POLITECNICO DI TORINO

Master's Degree in Engineering and Management

Master's Degree Thesis

Agile Transformation – Evidence from the chemical industry

Supervisor: Candidate:

Giovanni Zenezini   *Lara Calzoni*

Academic Year: 2023 – 2024

Abstract

Since its introduction in 2001, Agile has substantially elevated the success rates of software development projects. However, in recent years, even conventional organizations have begun to adopt Agile principles. The thesis investigates the complex process of transitioning to Agile within a company in a traditionally non-Agile industry. Through a qualitative analysis involving interviews, it compares theoretical perspectives from literature with real-world application within the analysed company.

In addition to conventional topics, the research identifies new prerequisites for successful Agile adoption, such as the need for an environment which embraces quick failure, the distinction from capital projects, and the removal of steering committees[1]. When dealing with ambiguous specifications, at least clarity about the "what" is essential. Too unclear requirements can result in increased expenses and efforts during modifications.

The study of team dynamics reveals that the successful implementation of Agile doesn't necessarily require a small team but can also depend on other factors. Consultation with many people and alignment with company goals can limit team autonomy. Agile teams require Subject Matter Experts (SMEs) and lower approval levels.

Challenges not extensively covered in literature are addressed, including issues related to resource availability, physical distance, individual determination, and the decision to adopt Agile in certain project types or departments. Furthermore, the thesis emphasizes the pivotal role of demonstrating Agile's benefits to ensure successful adoption and underscores that all people involved must understand its principles.

The main success factors identified are resource availability and full project dedication, both necessary for frequent customer interactions. Comprehensive training for everyone, including business and leaders, is required. Leaders must understand the implications of Agile and create a clear vision of what Agile means inside the organization.

---

[1] A steering committee is an advisory board of experts that guides an organization's direction, scope, budget, timeline, and methods. This group meet regularly to evaluate progress and adjust strategies.

Table of Contents

List of Tables

List of Figures

1 Introduction

Agile is a project management framework that prioritizes flexibility, collaboration, and customer satisfaction. Initially it was created for software development projects, where requirements and solutions are generated iteratively through planning, testing, and feedback. Agile approach has improved software project success rates while enhancing quality, productivity, and innovation of teams.

In recent years, Agile has expanded beyond its software development roots, permeating various other industries. This trend has been documented in studies such as *Agile Outside of Software Development – Systematic Literature Review* and *A taxonomy of scaling agility,* which highlight its adaptability and relevance across various domains such as manufacturing, telecommunications, banking, education, retail, and mass media. These businesses often face changing customer preferences, complicated and uncertain environments, and increased competition. Consequently, integrating Agile concepts and practices can enhance their agility, adaptability, and responsiveness.

Many factors influence the adoption and implementation of Agile in non-software contexts, including company culture, project characteristics, team composition, and stakeholder needs. As a result, it is essential to understand how Agile is implemented and executed in an organization beyond the context of software, as well as the benefits and problems that come with it. Indeed, the purpose of this thesis is to investigate the Agile transformation within a chemical company, which is in a different industry than the typical Agile domains.

The study compares the viewpoints of practitioners who regularly use the Agile methodology within the analyzed organization with the principles of the methodology as stated in the research literature. A series of internal interviews is used to facilitate this comparison. The actual application of the methodology's concepts is examined, offering an opportunity to detect similarities, differences, and possible gaps between the reality and the theory.

To comprehend why a chemical company, like many others, is transitioning towards Agile, it's essential to investigate the disparities among various project management

methods. The second chapter of the thesis serves this purpose. It provides a literature review of the project management approaches, focusing on Waterfall, Agile, and Hybrid models. It describes the main features, advantages, and disadvantages of each approach, and how they differ from each other.

The third chapter outlines the research methodology employed in this study, providing a detailed explanation of the creation of the interview guide, the profile of the respondents, and the execution of the interviews. It further describes the subsequent steps begun after data collection, which involve a specific process of summarization, coding, cross-referencing with existing literature, and interpretation.

The fourth chapter describes the insights learned from the interviews and their parallelism with the referenced literature, identifying confirmations, discrepancies, or significant gaps about Agile prerequisites, team structure, challenges, and key success factors in the transition process.

The concluding chapter draws conclusions based on the findings and discusses benefits, limitations, and future steps of the research. This final segment aims to articulate the significance of the study, delineating the constraints encountered during the research process and proposing potential future steps to enhance the current results.

