uniquely influencing agile and traditional methods of project management. For agile methods of project management, the emerging trends are influencing how iteration occurs, improving decision-making, enhancing communication, shifting priorities, and improving how complex requirements are addressed. Scrum is one of the agile methods of APM that is influenced by emerging trends in the IT industry. The emerging trends are influencing how projects are handled remotely, increasing focus on the agility of businesses, increasing how continuous integration and delivery are implemented, facilitating how automation is implemented, and guaranteeing decisions are executed based on efficient data insights<sup>103</sup>. For example, efficient communication allows for tacit knowledge to be implemented to influence trial and error during the build process<sup>104</sup>. The following phases of the scrum methodology are heavily influenced by emerging trends in the IT industry.

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<sup>103</sup> Burgmaier (2017), p. 2.

<sup>104</sup> Schwaber (1997), p. 126.

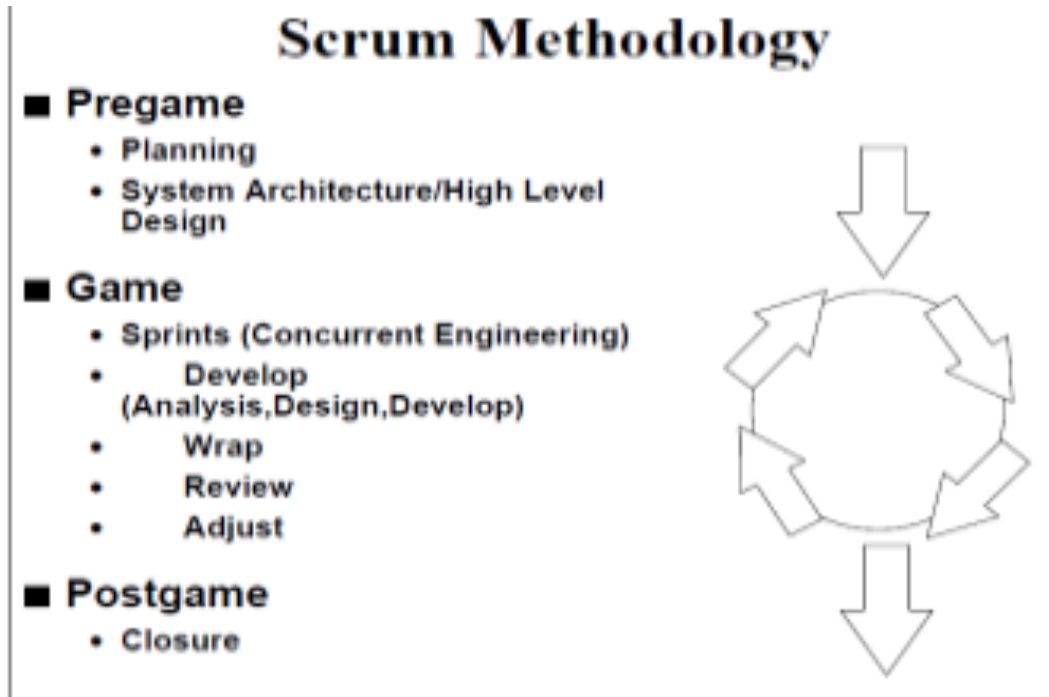


Figure 8 Phases of the scrum methodology influenced by emerging trends in the IT industry landscape<sup>105</sup>.

The image capturing the phases of the scrum methodology represents the essence of properly adopting and implementing the emerging trends in the IT industry landscape to achieve success in project management. One of the successes of APM is the real-time provision of feedback. Actions and decisions are efficiently handled when real-time feedback is provided. Project team members efficiently handle their roles and responsibilities by relying on real-time feedback. Thus, the use of these trends on APM improves effectiveness and efficiency, enhancing the success rate of companies regarding their project management responsibilities. Conversely, the implementation of the trends in TPM also indicates benefits. One of the weaknesses of TPM is its rigid nature. Once a project is initiated, TPM maintains that all phases must be addressed without going back in case of arising issues or errors<sup>106</sup>. These issues or errors are only addressed once the project process has been finalized. Through the emerging trends, TPM is redefined, allowing for stricter planning and risk management. Since the project management process is rigid, upfront planning must be meticulous for risks to be avoided.

<sup>105</sup> Schwaber (1997), p. 128.

<sup>106</sup> Habermann (2013), p. 94.



For the waterfall method of TPM, implementing these emerging trends ensures that companies in the German IT industry break down their projects to facilitate management. Large-scale management of projects is being minimized, allowing these companies to plan properly. Additionally, these companies are achieving success when adapting to change, especially in the planning phase of the project. As planning takes place, additional information regarding the whole project is being devised to ensure that critical aspects are captured to minimize errors or risks. Conversely, Gantt charts are being enhanced through automation. Repetitive tasks are being automated to allow for optimization of workflows and decision-making. These stages are essential for handling specific project milestones to ensure each phase of TPM is efficiently addressed.

The benefits of implementing the emerging trends in agile and traditional methods of project management include reduced reliance on human resources, improved remote work, the infusion of some agile functions in TPM, improved adaptability, better data protection, and focused continuous improvement. For instance, IT companies are striving to broaden their project teams by adopting remote work. The provision of technological devices like computers and laptops improves how team members handle their roles and responsibilities. Having a diverse team facilitates how the preferences of consumers are collected and infused in the initial planning phase. German IT companies are focused on developing products or services that directly address the unique preferences specified by consumers.

Nonetheless, there are drawbacks to the IT trends emerging today in the German industry. The first drawback that IT companies in Germany are experiencing is integration. Companies are struggling with implementing the required technology and human resources to ensure that project processes are properly handled. Implementing the emerging technology requires proper planning, allowing companies to hire team members with the right skills and expertise<sup>107</sup>. For existing employees, IT companies are being required to offer training and development programs. These approaches can be limited based on ethical considerations or potential job displacements due to AI's influence on automation. The second drawback of the emerging IT trends is the confusion associated with planning. Companies are dealing with numerous documents and stakeholders, causing complexities<sup>108</sup>. Thus, APM's iteration characteristic can lead to scope creep. For TPM, focusing on broadening the planning phase can lead to challenges with

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<sup>107</sup> Fiedler (2010), p. 17.

<sup>108</sup> Cf. Reinema et al. (2013), p. 113.



adaptation. Since TPM is rigid, introducing new ideas and perspectives can be challenging during the planning phase.

The third challenge with the emerging IT trends is measuring success. Focusing on milestones and schedules might fail to offer the definitive progress being attained during project management. For TPM, siloed structures are problematic because they inhibit communication. The sharing of vital information and feedback is essential to measuring success. Hierarchical communication leads to limited sharing of information and feedback, making it hard for IT companies to measure success. Finally, focusing on attaining the set deadlines can lead to a lack of value. Team members will specifically focus on executing actions and decisions that directly influence progress rather than focusing on quality. Ultimately, the intended outcomes for products and services are misrepresented, leading to poor attainment of consumer preferences.

## **6.2. Analysis of adaptability to market changes**

The German IT industry market is influenced by several changes. The industry is experiencing exponential growth based on these changes. The changes being experienced include a booming sector, a shifting focus on software, demand for redefined talent and skills, a need for improved stakeholder engagement, and a push for digitization by various departments and the government. These elements have ensured that Germany's IT sector aligns its targets with the changes in the market. For instance, IT companies in Germany are adhering to changes associated with strong brand performance. High-quality brand performance is being attained through agility<sup>109</sup>. Clients are focused on working with IT companies that offer agility in their project management processes.

The market changes have led to IT companies in Germany focusing on value, business sustainability, and enhanced stakeholder engagement. Recently, the emergence of the COVID-19 pandemic redefined how projects are handled. The major focus for companies was to implement remote work with the view of protecting team members from the virus. Furthermore, these companies focused on sustaining their operations despite the regulations developed by the federal and state governments. The adoption of remote work is one of the adaptabilities that companies are implementing today to address arising issues. Through remote work, German IT companies are succeeding in providing products and services that directly align with the unique preferences of consumers.

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<sup>109</sup> Burgmaier (2017), p. 5.



German IT companies are also focusing on APM to handle their projects. The rigid TPM methodologies like the waterfall method and Gantt charts are being dropped in favor of flexible strategies such as Scrum and Kanban. Shifting from TPM to APM has allowed IT companies to drop their hierarchical approach to communication, adopting a more collaborative approach to sharing vital information and feedback<sup>110</sup>. Appropriate decision-making and conflict management are attained through a collaborative approach to sharing of vital information and feedback. Collaboration is also crucial because it allows these companies to equally distribute responsibility, ensuring that high motivation is sustained. Since the economy is always changing, companies are seeking to implement APM to ensure that their production processes and operations are effective and efficient<sup>111</sup>.

Managing talent is another adaptability strategy that is being used by German IT companies to navigate the market changes being experienced. Companies are focusing on soft skills to improve how their projects are managed. Project managers and team members are required to possess soft skills like strong communication, conflict resolution, collaboration, and decision-making skills to improve how projects are managed. These soft skills improve how vital ideas, perceptions, information, and feedback are shared. In addition, these soft skills are being utilized to enhance how project teams initiate, develop, and sustain strong relations with stakeholders. Based on the need for refined and streamlined soft skills, German IT companies have developed professional development programs that help with attaining them. These programs are used to train and develop employees, supporting them as they focus on attaining soft skills.

German IT companies are also adapting to market changes through standardization and certifications. For example, these companies are using PRINCE2 and the Project Management Body of Knowledge (PMBOK) to achieve consistency and high quality. PMBOK was developed by the Project Management Institute (PMI) and is a theoretical approach used to transform production. PMBOK is compatible with both APM and TPM. Initially, the focus was to utilize PMBOK on an as-is basis, ensuring that the initiation and closure phases were properly managed<sup>112</sup>. However, the focus is shifted to other phases of project management, with APM strategies being considered over TPM's. Overall, PMBOK is used to provide the best practices that German IT companies can rely on to improve how

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<sup>110</sup> Fernandez/Fernandez (2008-2009), p. 10.