2 Different project management approaches

2.1. Traditional approach

2.1.1. Waterfall Overview

The Waterfall methodology stands out as the most recognized and frequently employed approach among traditional project management models. Consequently, the attention in this section will be directed towards this method.

The genesis of the Waterfall approach can be identified into the construction and manufacturing sectors. In these industries, characterized by structured physical environments, design alterations turned out to be excessively costly at an early stage in the development process.

Winston Royce introduced this model in his renowned paper *Managing the Development of Large Software Systems* in 1970. Although the word "Waterfall" was not explicitly used in that article, the foundational principles of the Waterfall model were articulated within Royce's work. This important paper laid the groundwork for a methodical and sequential method of project execution, delineating a series of phases wherein progress cascades continuously, resembling the flow of a waterfall.

The expression "Waterfall approach" is commonly used interchangeably with "predictive approach" due to the characteristics of the model. In this methodology, the project moves through a series of well-organized and distinctly defined stages, with each stage building upon the results of the preceding one. This synonymous usage is documented in the *PMBOK Guide*, which states: "A predictive approach is useful when the project and product requirements can be defined, collected, and analyzed at the start of the project. This may also be referred to as a Waterfall approach" (Institute, P. M., 2021). In this context, the term "predictive" denotes the ability to create forecasts and plans for the entire project from the very beginning. In practical terms, a predictive approach implies

an accurate understanding of all project requirements before initiating the development process. This approach is especially fitting when the project operates in a stable environment, and there is a low probability of substantial changes in requirements throughout the project's lifecycle.

Predictive methods may incorporate proof-of-concept developments to explore alternatives, but most of the project activities adhere to the plans established early in the project. Frequently, projects employing this approach make use of templates derived from previous, analogous projects.

The traditional approach relies on a detailed reference scope, which is ideally exhaustive, maintaining a consistent commitment to delivering all project requirements, with the significant restriction on requirements, as illustrated in left portion of Figure 1. These requirements serve as the foundation for estimating the necessary time and cost for delivery. Adhering to this, a plan is established and strictly followed, with the aim of predicting future outcomes by estimating and minimizing changes during the project. For this reason, Waterfall is often termed as a "plan-driven" methodology.
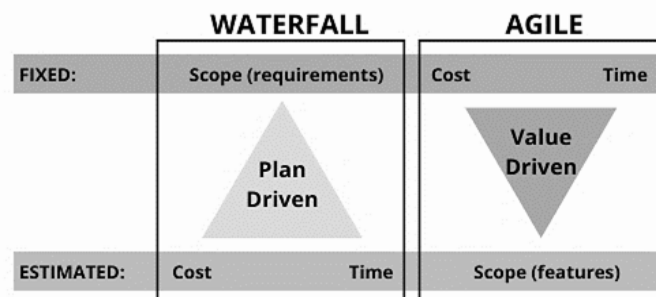
Figure 1 - Comparison between Waterfall and Agile methodologies

Ideally, all requirements would be delivered within the estimated cost and schedule, without any changes throughout the project. However, achieving perfection is unrealistic. Consequently, when a project slows, modifications to the cost or schedule are required to guarantee the delivery.

2.1.2. Waterfall Phases

In Royce's conception, the Waterfall model breaks down the project lifecycle into separate phases, with each stage leveraging the achievements of the previous one. Although Royce's idea wasn't originally designed as an independent methodology, it has become emblematic of the Waterfall method.

The origins of the approach in industries like manufacturing and construction, where changes are hard to implement once a project has begun, necessitated a strict product development process. In these sectors, project stages must proceed sequentially, and it's challenging to make alterations once the project is in progress.

In the project development process, adherence to a sequential approach is crucial, where each stage necessitates full completion before progressing to the next. Once a stage is concluded, revisiting it becomes impossible, forcing a restart of the entire process to return to a prior stage.

As noted by Petersen et al., this systematic approach, commonly known as the "stage-gate model" requires a meticulous quality check for documents at each transition between phases. The initiation of each new stage is dependent on the successful completion and approval of the preceding stage, ensuring a methodical and quality-controlled progression through the project phases. There are multiple steps in the Stage-Gate process, and each one includes tasks from various functional areas within an organization. When every stage is finished, the results are examined in accordance with established benchmarks, termed "gates". This guarantees that the development outcomes are in line with client expectations while also maintaining development quality.

In his publication, Royce presented a seven-steps model consisting of the following: "Systems Requirements," "Software Requirements," "Analysis," "Program Design," "Coding," "Testing," and "Operations" (Royce, 1970). Nevertheless, numerous variations of this framework can be found in the literature, with alterations to the precise number and description of these phases. Pioneering researchers, including Petersen et al. and Bassil, offer insightful explanations of the Waterfall phases.
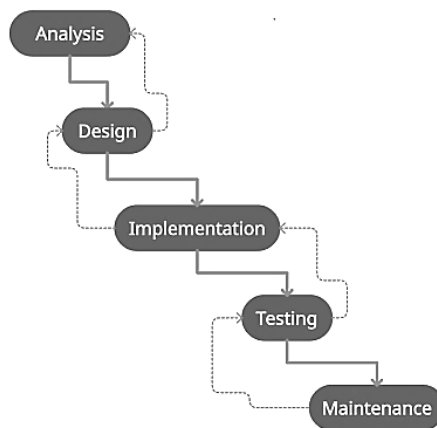
Figure 2 - Curinga et al.'s adaptation of the Waterfall model, inspired by Bassil

Figure 2 illustrates Curinga et al.'s adaptation, influenced by Bassil's model, which serves as a visual representation of the multiple stages involved in the traditional project management approach:

1) (Requirements) Analysis,
2) Design,
3) Implementation,
4) Testing,
5) Maintenance.

While the phase titles are mostly intuitive, a detailed explanation for each step can be found in the following subsections.

1) Requirements Analysis

The first phase is marked by a rigorous collaboration between the project team and stakeholders, aiming to gather and document all project requirements in a comprehensive manner. It represents the final opportunity for the project team to interact with the customer before the project begins. Given its significance, this phase is critical as it lays the foundation for the successful execution of the entire project.

The process commences with the elicitation of requirements, a step that entails conducting stakeholder meetings, interviews, questionnaires, brainstorming sessions, and

workshops. The aim is to collect comprehensive information from clients or end-users regarding their expectations and necessities for the product. After gathering the requirements, an analysis is conducted to identify any discrepancies, conflicts, or ambiguities. Following this, a comprehensive document is created and shared with project stakeholders, including the project manager, project sponsor, project team members, and the end customer. The approval of this document by stakeholders signifies an important milestone, emphasizing the sequential nature of the Waterfall model.

In conclusion, the Requirements Analysis Phase underlines the significance of meticulous planning and documentation in establishing a solid groundwork for the subsequent stages.

2) Design

During the Design Phase, the specifications acquired in the initial phase guide the creation of a design for the product.

This design process unfolds in two stages: Logical Design and Physical Design. In the Logical Design Stage, solutions that can meet the customer's requirements are identified, without investigate into specific software or hardware aspects. This is followed by the Physical Design Stage, where a more tangible design is developed, specifying the hardware, software, architecture, data sources, and service specifications for the project.

The Design Phase abstains from any coding activity. Instead, it sets the stage for the next phase of the model and is subject to a comprehensive review and approval by stakeholders.

3) Implementation

The Implementation Phase, often referred to as the "Coding Phase", is the most complex and the longest stage as it involves the actual construction of the product based on the project plan and design.

During this step, the project team constructs or codes the product in small pieces, known as "units", and combines them to form a functional product. Once the coding is completed, a senior developer undertakes a detailed code review to ensure its correctness and efficiency. Any errors identified or potential enhancements are addressed at this

point. Following this, each component is subjected to testing to confirm its expected functionality. Any bugs or issues discovered are corrected before advancing to the next phase.

Given its crucial role in actualizing the design, the Implementation Phase is essential. It necessitates meticulous adherence to the system specifications and the system architecture to ensure that the final product aligns with the requirements and the design.

4) Verification

The Verification Phase, often referred to as "Testing Phase", is a critical stage dedicated to identifying and resolving any issues or bugs within the system. The system undergoes comprehensive testing to ensure it operates as anticipated and fulfils all the requirements outlined in the initial phase.

If the project requirements are not satisfied, the team is required to review the project from the first phase to identify the inconsistencies. This iterative process continues until the system meets the project's defined needs.

The result of this phase is a system ready for deployment. The Verification Phase is of paramount importance as it certifies the system's readiness for use and its reliable performance in real-world conditions. It requires a detailed and systematic approach to ensure all potential issues are identified and addressed.

5) Maintenance

The Maintenance Phase is a crucial stage that ensures the system remains functional in the long term and consistently meets user needs. During this phase, the project team adjusts the system or specific components to correct errors, increase performance, or adapt to a modified environment. The team also identifies and rectifies any errors that might have been missed during the Verification Phase.