<sup>111</sup> Fernandez/Fernandez (2008-2009), p. 10.

<sup>112</sup> Fernandez/Fernandez (2008-2009), p. 13.



they manage their projects. PMBOK operates by providing a common language, offering a process-based approach, encouraging customization, and supporting professional development.

Gamification is another marketing strategy that is being used by these companies. As a marketing trend, gamification is allowing these companies to implement applications with gaming items in non-game situations to make processes, operations, products, and services enjoyable<sup>113</sup>. Making these aspects enjoyable allows these companies to strengthen ties with customers, leading to better marketing outcomes. Gamification is viable because it can be incorporated into various technologies. Gamification applications are compatible with devices like smartphones, laptops, computers, and iPads. Thus, consumers can easily enjoy the marketing content shared through gamification.

Nonetheless, it is also crucial for these companies to note that adhering to market changes also poses a challenge. The first challenge is cultural resistance. Companies implementing TPM experience cultural resistance at a higher rate because of its hierarchical structure. Hierarchical structures are rigid and always resist change. Resistance to change is problematic because it inhibits how new project management practices are implemented. The second challenge that German IT companies must be wary of is unalignment of new ideas, tools, processes, and changes with the existing organizational structures. Organizations have developed structures that are mostly rigid. This component is inhibiting how these companies implement factors required in appropriate management or projects.

Finally, German IT companies must be aware of the security issues associated with implementing strategies to adapt to market changes. APM and TPM are essential project management approaches that are effective when data security is sustained. Failing to secure data can lead to other severe outcomes for companies, especially through lawsuits. Today, companies are struggling to secure their data due to constant breaches from unauthorized personnel. The successful infiltration by unauthorized personnel is based on ongoing technological advancements. Therefore, it is the prerogative of German IT companies to implement appropriate security measures to ensure that their data is secured, protecting against unauthorized access.

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<sup>113</sup> Guven (2020), p. 86.



## 7. Empirical survey

The study utilized a comprehensive methodology to probe the contrasting impact of agile and traditional project management methodologies within the IT industry in German. Utilizing the triangulation design made it possible for the study to capture the multifaceted aspects of project management methodologies and their implications to stakeholders, innovation, efficiency and customer satisfaction. The design put together literature reviews and quantitative methods to attain a comprehensive analysis. This design allowed for a deeper understanding of the nuanced differences between Agile and traditional methodologies within the German IT industry<sup>114</sup>.

Literature reviews are attained by making systematic reviews, evaluations, and synthesizing existing research studies and articles of different IT organizations in Germany. These reviews are aimed at uncovering perceptions, subjective experiences and quantitative data regarding the acquisition, benefits, and challenges of every methodology. In addition, evaluations of selected IT articles focused on agile and traditional approaches, offering contextualized insights.<sup>115</sup> The aim of literature reviews is to offer a comparative overview of the existing literature, offer insights, and identify gaps in knowledge within the current state of research on a certain topic. Quantitative data collection on the other hand involves distributing surveys to a diverse sample of IT professionals including stakeholders, team members, and project managers. The surveys are meant to quantify experiences and perceptions linked to project success rates, adaptability to change and team dynamics, among other variables. Validated assessment tools are used to ensure the validity and reliability of the data collected.

Quantitative data and literature reviews are then analyzed thematically to determine the recurring patterns and emerging themes. Quantitative data collected from questionnaires is subjected to statistical analysis, including regression, correlation, and comparative analysis to outline the significant differences and links between agile and traditional methodologies on different business implications. In addition, the research made use of meta-analysis in order to conduct a methodical evaluation of the business implications that have been found to be associated with agile and traditional project management methods<sup>116</sup>. As part of this research, a comparison and contrast of the results and experiences that were reported by organizations who utilized each technique was made. This enables us to gain a

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<sup>114</sup> Turner et al. (2017), p. 243 f

<sup>115</sup> Wang (2009), p. 1.

<sup>116</sup> Stanley/Jarrell (2005), p 299 f





more nuanced knowledge of the strengths and shortcomings that are associated with each methodology. In addition to the immediate results of the project, the comparison took into account other aspects, such as cost-effectiveness, adaptability, and the level of pleasure experienced by stakeholders. The findings were strengthened in terms of their overall reliability and validity as a result of this triangulation of data from systematic reviews, evaluations, and existing research case studies. This contributes to a more robust understanding of the nuanced business implications associated with the adoption of agile and traditional project management methods in the German IT sector<sup>117</sup>.

The triangulation approach offered a comprehensive understanding of the unique business implications of agile and traditional methodologies within the IT industry in Germany. By using both quantitative rigor and richness of literature reviews, the study aimed at providing important insights and practical guidance to firms navigating project management decisions in the dynamic sector.

### **7.1. Survey methodology**

The study focused on German IT companies that are using agile and traditional methods to manage their projects. The survey was shared with participants from various companies within the IT industry. Informed consent was sourced from the participants through email. The participants were accorded adequate information regarding the purpose, procedures, benefits, and risks of participating in the study. Out of a possible 800 participants, 448 showed interest in the study. Subsequently, the survey was shared with these individuals online, allowing them to provide their feedback on several aspects regarding the use of APM and TPM during project management. As indicated in the literature review section of the study, various aspects regarding the use of APM and TPM were captured in the survey. Issues like suitability, experience, efficiency and project timeframes, innovation and adaptability, stakeholder collaboration and satisfaction, and comparison and preferences were captured in the surveys.

The questions that were developed were of various types. Open-ended, Likert scale, and multiple-choice questions were developed for the survey. A variety of question types were critical in ensuring that both qualitative and quantitative data were collected to analyze the topic under investigation. The efficiency of these questions was tested through a pilot. A group of IT experts were allowed to answer the questions, and a mock analysis conducted. The mock analysis allowed for qualitative and quantitative data to be analyzed, providing an in-depth

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<sup>117</sup> Katarína/Šimíčková (2019)



understanding of the implementation of APM and TPM among IT companies in Germany. The success rate of the mock analysis allowed for the survey to be implemented in the data collection process. The validity and reliability of the survey were guaranteed by aligning questions with the research questions and objectives developed. Similarly, the questions developed were targeted at a specific audience, project managers, and team members. Aligning the questions with a specific audience ensures the responses generated are appropriate for the study's topic. As a result, the findings of the study can be easily generalized for other companies in the German IT industry.

Validity and reliability were also guaranteed through well-written and unbiased questions. Ambiguity, jargon, and leading questions were avoided in the survey to ensure that the audience properly developed its responses. Moreover, the validity and reliability of the responses were based on a logical flow. The questions were easy to follow, allowing the participants to chronologically offer their feedback. Generally, the combination of data collection and analysis ensured that the feedback developed from the participants was reliable and valid. Using the data collected to generate findings means that the study is of high-quality and can be used to understand the ideas, perspectives, and decisions that guide how IT companies in Germany select between APM and TPM.

The participants in the study were diverse based on age, gender, position, and experience. These differences facilitated how the survey captured various aspects that influence how they select an appropriate project management approach. Furthermore, relying on diversity allowed the study to validate the findings of studies conducted by other scholars regarding the implementation of an appropriate project management approach. Since the surveys were distributed online, appinio.com was used<sup>118</sup>. Appinio is a leading market research firm in Germany. Through Appinio, the participants were able to offer their feedback regarding the questions asked. The survey platform was also selected because it allowed for the generated feedback to be analyzed. Since the study utilized comprehensive analysis, a better understanding of the data collected was developed. For efficiency, the survey was developed in an HTML format and made available on the Appinio website. A specific link was shared with the participants who showed interest in the study. To avoid ambiguity and problems with collecting data from participants, specific companies were selected. These companies were selected because of their success rates in handling projects in the past. Since

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<sup>118</sup> Appinio (2024), p. 1.



contacting individual project managers proved problematic, a specific message was sent to the Human Resources (HR) departments of these organizations. Through these departments, a special invitation was shared with project managers, who facilitated how the participants were contacted and selected.

The responses generated through the surveys were monitored through page views, the number of those who had accessed them, and the number of those who had completed them. The efficiency of Appinio allowed for duplications to occur, minimizing errors and stuffing<sup>119</sup>. Once a survey had been completed and delivered, the slot was blocked, and the access link expired. The participant was also not allowed to access another link. Adhering to this meticulous approach to managing the surveys meant that the data collected was factual, reliable, and valid, enhancing how comprehensive analysis took place.

The qualitative elements of the surveys were compiled in a single file, and common themes were taken from them. Through these common themes, a discussion on the use of APM and TPM was initiated, understanding the selection of German IT companies regarding their project management approaches. Compiling the qualitative responses facilitated how the common themes were developed. For example, the compilation of these responses allowed for a common theme like efficiency with implementing APM and TPM based on experience. Companies that had team members with vast experience in project management had better outcomes when implementing APM and TPM. These companies succeeded in utilizing these project management strategies to address their projects and develop products and services that directly aligned with the unique preferences of customers. Overall, the approach used in the survey methodology allowed for the intended data to be collected.

There was a need to prevent influencing data collection from the targeted participants. Therefore, the need to provide incentives to participate in the study was avoided. Providing an incentive would have influenced how the participants worded their responses. Similarly, some of the participants who had decided to avoid the study would have rescinded their initial decision. Their responses would have greatly affected the quality of the study. In addition, their responses would have greatly affected the reliability and validity of the overall feedback generated.

## **7.2. Data collection**

The data for the study was collected through a survey questionnaire. The survey questionnaire had several types of questions aimed at generating adequate

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<sup>119</sup> Appinio (2024), p. 1.



responses from the targeted participants. The sampling method that was used for the study was simple random sampling. As a random sampling technique, various individuals from the IT industry in Germany were targeted for inclusion in a study. A simple random sampling method was selected for a number of reasons. To begin with, selecting this sampling method was because of its ease of access for participants. The participants were easily accessible based on their proximity to the researcher. Thus, data collection was fast and easy. In addition, selecting simple random sampling was based on cost. Since the participants were from German IT companies, time and resources were saved regarding sampling. For example, delivering the survey was easier because the participants were readily identifiable and easily accessible.