It is important to monitor and evaluate the product's performance and feedback during this phase. The Maintenance Phase concludes when the client is completely satisfied or continues if frequent updates are required. Meticulous planning and resource allocation

are necessary during this stage, as maintenance costs can accumulate over time and often surpass the development costs.

2.1.3. Waterfall Advantages

In emphasizing the advantages of the conventional approach, an examination of scientific literature articles was undertaken, incorporating the Pargaonkar's paper and insights gathered from interviews conducted by Thesing et al.

Thesing's observations underline that this methodology enables reliable estimation of both time and budget, minimizing the risk of unexpected delays and cost overruns.

Secondly, it allows for the consideration of dependencies from the project's initiation, enhancing coordination and ensuring a smoother development process.

Additionally, with this methodology the "measurability of the project progress (by planned milestones) are perceived as beneficial" (Thesing et al., 2021). This is important for monitoring the project performance, tracking the budget, and reporting the status.

Moreover, the Waterfall approach promotes stable, systematic, and documented planning, laying a strong foundation for successful project execution.

Finally, the emphasis on fixed roles and processes with clear responsibilities enhances team collaboration and ensures a shared understanding of individual roles.

Pargaonkar's paper highlights the methodology's commitment to comprehensive documentation at each stage, ensuring a thorough understanding of project requirements, design specifications, and implementation guidelines, serving as a valuable reference for future maintenance.

The traditional approach is simple to comprehend and follow and does not require certifications or specific training for project managers or employees. This saves time and resources by avoiding a steep learning curve.

Moreover, Waterfall limits customer involvement only in the first phase, which helps the team avoid delays and reach completion according to the set timeline.

In general, the traditional approach is particularly suitable for small projects with stable requirements, where changes are less likely to occur during the development process.

2.1.4. Waterfall Disadvantages

Pargaonkar has identified several disadvantages of the Waterfall methodology. Primarily, the rigid and step-by-step structure of the approach presents a notable disadvantage when confronted with alterations or unexpected events throughout the project. Adapting to modifications becomes challenging, as making adjustments involves redesigning either specific components or the entire system, potentially affecting the project's schedule, budget, and scope.

In the second aspect, customer engagement is generally confined to the initial phases of the project, mainly during requirements gathering. This limited involvement contributes to a lack of ongoing feedback, potentially resulting in a final product that fails to align with the client's preferences.

In addition, the traditional methodology delays the testing and verification phase until the project is finished. This postponement increases the likelihood of errors and adds complexity to the resolution since identifying and correcting issues becomes less straightforward without simultaneous testing during the development process. Since testing is conducted solely after the product is fully developed, there is a potential risk of the product not meeting expectations, displaying suboptimal performance, or raising security concerns.

Moreover, Waterfall can lead to longer development cycles compared to more iterative methodologies, and the sequential nature of the approach may cause delays, especially if any phase takes longer than anticipated.

In conjunction with Pargaonkar's observations, Thesing et al. have highlighted the difficulty of outlining all requirements in detail at the beginning, potentially resulting in project delays and intensified costs.

Additionally, abstract specifications can contribute to inaccurate planning, leading to both delays and the need for subsequent rework.

2.2. Agile approach

2.2.1 Agile Overview

Characterized as a "value-driven" methodology, Agile emphasizes the directive to "prioritize the work by business value and do the most valuable work first", as specified by the Project Management Institute's website.
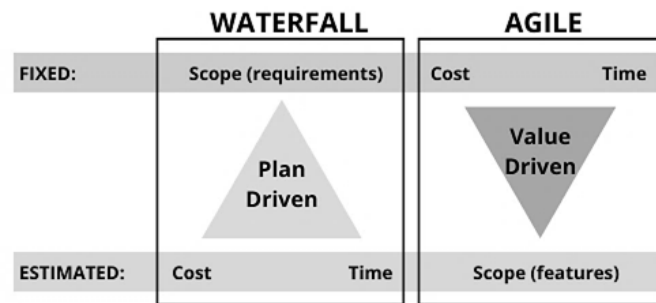
Figure 1 Comparison between Waterfall and Agile methodologies

The right part of Figure 1, illustrates how macro cost and time objectives are established early in the process, guiding the definition of the project scope. Notably, the project scope is not rigid and may experience alterations over time.