Moreover, selecting this sampling technique was based on its ease of generalizability. The focus of the study is to ensure that the findings generated are generalized for the German IT industry. Generalizability will help discuss how companies in this industry are selecting and implementing either APM or TPM to manage their projects. Furthermore, generalizability will help discuss the efforts being implemented by companies to prepare their project team members based on the strategy selected. Furthermore, the reason for selecting this sampling technique was fairness and unbiasedness. Randomly selecting participants meant that team members from various IT companies in the German industry would have the chance of responding to the shared survey. Based on this approach, the chances of bias creeping into the study were minimized.

Further, the reason for utilizing this sampling method was the simplicity of its implementation. The technique did not require complex procedures or stratifications for implementation to be attained. Based on this characteristic, the technique allowed for a faster and less costly implementation. Finally, the sampling technique was implemented because it guaranteed versatility. The targeted participants had diverse characteristics. Therefore, their responses were influenced by these characteristics, requiring meticulousness to understand their input regarding the research topic. Using this sampling technique ensures participants are selected irrespective of their age, gender, and level of experience. As indicated in this section, the data collection technique utilized was the survey. This data collection technique was selected because it offered the researcher various benefits. To begin with, the data collection approach was selected because it facilitated how qualitative and quantitative data were collected. The multiple choice, Likert scale, and open-ended question types resulted in qualitative and



quantitative data. The response rate from the participants was 100%. The participants who responded to the invitation to participate were eager to share their views on the implementation of APM of TPM in project management. They believed that sharing their perspectives would help redefine how their organizations approach project management in the future. The participants also followed the guidelines on responding to the survey questions, ensuring that errors are prevented. Therefore, no survey was trashed because of poor responses.

Data quality and consistency was ensured through various approaches. The researcher began by identifying and defining data needs. The information collected from the participants was aimed at discussing various issues associated with implementing APM and TPM during project management. Thus, unnecessary data collection was avoided. Data collection was also standardized, ensuring that appropriate guidelines are implemented to develop intended themes and patterns. Training was offered to participants to ensure that they understood the need for recording appropriate feedback based on the questions asked. During data collection, progress was monitored to ascertain completeness, accuracy, and consistency. Arising inconsistencies or anomalies were promptly addressed. Addressing these inconsistencies and anomalies ensured that the data was cleaned and verified. Overall, appropriate technology was implemented to help with collection, tracking, and verifying data.

Finally, ethical considerations were implemented during the data collection process. Informed consent was obtained from the participants before the data collection process commenced. Sourcing for informed consent ensured that the participants joined the study at their own accord. Similarly, informed consent meant that the study adhered to the regulations and guidelines for conducting such research. Relying on these regulations and guidelines meant that the data developed was valid and reliable. Another ethical consideration that was utilized in the study was confidentiality. The participants were assured of their confidentiality. Their responses and identities were protected, minimizing opportunities for unauthorized access or disclosure. Based on these ethical considerations, the research progressed as intended, ensuring data is collected and used to discuss various themes and patterns.

### **7.3. Analysis and interpretation of survey results**

A comprehensive approach was used to analyze the data from participants. Through a comprehensive approach, qualitative and quantitative data were analyzed. The analysis methods that were used were literature reviews and

quantitative methods. Literature reviews were crucial in generating the qualitative themes and patterns required in analyzing the implementation of APM and TPM in project management. Conversely, qualitative methods were used to generate statistical figures to represent issues associated with the implementation of APM or TPM in project management endeavors. Several themes arose from the analyses conducted. Overall, the participants' characteristics were diverse. They were of diverse genders, had different ages, and had vast experience regarding the utilization of APM and TPM in project management. The following graphs indicate the diversity of the participants:

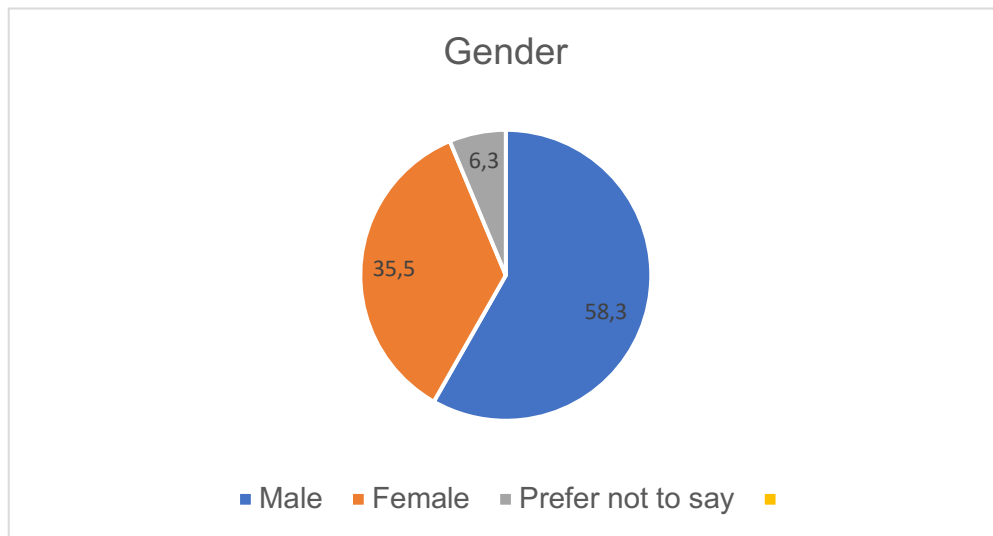


Figure 9 Gender of participants who joined the study.

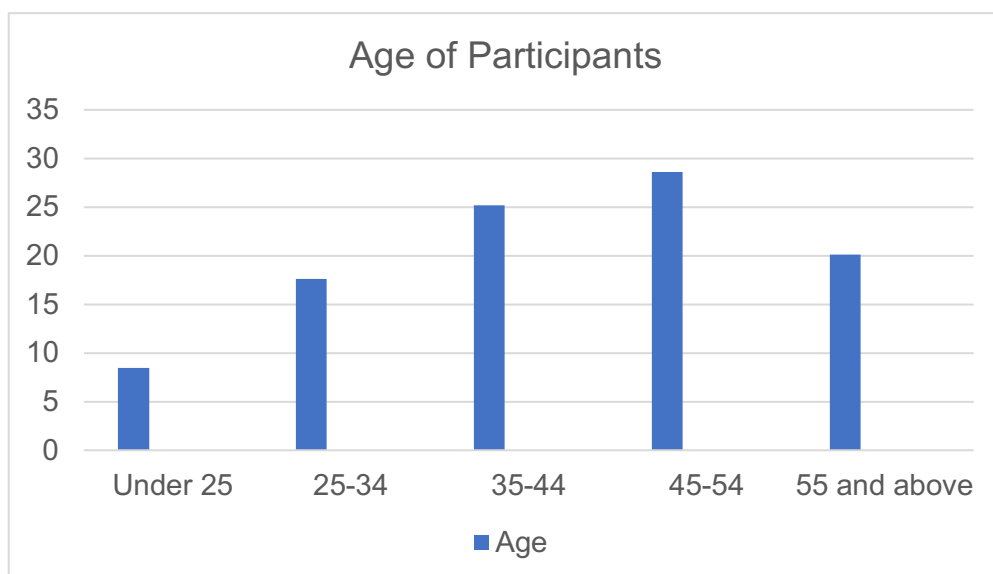
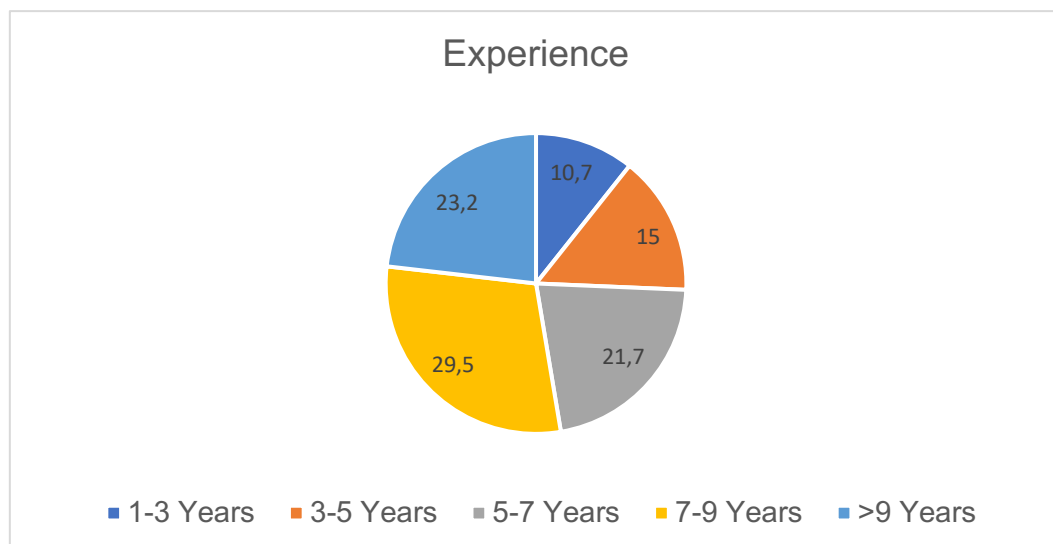


Figure 10 Age of participants who joined the study.