In this approach, customer feedback on deliverables serves as the foundation for the subsequent phase. Within the Agile methodology, the iterative process of multiple incremental deliveries enables the project team to evaluate the product's status, distinguishing essential elements from superfluous ones. This framework allows for seamless adjustments or changes in direction as needed, embodying an adaptive approach.

The foundational document that outlines the Agile methodology is the *Manifesto for Agile Software Development*, commonly referred to as the *Agile Manifesto*. This document, created by a group of seventeen software practitioners in 2001, serves as a declaration of values and principles for software development. The *Agile Manifesto* emerged as a response to conventional, plan-driven, and rigid approaches to software development,

including Waterfall, which were often found to be ineffective, inefficient, and unsatisfactory for both developers and customers. According to the creators of the *Agile Manifesto*, the Agile approach was articulated as a "an alternative to documentation-driven, heavyweight software development processes" (Beck et al., 2001). The document aims to promote a more flexible, adaptive, and collaborative way of developing software, based on the four main values that can be found on the original website and that are displayed in Table 1.

> We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:
>
> **Individuals and interactions** over processes and tools
>
> **Working software** over comprehensive documentation
>
> **Customer collaboration** over contract negotiation
>
> **Responding to change** over following a plan
>
> That is, while there is value in the items on the right, we value the items on the left more.

Table 1 - Agile values presented in the Agile Manifesto (Beck et al., 2001)

About the first value "Individuals and interactions over processes and tools" (Beck et al., 2001), *Agile Manifesto*'s authors emphasize the importance of human communication and collaboration among the software developers and the customers, rather than relying on predefined processes and tools that can limit creativity and responsiveness.

Going on commenting the second main value from the list, "Working software over comprehensive documentation" (Beck et al., 2001), the idea is to consider the importance of the delivery of working software that meets the customer's needs and expectations, rather than producing extensive documentation that can be obsolete, irrelevant, or inaccurate.

About "Customer collaboration over contract negotiation" (Beck et al., 2001), *Agile Manifesto* promotes a close and continuous involvement of the customer throughout the software development process, rather than a fixed and formal agreement that can constrain the scope and quality of the software.

Lastly, when commenting the Agile value, "Responding to change over following a plan" (Beck et al., 2001), the document's signatories recognize the uncertainty and variability of software development, and they encourage the ability to embrace and respond to changing requirements, feedback, or market conditions, rather than following a rigid and predetermined plan that can lead to low outcomes.

Apart from the four values, the *Agile Manifesto* outlines twelve principles, shown in Table 2, that provide additional guidance and strategies for putting the values into action.

We follow these principles:
1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the art of maximizing the amount of work not done--is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Table 2 - Agile principles presented in the Agile Manifesto (Beck et al., 2001)

The Agile Alliance[2] agreed on the *Agile Manifesto* with software as their focus, which makes sense as they were all software developers at the time. However, Agile has become more popular and has expanded beyond software. So, there is a continuing debate about if the original manifesto must be modified to suit new adopters from other industries. The Agile expert Michael Moore[3] tried at what the document might look like if it were to change, posting it on the *VersionOne Agile Management* blog. As evident from Table 3, the principles are almost the same, Moore just changed the word "software" to "product", but the idea is that now it is possible to apply the principles also to other industries.

We follow these principles:
1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable **products**.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working **products** frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working **product** is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity–the art of maximizing the amount of work not done–is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Table 3 - Agile principles according to Michael Moore

[2] The group of independent thinkers about software development named themselves as "Agile Alliance".
[3] Michael Moore has more than 19 years of experience helping organizations adopt Agile principles and values.

Also Gil Broza[4], another Agile expert, in his book *Agile for Non-Software Teams* restated the values and the principles, so they're less tightly tied to software development, obtaining the values in Table 4 and the principles in Table 5.

Deliver value early and often
Adaptation
Customer collaboration
Putting people first

Table 4 - Agile values presented in Agile for Non-Software Teams

1. Organize people around value creation

2. Collaborate on a product, service, or solution

3. Produce outcomes of value

4. Always work on what's most important

5. Get feedback frequently

6. Keep the cost of change low

7. Constrain the intake of work

8. Visualize the work

9. Break work down

10. Bounded team autonomy

11. Self-organization

12. Collaboration

Table 5 - Agile principles presented in Agile for Non-Software Teams

---

[4] Gil Broza helps organizations turn their software development teams into engaged, productive, and trusted Agile delivery partners.

To sum up, the *Agile Manifesto* is often regarded as a significant milestone in the progression and history of software development. It has inspired numerous organizations, beyond just the software industry, to embrace a more Agile methodology.