An observation that was made during the collection of data was that participants who were older than 34 years had a vast experience regarding the implementation of APM and TPM in the project. According to these participants, understanding the workings of APM and TPM required appropriate planning, training of employees, and provision of resources to achieve success. Similarly, participants of advanced age provided in-depth responses to the questions asked, exhibiting their vast knowledge about the operations of APM and TPM. Thus, the employees with vast knowledge in the field of project management had a better understanding of the implementation of an appropriate strategy to address the intended targets. The following graph represents the experience of the participants, with higher rates capturing older employees who have been in the field of project management longer:



*Figure 11 Representation of experience of team members who have handled projects based on their professional careers. Older team members have better experience at project management.*

Furthermore, a majority of the participants indicated that they had used APM or TPM in project management in their careers. The responses indicated that the use of these project management strategies was based on the provisions of their organizations. Organizations implement project management strategies based on their structures. According to the respondents, the alignment of the project strategies with organizational structures ensured that tasks and responsibilities were properly handled. The following graph indicates the experience of the participants when using APM or TPM when handling projects:

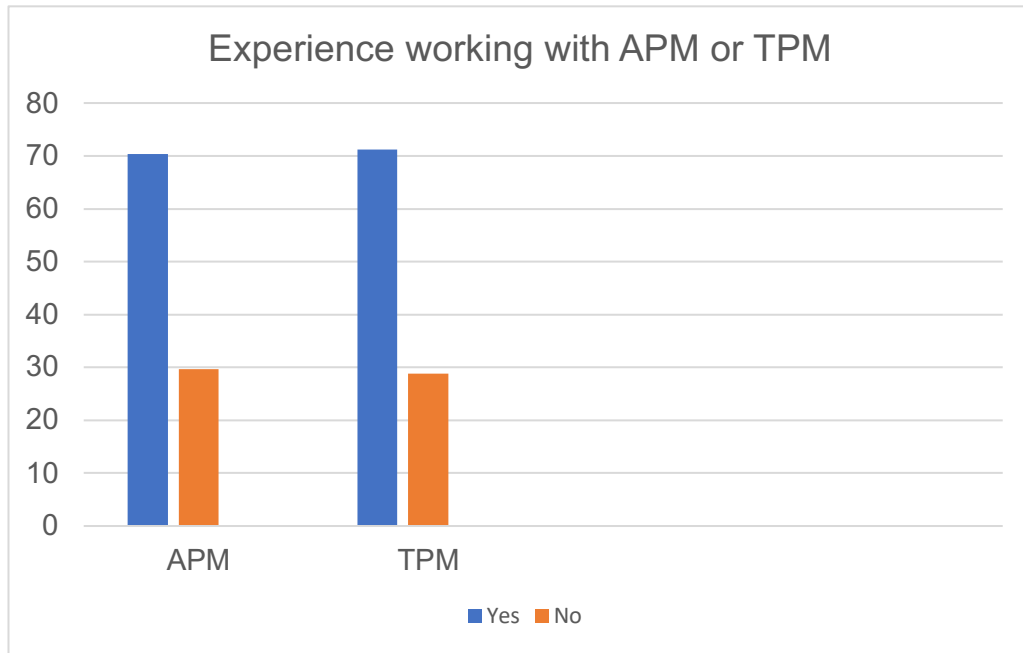


Figure 12 Experience of respondents regarding the utilization of APM or TPM during project management.

The major areas of concern for the researcher were (a) the efficiency of the project management approaches to meeting project timeframes; (b) innovation and adaptability; (c) stakeholder collaboration and satisfaction; and (d) comparison and preferences. A quantitative analysis of the data represented the following visual representations:

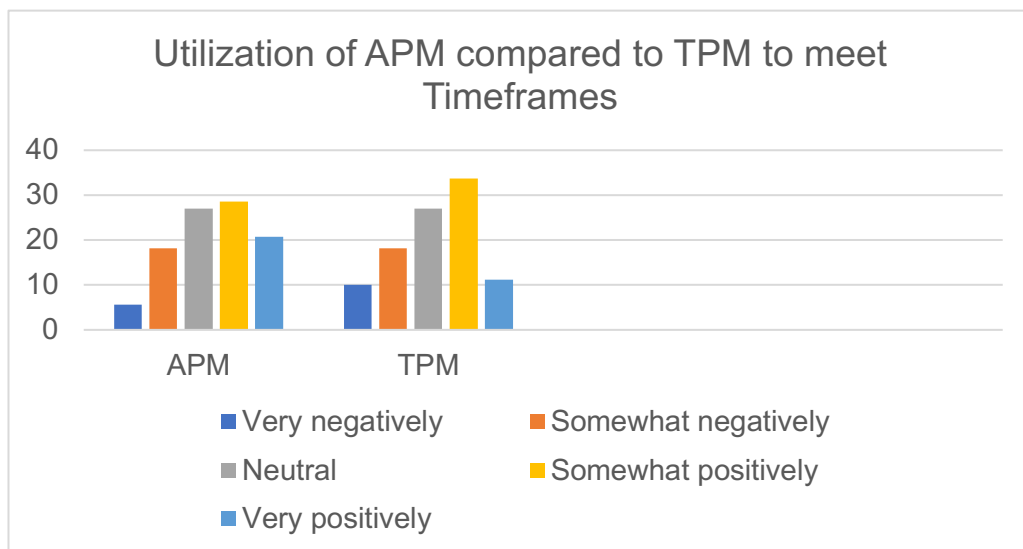
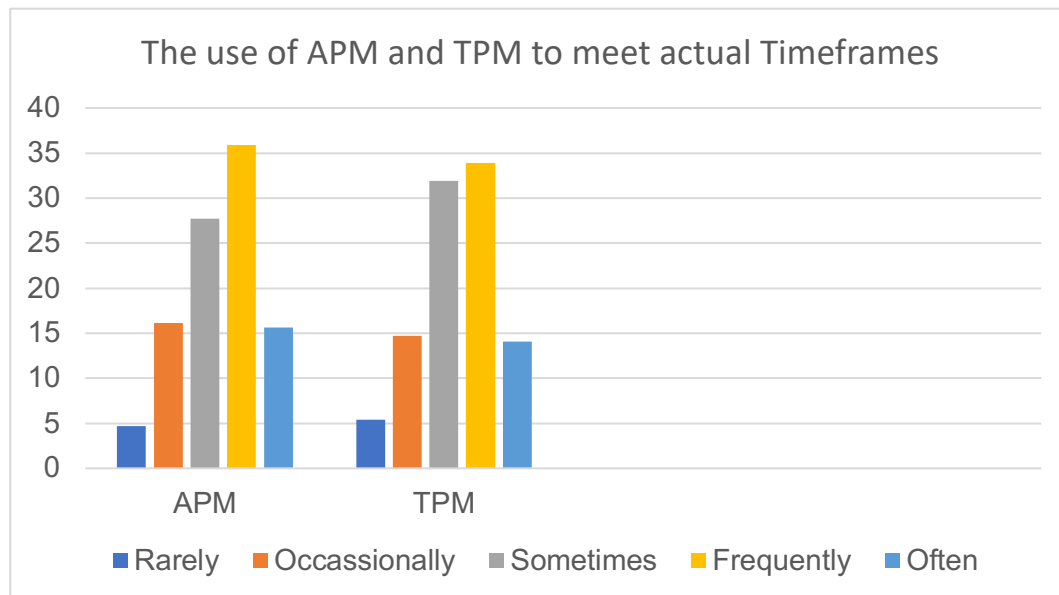


Figure 13 Utilization of APM compared to TPM to meet project timeframes.





*Figure 14 A graph showing the actual attainment of timeframes. A comparison between APM and TPM.*

From the analysis conducted regarding the efficiency of APM and TPM in handling projects, it was evident that the participants had different perspectives on the efficiency of the approaches. However, the participants believed that the utilization of APM in handling projects frequently led to the attainment of timeframes. One aspect that was clear during the analysis of the data was that the participants favored the use of APM to achieve the intended timeframes when using APM. According to these participants, the inclusion of revisions allowed for the set timeframes to be attained faster. Based on their experiences of utilizing APM and TPM, the participants had the following recommendations:

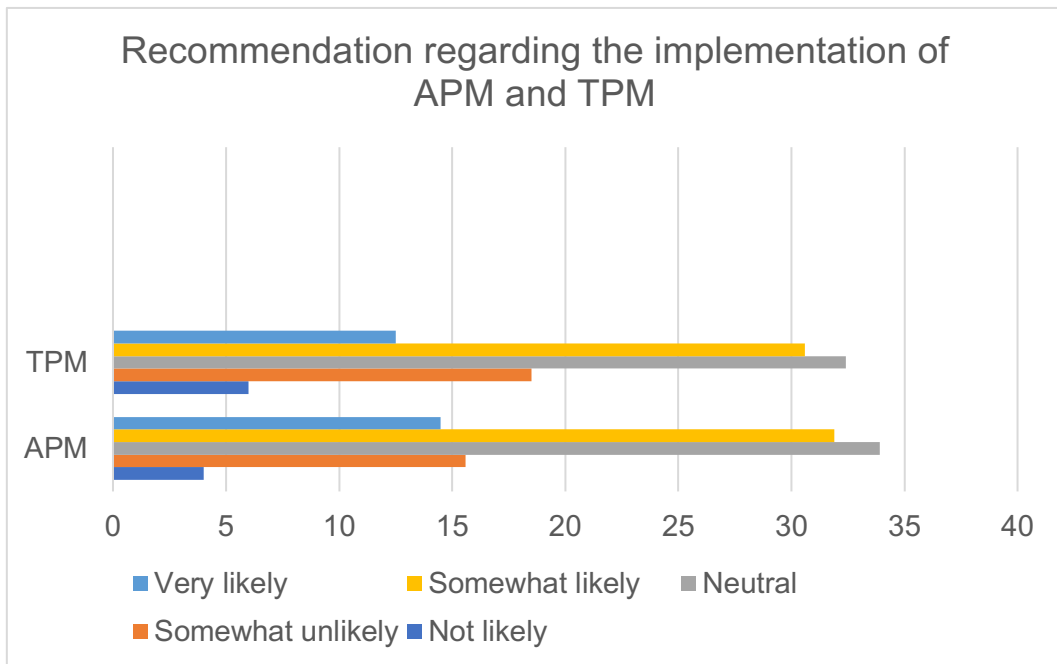


Figure 15 Recommendation regarding the implementation of APM and TPM.

In general, the findings of the study indicate that the participants have a liking for APM compared to TPM. In the preference section, the participants indicated that they would consider utilizing APM rather than TPM. However, a combination of both approaches to project management was overwhelmingly recommended. The following charts indicates the perspectives of the participants regarding the two approaches to project management:

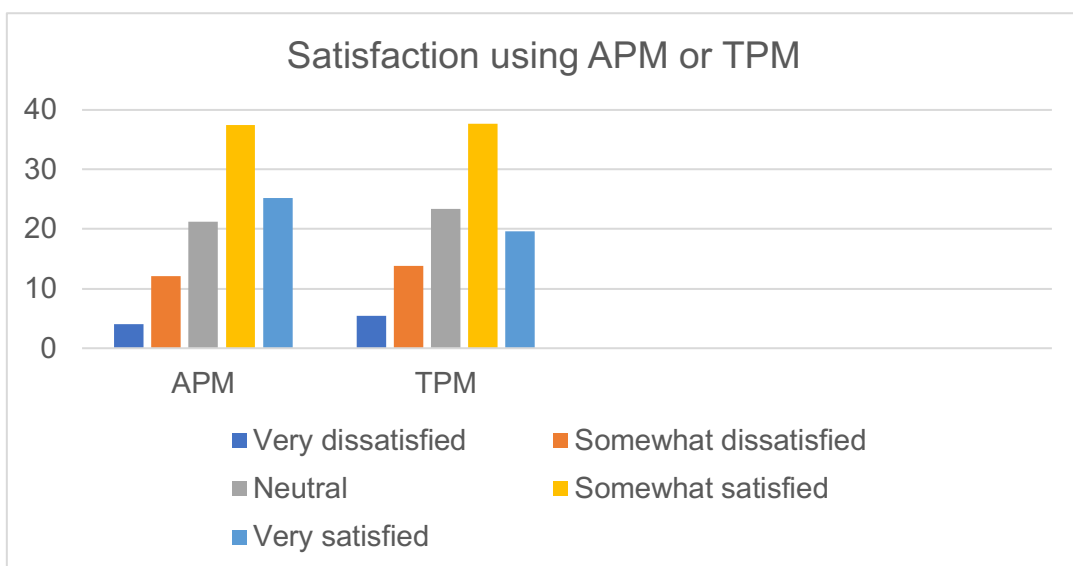
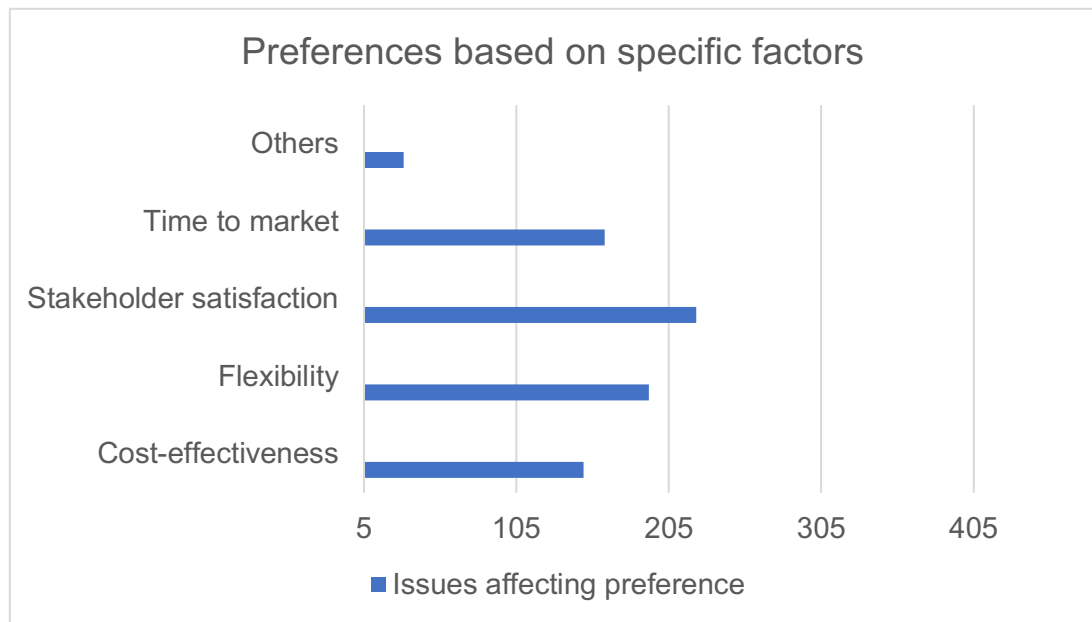


Figure 16 Satisfaction levels when using APM or TPM.



*Figure 17: Issues influencing preferences of team members regarding APM and TPM.*



## 8. Discussion

This section discusses the findings of the study. The study focused on investigating the business implications of agile versus traditional methods of project management among German IT companies. A comprehensive approach was used to collect and analyze data regarding the implementation of these project management strategies in organizations. This comprehensive approach allowed for various themes and patterns to be developed.

### 8.1. Comparing the effects of agile and traditional methods

Agile and traditional methods of project management have different effects on organizations. From the data collected and analyzed from the participants, there were various perspectives and opinions that were observed. The participants indicated a liking for APM compared to TPM. This outcome is supported by the input of experts. The preference for APM over TPM is flexibility. Organizations implementing TPM have been marred by a hierarchical approach to project management<sup>120</sup>. Through the implementation of APM, companies are focused on fostering collaboration among team members. Collaboration is aimed at improving adjustments to changing challenges and opportunities, leading to better adaptation<sup>121</sup>. Generally, the implementation of APM over TPM is based on flexibility, allowing team members to execute actions and decisions aimed at facilitating how the set project management targets are attained.

However, it is also essential to note that there are participants who consider the use of TPM to manage projects. The preference for TPM was based on its rigidity, allowing team members to conduct meticulous planning before initiating projects. Through appropriate planning, organizations are able to develop projects that are guided by well-defined deliverables<sup>122</sup>. Nonetheless, the use of TPM is marred by inconsistencies<sup>123</sup>. The project management method is rigid, making it inappropriate for efficiently handling projects because it inhibits the implementation of changes or arising issues<sup>124</sup>. Thus, the implementation of APM or TPM is based on the targets set by organizations. Additionally, the implementation of either of these project management strategies is aligned with organizational structures. Companies in the German IT industry are required to implement an appropriate project management strategy aligned with their organizational structures.

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<sup>120</sup> Hernandez/Hernandez (2008-2009), p. 10.

<sup>121</sup> Möller (2022), p. 73.

<sup>122</sup> Burgmaier (2017), p. 3.

<sup>123</sup> Habermann (2013), p. 94.

<sup>124</sup> Lenfle (2008), p. 15.



## **8.2. Strategic implications for companies**

German IT companies that are seeking to implement APM or TPM must be well prepared. Adequate preparation is based on addressing the unique needs of team members and the preferences of stakeholders. The strategic implications that German IT companies must be aware of are faster time to impact markets, enhanced adaptability, enhanced adaptation to innovation, and better stakeholder engagement. For example, companies implementing APM will experience better adaptation to changing or emerging trends<sup>125</sup>. Conversely, companies implementing TPM will have a faster reach to markets. Since this project management approach is rigid, phases will be handled within the developed timelines. Thus, the intended outcomes will be attained within the set timeframes<sup>126</sup>.

Despite these benefits, APM and TPM have drawbacks regarding their implications. These drawbacks are associated with scope creep, the need for an in-depth upfront investment, and difficulties associated with handling larger projects. Therefore, it is essential for German IT companies to understand the specific targets developed for each project. For instance, failing to conduct in-depth planning can lead to failure. This shortcoming is mostly associated with APM because it allows for flexibility. Failing to plan accordingly can lead to increased costs and a need for a stretched timeframe. The prerogative for understanding the drawbacks of implementing these project management approaches lies with the companies.

## **8.3. Limitations of the methods and the study**

Companies implementing APM must be aware of its limitations. The limitations of this method are limited upfront planning, ease of scope creep, documentation gaps, inability to scale up, and the need for constant adaptation efforts. Conversely, the limitations of TPM include rigidity, slower time to influence the market, demotivation due to stifled creativity and innovation, overreliance on planning, and limited involvement of stakeholders. These limits make it hard for project managers to properly influence how projects are handled within their settings. Nonetheless, it is the prerogative of German IT companies to understand the limitations of these project management approaches before implementing them.

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<sup>125</sup> Burgmaier (2017), p. 2.

<sup>126</sup> Habermann (2013), p. 94.



The study also had its limitations. To begin with, the study faced a problem with its sample size. The German IT industry is expansive and relying on a sample size of 448 poses a problem pertaining to generalization. In addition, the study experienced limitations regarding data collection. Surveys can be marred by bias from respondents, limiting validity and reliability. Furthermore, the study experienced a limitation based on time and resources. Conducting such a study requires adequate time and resources to ensure that the intended perspectives are generated. Nonetheless, the researcher implemented in-depth prior planning to ensure that the intended outcomes are attained.



## 9. Conclusion

In this section, a summary of the findings of the study is conducted. Additionally, implications for practice and outlook and future research fields are discussed. The analysis of the findings from the respondents provided various themes regarding the utilization of APM and TPM in project management. The implementation of these strategies relied on the preparedness of organizations, including resources, manpower, leadership, and technology. Focusing on these areas provides clear perspectives on the decisions made by organizations regarding the implementation of APM and TPM.

### 9.1. Summary of Findings

The findings have affirmed the themes developed from the data collected from the participants. To begin with, the findings indicate that the implementation of APM and TPM are based on experience. According to the respondents, the use of APM or TPM are based on years of experience. Through experience, the respondents indicated that projects are properly managed by team members who have an experience between 7 and 9 years of experience. Understanding the use of APM and TPM is based on the complexities of uncertainties of project situations<sup>127</sup>. Thus, the respondents indicated that their experiences allowed them to properly handle their projects. From the respondents, APM and TPM are greatly implemented in their organizations. The findings showed that at least 70% of the participants had an experience with APM and TPM in project management. Overall, the findings showcased that the use of these project approaches are based on the understanding team members have regarding their components and characteristics.