2.2.2. Agile methodologies

In the context of Agile methodologies, Sommer et al. highlighted the existence of at least nine distinct methods, including "Scrum, Crystal, Extreme Programming, Adaptive Software Development, Agile Modeling, Dynamic Systems Development Method, Feature Driven Development, Internet Speed Development, and Pragmatic Programming" (Sommer et al., 2015). Each of these methodologies provides distinct benefits by utilizing specific tools, approaches, and cultivating a unique development culture. It is noteworthy that the majority of these methodologies do not comprehensively address all aspects of project management. Instead, these methodologies offer tools tailored to manage specific aspects of the product development process. Notably, among them, the Scrum framework distinguishes itself by being explicitly designed to supervise projects from beginning to completion.

Numerous literature articles, including *Popular Agile Methods in Software Development: Review and Analysis* and *Towards a hybrid project management framework: a systematic literature review on traditional, agile and hybrid techniques*, consistently highlight Scrum as the most prevalent Agile methodology. This assertion is also confirmed by empirical studies such as *The 16th State of Agile Report*, where a significant 87% of respondents affirm to employ the Scrum methodology. Therefore, this particular methodology is the central point of discussion, with a comprehensive examination provided in the next section. On the other hand, other methodologies receive a general overview in section 2.2.2.2.

2.2.2.1. Scrum methodology

Scrum is an Agile methodology that builds on the Agile principles, creating structure that helps teams apply the Agile principles in their daily work and deliver products incrementally and iteratively.

The method consists of three main roles: Product Owner, Scrum Master, and Development Team. A brief description of each role follows.

1) Product Owner

The Product Owner assumes the role of the team's interface with external stakeholders, ensuring that the team provides the highest value to the customers while also keeping them informed and satisfied during the process. This person interacts with customers, listens to their needs, shares this information with the team, and defines the product vision.

This role is also responsible for developing the Product Backlog based on the requirements obtained. The Product Owner needs to prioritize Product Backlog items and ensure that they align with the overall product vision. This necessitates ongoing and cooperative interaction with stakeholders.

2) Scrum Master

The Scrum Master is the individual who guarantees that everyone understands and executes Scrum correctly, helping them in achieving their goals and delivering value.

This person assists the team in self-organization and cross-functionality, resolves any issues that impede the progress, and ensures that all events are positive and beneficial.

The Scrum Master also works closely with the Product Owner to understand and communicate the product's value, manage the backlog, and plan and divide tasks with the team.

3) Development Team

The Development Team is the core group of the Scrum framework accountable for implementing the tasks assigned to each sprint. Depending on the domain, this group may include individuals with a variety of capabilities, such as engineers, designers, programmers. The team is self-organized and cross-functional, which means they can operate both independently and together and are capable of doing all activities.

Developers are in charge of planning the sprint, assuring quality by adhering to the standards, and adjusting their plan on a daily basis to meet the sprint goal.

This process follows a cycle of fixed-length iterations, called "sprints", which usually last from two to four weeks, but never more than a month.

In the Scrum methodology, the terms "ceremonies" and "events" are used interchangeably to indicate particular activities. Each ceremony fulfils a specific purpose and offers a chance to examine and adapt both the product and the process. The Scrum events include:

1) Sprint Planning,
2) Daily Stand-Up,
3) Sprint Review,
4) Sprint Retrospective.

Following the cycle shown in Figure 3, the team can provide products that satisfy the customer's expectations while adjusting to changing requirements and market conditions.
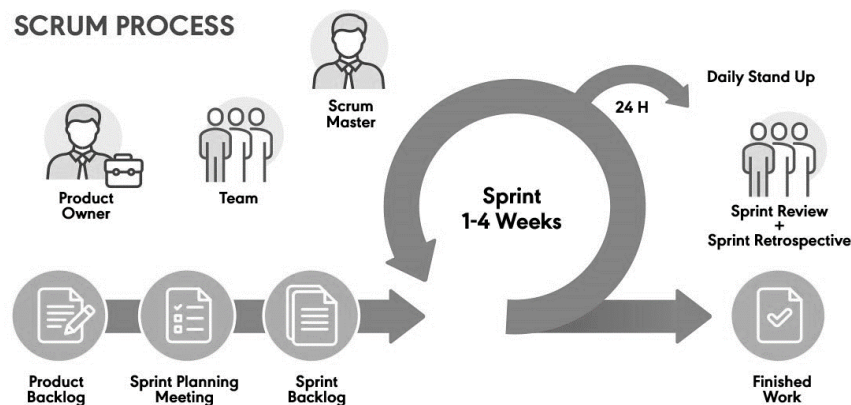
Figure 3 - Scrum process

The following lines provide a description of these events.