In addition, the findings indicate that APM and TPM efficiently handle project timeframes. Meeting timeframes is crucial because it allows companies to influence markets as initially envisioned. Burgmaier indicated that the use of traditional methods of project management is common within organizations<sup>128</sup>. From the findings of the study, TPM project approaches are considered to lead to better market influence compared to APM. Specifically, 33.7% of respondents believed that the use of TPM positively impacted project timelines, leading to better attainment of time-to-market requirements in the German IT industry. This is higher than 28.6% rate generated from respondents regarding APM's use. The successful implementation of APM and TPM also showed a varied response. Generally, APM

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<sup>127</sup> Fernandez/Fernandez (2008-2009), p. 10.

<sup>128</sup> Burgmaier (2017), p. 2.



was frequently implemented in project management compared to TPM. However, participants noted that they implemented TPM more often than APM.

Moreover, the findings captured the influence of APM and TPM on innovation and adaptability. For APM, the respondents noted that its flexibility allowed for innovation and adaptability. This aspect is captured by other experts like Moller who noted that APM allows for the project manager to implement changes to support innovation and enhance adaptability<sup>129</sup>. Conversely, the use of TPM was viewed to support innovation and adaptability by ensuring that planning is properly handled. The linear strategy of TPM requires project managers and team members to understand their specific roles and responsibilities to properly define scope, objectives, routine, and goals<sup>130</sup>. TPM's linear strategy was identified as an appropriate strategy for positively influencing predictability and rigidity within projects. Nonetheless, the flexibility of APM superseded TPM's linear strategy. Flexibility allowed German companies to adapt to changing needs of projects, leading to the intended outcomes.

Stakeholder collaboration and satisfaction were other themes that were present from the findings of the study. APM and TPM influence how project managers, team members, clients, and other stakeholders collaborate to properly address the requirements of projects. These project management strategies supported collaboration and satisfaction through effective communication. Nonetheless, the respondents indicated that TPM influenced communication more positively compared to APM. Due to its rigidity, it is essential to note that upfront communication is supported to ensure that proper planning takes place. In general, the respondents were satisfied with the use of APM and TPM to advance stakeholder collaboration and satisfaction during project management.

The successes of APM and TPM influenced the perspectives of the participants, calling for their integration. A hybrid approach was considered by the respondents because of the provisions they offer to project managers and team members<sup>131</sup>. Using a hybrid approach will lead to cost-effectiveness, better flexibility, stakeholder satisfaction, and a shorter time-to-market. Therefore, participants recommended the use of these project management strategies to handle their projects, focusing on attaining higher targets to sustain high-quality products and services. The current success of the German IT industry is based on the focus of companies regarding APM and TPM.

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<sup>129</sup> Möller (2022), p. 73.

<sup>130</sup> Fernandez/Fernandez (2008-2009), p. 11.

<sup>131</sup> Burgmaier (2017), p. 2.





## 9.2. Implications for practice

The study is important for the German IT industry based on various factors. Through this study, companies in the German IT industry will make the right decision regarding the selection of project management methodologies. Selecting the right methodology will involve understanding the characteristics of the project. For example, companies will succeed in understanding the size, complexity, and challenges associated with their projects. Thus, project managers will understand the importance of choosing the right methodology to guide project management processes. The selection of the right methodology will also be based on cultural factors. Companies must understand the cultural preferences of team members, consumers, investors, and other stakeholders to influence how each methodology is implemented. Understanding cultural concepts ensures that processes, such as planning and structuring, are well understood. The adoption and implementation of resources are also understood. Team members must be well-equipped to handle their unique roles and responsibilities properly. Overall, understanding cultural factors will also allow German IT companies to understand the alignment of their methodologies with their organizational structures. This understanding will ensure that proper planning is implemented to achieve intended outcomes.

Similarly, the study has provided information on the implementation and training of team members. Implementation and training will facilitate how the methodologies are tailored to align with the evolving needs of German IT companies. Smoother handling of projects relies on understanding the specific needs of IT industry stakeholders. Conversely, appropriate implementation of the methodologies relies on the training support of project team members. Training ensures that the unique needs of practitioners are addressed, leading to the development of appropriate skills and expertise. Through these methodologies, German IT companies develop training programs and support mechanisms to facilitate how projects are handled in the long-term.

Moreover, the study has identified several metrics for measuring success during project management. The implementation of the metrics is aligned with the characteristics of each methodology. Creating a distinction between the methodologies will allow IT companies in Germany to understand the importance of appropriate implementation. Tracking the progress of projects ensures that emerging issues and challenges are promptly identified and addressed. The failures companies are experiencing in project management arise from poor



tracking and measurement of progress. Furthermore, the study has identified the need for collaboration and communication to improve the sharing of vital information between stakeholders. The successful handling of projects through APM and TPM is based on bridging the knowledge gap through efficient collaboration and communication. Effective collaboration and communication also support continuous improvement. Knowledge sharing facilitates how monitoring and evaluation take place. Generally, studying the impacts of APM and TPM on project management has provided vital information that can be implemented by German IT companies to achieve success in their project management endeavors.

### **9.3. Outlook and future research fields**

The field of PM, especially within the context of the German IT sector, keeps evolving. As firms are determined to remain competitive and adapt to the changing landscape of technology, the findings of the study and insights can serve as a basis for future research and explorations. German IT industry is dynamic, and its landscape is influenced by continuous improvements regarding agile and traditional approaches to project management. Focusing on these methods for project management has offered valuable insights regarding the implementations made by German IT companies. Similarly, focusing on these methods of project management has provided valuable insights for companies regarding implementation, especially considering the constant evolution of the German IT industry. Based on the information developed, companies in the German IT industry will understand the continued growth of APM, recent acceptance of hybrid approaches in project management, and influence of cultural factors in the implementation of APM or TPM.

The findings of the study have also identified areas for future research. To begin with, scholars can focus on investigating how the implementation of APM or TPM align with emerging technologies to properly address projects and influence emerging market trends. The recent technological advancements are crucial in project management because they influence the operational efficiency of project managers and their teams. Another area of focus for experts is appropriate management of talent and implementation of leadership approaches to successfully utilize APM or TPM in project management. Here, experts will focus on the specific skills and expertise required by project team talent and leaders to successfully implement each methodology. Similarly, experts will focus on the influence of talent and leadership styles in attaining and managing transitions.



Furthermore, experts can focus on emerging AI and how it influences automation. Specifically, experts will focus on the use of AI to influence automation and how APM or TPM can be aligned with it. In this case, experts will determine how the implementation of AI influences the use of metrics to measure success, attaining sustainability for each methodology, and ethical considerations when utilizing emerging technologies. These future fields of research will generate more information regarding issues affecting the successful implementation of APM or TPM.



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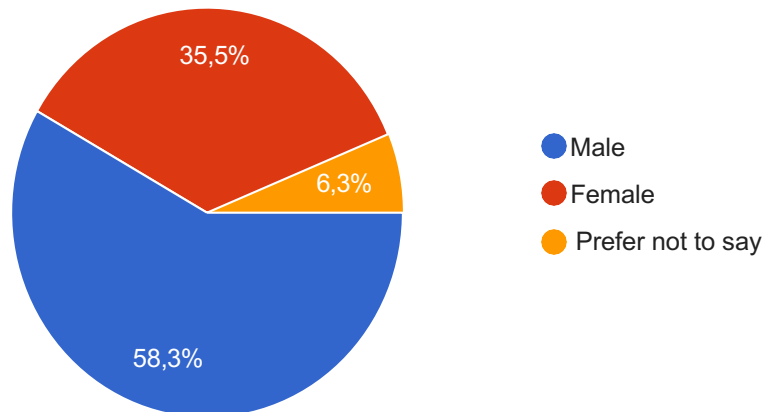


## Appendix -

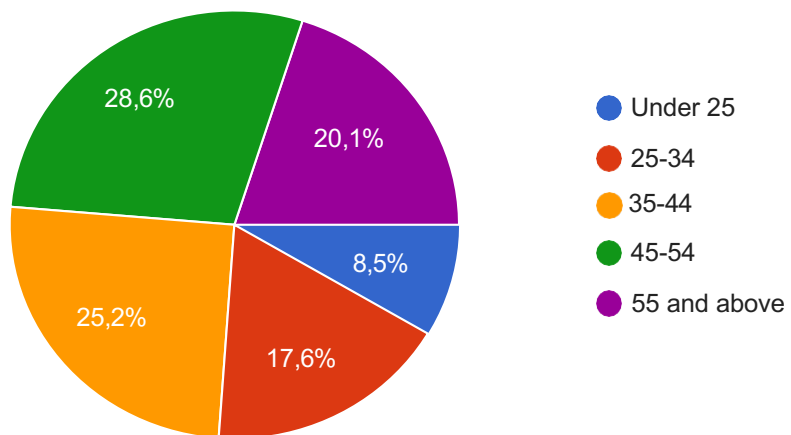
This appendix contains the questionnaire used to collect the empirical data for this master's thesis.