1) Sprint Planning

At the beginning of each sprint, the team comes together to plan the next iteration. This collaborative effort implies defining a "Sprint Goal" that encloses the objective of the sprint and formulating a "Sprint Backlog". The Sprint Backlog is derived from the "(Prioritized) Product Backlog", which is a list of all components needed for the product, ranked by importance with the MoSCoW[5] rule.

The Scrum Master plays a pivotal role in facilitating this meeting, ensuring effective planning and productive discussions. His responsibilities may include proposing methods to decompose Product Backlog items or user stories into manageable tasks, initiating conversations with targeted questions, and maintaining a focus on the Sprint Goal.

Upon the conclusion of the Sprint Planning, the team transitions into the first Daily Stand-Up.

2) Daily Stand-Up

Daily Stand-Ups, also known as "Daily Scrum", are short meetings that last no more than fifteen minutes and are meant to quickly update everyone on the progress of the project. These sessions are normally held once every day, usually in the morning.

The purpose of the Daily Stand-Up is not an extensive status meeting, but to provide an opportunity for team members to communicate their progress and indicate any potential obstacles. All team members reports on what they completed the day before, what they intend to do today, and whether there are any impediments to their work.

This model promotes accountability, as team members report their accomplished tasks in front of their peers.

---

[5] MoSCoW is a prioritization technique to determine the flow of activities based on their importance.
"Must" are the essential requirements.
"Should" are the elements that are important, but not critical to the success of the project.
"Could" are desirable requirements that are nice to have but are not critical.
"Won't" are the requirements that are explicitly excluded from the current scope of the project because they are not feasible or because they can be considered for future iterations.

3) Sprint Review

The Sprint Review is a meeting that takes place at the conclusion of every sprint, typically lasting forty-five minutes for each week of iteration. This event provides the Development Team with an opportunity to show achievements, present the work finalized during the sprint, and gather immediate feedback from stakeholders. For this reason, the presence of stakeholders is crucial as their discussions can generate new ideas for the Product Backlog, provide insights into future trends and market dynamics, or identify obstacles that need to be addressed.

Unlike traditional project closure meetings, the Sprint Review in Scrum doesn't involve stakeholder approval or disapproval of the work. Rather, it promotes continuous collaboration, ensuring there are no unexpected events at this stage of the sprint.

4) Sprint Retrospective

The Sprint Retrospective, the final event concluding a sprint, shifts the focus from the product to the process and group dynamics. It serves as an evaluation of the sprint, encouraging reflection on three crucial elements: recognizing successes from the past sprint, identifying areas for improvement, and making commitments to address in the next sprint.

The principle of continuous improvement drives the development within an Agile team, with retrospectives playing a key role in this process.

Backlog Refinement is an additional meeting that is not an official Scrum event, but it is commonly integrated into the team's routine.

Backlog Refinement

The Scrum Guide defines Backlog Refinement as the process of breaking down the Product Backlog's content into smaller and more specific components. The goal of this procedure is to improve the backlog items by providing detailed descriptions, prioritizing them, and estimating their size.

During these refinement meetings, the emphasis is on the Product Backlog rather than the Sprint Backlog. The purpose is not to review the complete Product Backlog, but rather to focus on features that will be included in the next iteration or within a maximum of two sprints.

Informal interactions between Product Owners and developers can also be considered refinement activities because they help to improve and update the Product Backlog in preparation for the next Sprint Planning session.

2.2.2.2 Other Agile methodologies

Beyond Scrum, the study *Popular Agile Methods in Software Development: Review and Analysis* also examines the following other Agile methodologies.

- **Extreme Programming (XP)**

  Extreme Programming is a widely used Agile methodology known for its focus on developing high-quality software that can adapt to changing requirements.

  The five guiding principles of Extreme Programming (XP) are courage, respect, communication, simplicity, and feedback. Indeed, the methodology emphasizes the need of face-to-face interactions for sharing of knowledge effectively among team members and promotes simplicity in design to reduce waste and simplify maintenance. Extreme Programming demands for frequent client demonstrations in order to get regular feedback and make any necessary adjustments. In XP, respect is about appreciating the individual contributions of every team member and applauding each little accomplishment. Lastly, the courage enables the team to honestly report progress and estimates.