### Section 1: Demographics

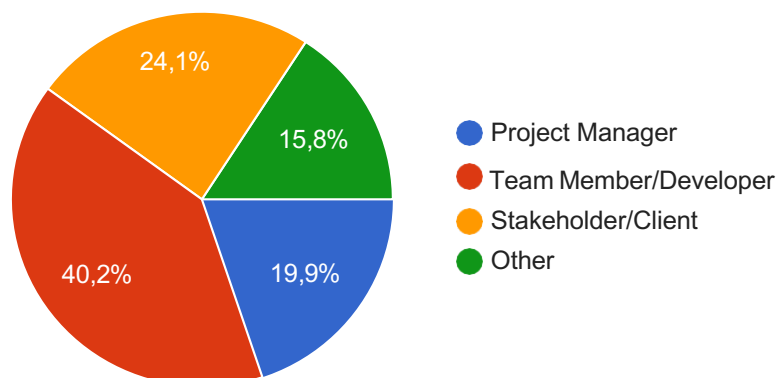
Gender (448 Respondents):



Age (448 Respondents):

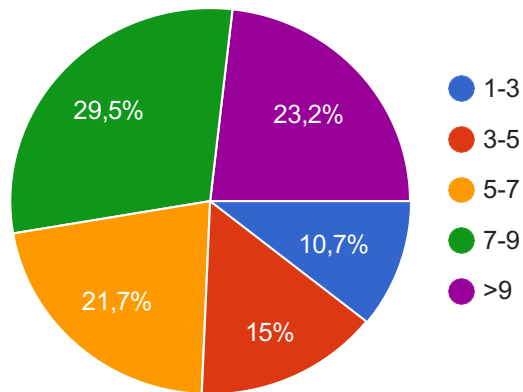


Current Position (448 Respondents):

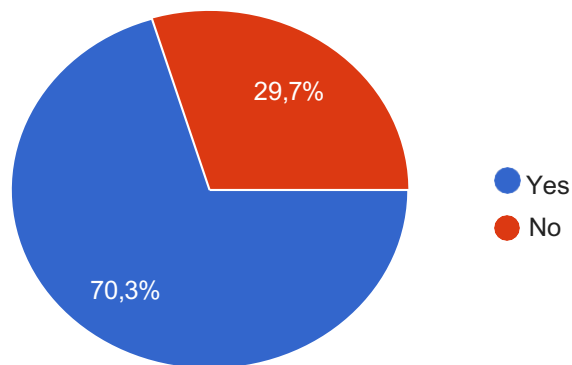


## Section 2: Experience with Project Management Methods

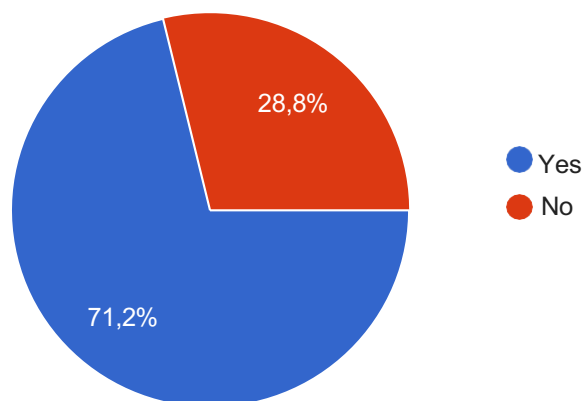
How many years of experience do you have in project management within the IT industry? (448 Respondents)



Have you worked with Agile project management methods before? (448 Respondents)

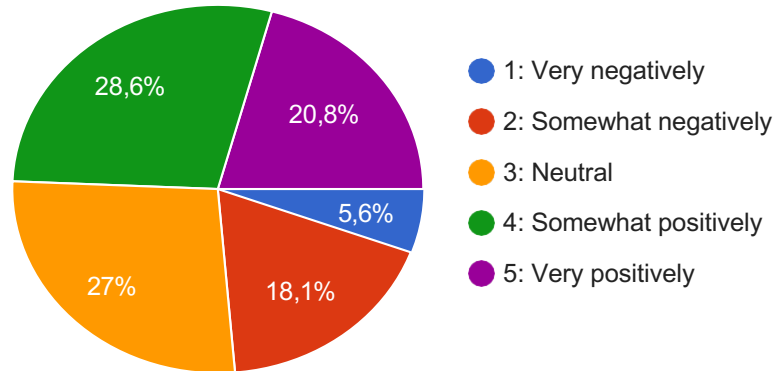


Have you worked with traditional project management methods before? (448 Respondents)

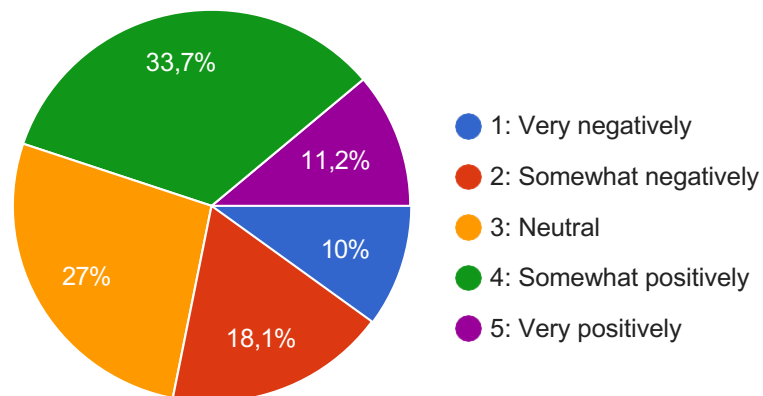


### Section 3: Efficiency and Project Timeframes

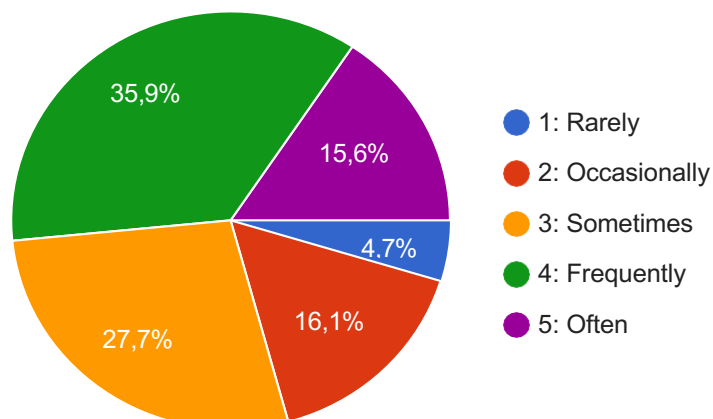
To what extent do Agile project management methods impact project timelines and time-to-market requirements in the German IT industry? (1-5) (448 Respondents)



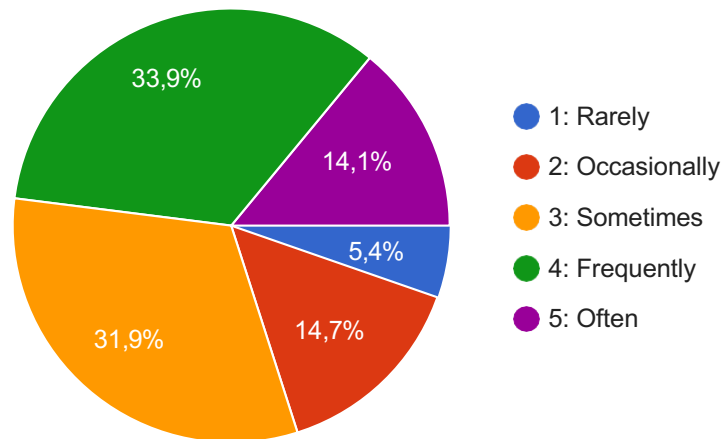
To what extent do traditional project management methods impact project timelines and time-to-market requirements in the German IT industry? (1-5) (448 Respondents)



How often do projects using Agile methods in the German IT industry meet their initial timeframes? (Rarely - Often) (448 Respondents)

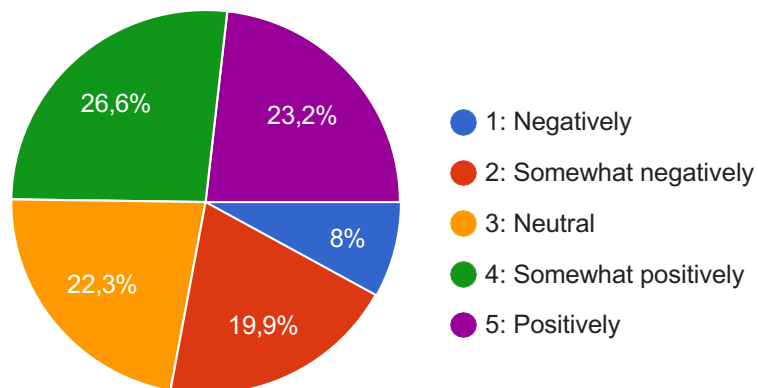


How often do projects using traditional methods in the German IT industry meet their initial timeframes? (Rarely - Often) (448 Respondents)

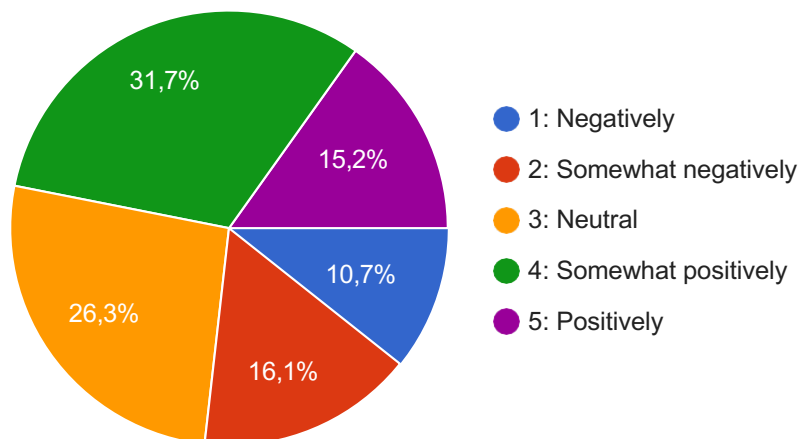


#### Section 4: Innovation and Adaptability

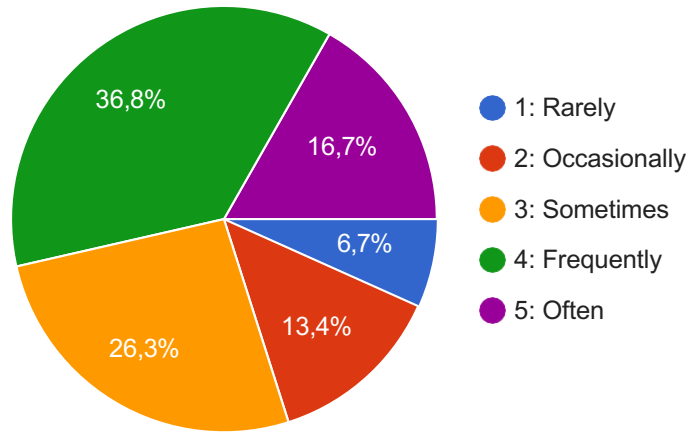
How does Agile project management influence innovative, flexible, and adaptive capabilities within project teams in the German IT sector? (1-5) (448 Respondents)



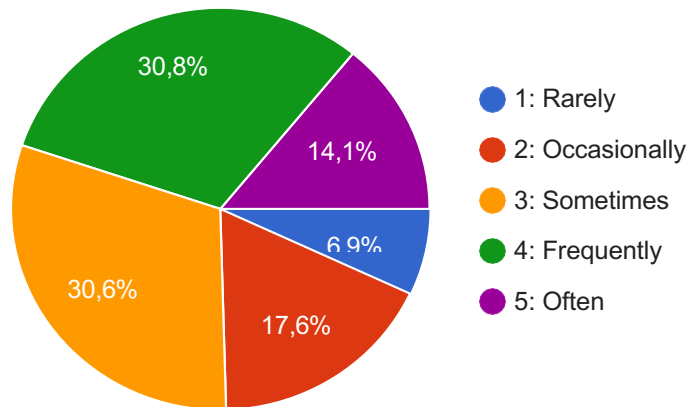
How does traditional project management influence predictability and rigidity within project teams in the German IT sector? (1-5) (448 Respondents)



How often do projects using Agile methods in the German IT industry adapt to changing requirements during the project lifecycle? (Rarely - Often) (448 Respondents)

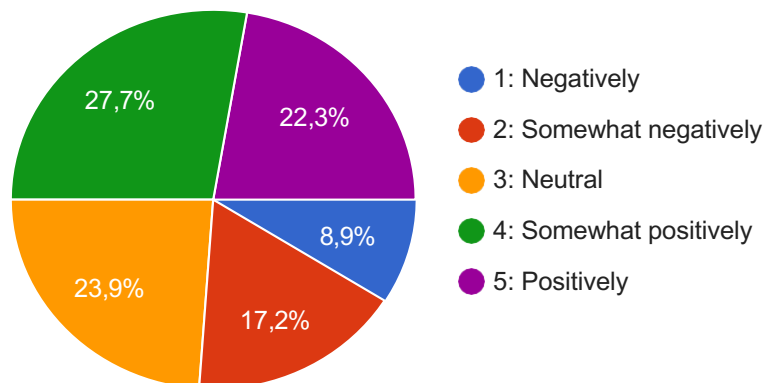


How often do projects using traditional methods in the German IT industry adapt to changing requirements during the project lifecycle? (Rarely - Often) (448 Respondents)

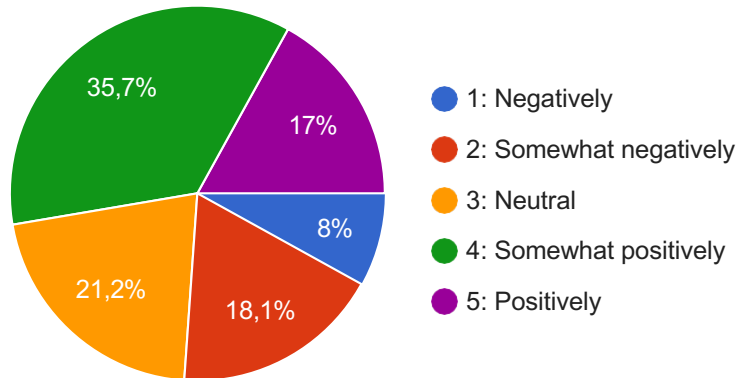


**Section 5: Stakeholder Collaboration and Satisfaction**

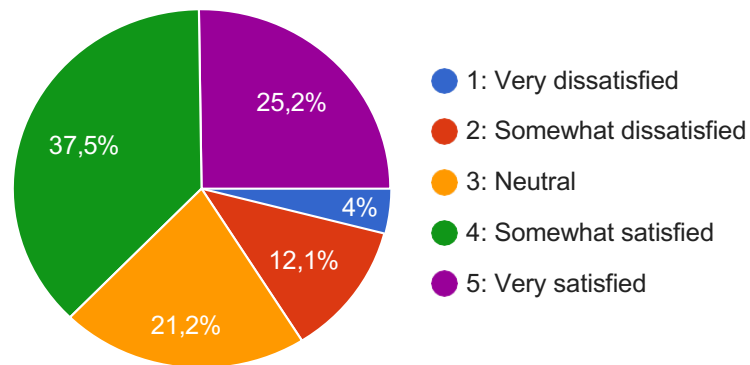
How do Agile project management methods influence stakeholder collaboration, communication, and customer satisfaction in the German IT industry? (1-5) (448 Respondents)



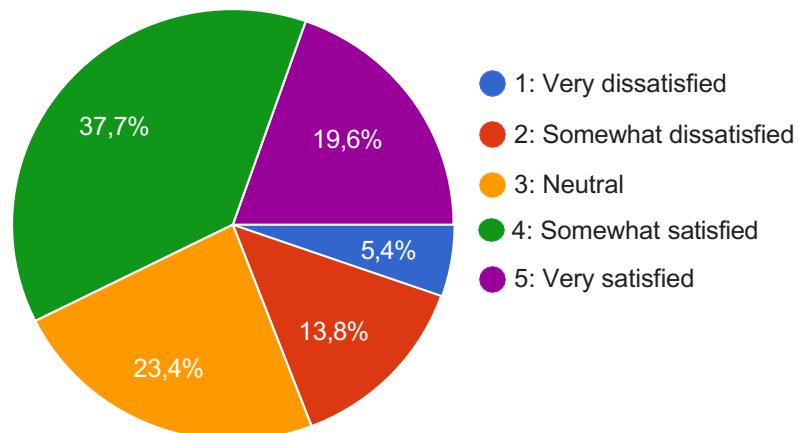
How do traditional project management methods influence stakeholder collaboration, communication, and customer satisfaction in the German IT industry? (1-5) (448 Respondents)



How satisfied are you with the overall outcomes when using Agile project management methods in the German IT industry? (1-5) (448 Respondents)

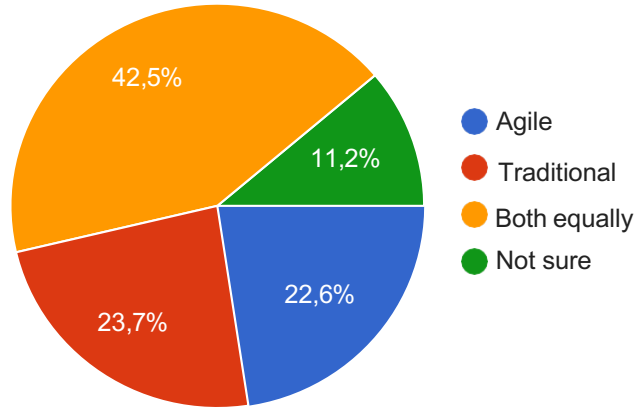


How satisfied are you with the overall outcomes when using traditional project management methods in the German IT industry? (1-5) (448 Respondents)

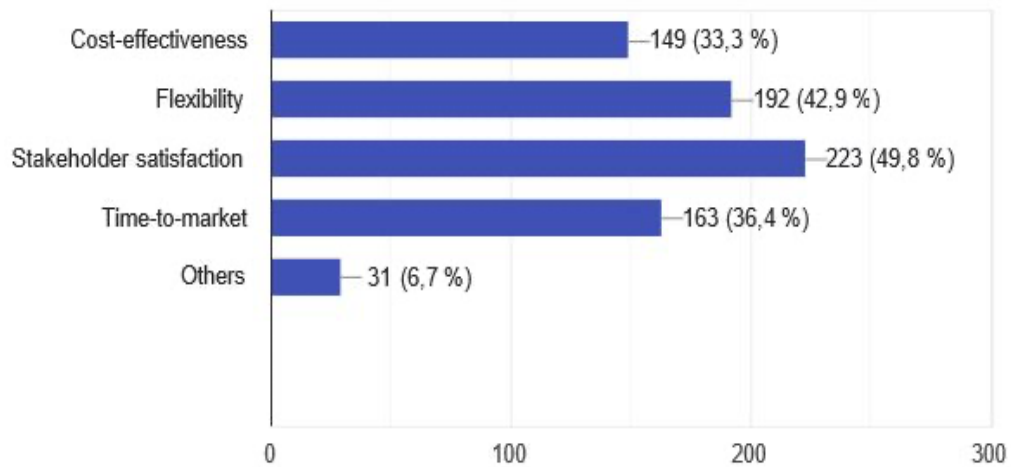


**Section 6: Comparison and Preferences**

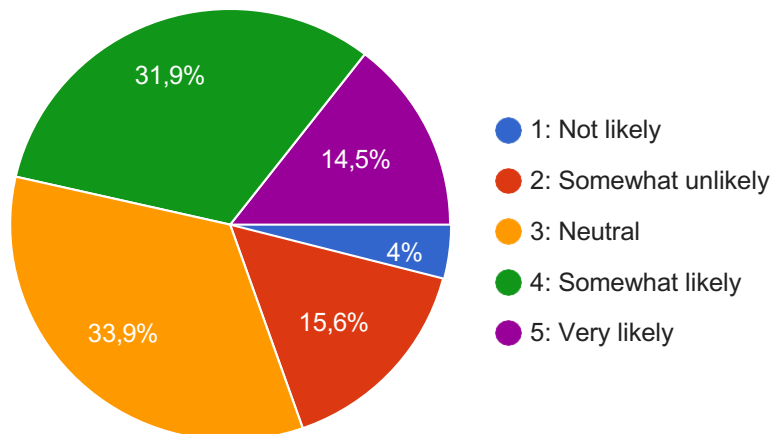
In your opinion, which project management method (Agile or traditional) is better suited for the German IT industry based on your experience? (448 Respondents)



What factors influence your preference for Agile or traditional project management methods in the German IT industry? (448 Respondents) (Select all that apply):



How likely are you to recommend Agile project management methods to others in the German IT industry? (1-5) (448 Respondents)





How likely are you to recommend traditional project management methods to others in the German IT industry? (1-5) (448 Respondents)