- **Feature Driven Development (FDD)**

  The Agile technique known as "Feature Driven Development" develops software using a gradual and short-iterative approach. FDD is particularly suitable for scaling up bigger projects and teams. It prioritises the creation of simple client-valued features that can be finished in a maximum of two weeks.

The initial phase in the Feature-Driven Development approach is to create an overall model that gives the team a common knowledge of the problem domain. The next step is to create a features list, in which the features are organized in a hierarchical manner, usually according to the business activity or domain subject. The third step involves planning by feature, which includes constructing the first timeline and giving individual responsibilities. Creating feature teams is part of the fourth process, which is design by feature. Build by feature is the last phase, which implies putting the designed feature into practice and testing it.

- **Test Driven Development (TDD)**

  Test-Driven Development is a software development approach that inverts the traditional cycle of design, code, and test. In TDD, the process begins with testing, followed by coding, and then design. This approach relies on a brief and iterative development cycle.

  The process starts with adding a test, and then repeating over all of the tests to see if the new one fails. Subsequently, code is written to pass the test, and all tests are run again. Refactoring the code for improvement completes the cycle, and this procedure is repeated as necessary.

- **Dynamic Systems Development Method (DSDM)**

  An Agile framework called the "Dynamic Systems Development Method" completely covers the entire project lifecycle and its business implications. It is a Rapid Application Development (RAD) methodology that uses incremental and iterative approaches that encourage user interaction.

  Many methodologies are included in DSDM, including MoSCoW prioritizing, timeboxing, prototyping, testing, and configuration management. It follows a number of important principles, such as putting the needs of the user first, encouraging frequent releases over focusing on quality, using iterative development to correct problems as they arise, conducting continuous testing throughout the project, and actively communicating with and involving all stakeholders.

The following steps constitute the DSDM process: conducting a business and feasibility analysis; iterating through the creation of functional model and prototype; designing and building iterations; and implementing the solution. This methodical strategy guarantees that the project stays focused on providing real business value.

- **Kanban**

   Originally developed in the context of manufacturing procedures, the Kanban technique is an approach to gradual, developmental process and transformation for companies. This approach makes sure that team members are not overworked and emphasizes just-in-time delivery. This methodology allows for transparency in the development process, with all parties able to view each stage of the process from task definition to client delivery.

   To reveal issues with system operation and encourage cooperation for continual enhancement, it employs a work-in-progress limited pull system as its main technology. A crucial component of Kanban is visualization, which makes it possible to comprehend the task and the process more clearly.

   The Kanban methodology begins with the roles and procedures that are in place right now, without dictating a particular set of responsibilities or sequence of phases. It is important to have consensus within the organization to undertake the shift. For system improvements to be successful and long-lasting, this understanding is essential. The methodology adheres to the current procedures, roles, duties, and names. It acknowledges that there are probably certain components of the organization that work well and should be kept.

   The goal of the Kanban approach is to eliminate anxiety and enable future change by agreeing to respect current roles. Moreover, the Kanban approach promotes leadership from individuals to top managers at all levels.

2.2.3. Agile Advantages

Analysing again the works of Pargaonkar and Thesing et al., the benefits of the methodology are further elucidated.

Agile stands out for its commitment to a continuous feedback loop within iterative development cycles. By identifying and addressing issues early in the project, teams can adapt to changing requirements and fast-paced environments. In the contemporary dynamic business environment, the adaptability of the methodology is crucial as it enables teams to react quickly and adaptively to evolving necessities. As articulated by Thesing et al., this involves the "ability to react flexibly and quickly to dynamically changing customer requirements with regards to project scope" (Thesing et al., 2021).

Agile technique places a strong emphasis on short development cycles, which help teams work more quickly and identify issues early. Defects are found early in the development process thanks to this approach's ability to provide continuous testing and validation, which lowers the time and expense needed to fix problems later.

This approach emphasizes working with customers throughout the development process, as expressed by the third value in the *Agile Manifesto*. By ensuring that the product meets the end-user's expectations, this customer-centric strategy improves product quality and raises customer satisfaction.

This incremental development methodology makes it possible to produce working systems in more manageable, smaller steps. An organization's time-to-market may be shortened because of this faster delivery cycle, enabling team members to react quickly to market demands.

Agile is not limiting in the process of finding a solution. People are empowered by this flexibility to investigate a range of approaches for problem-solving, cultivating creativity and promoting innovation.

In this methodology, team members are encouraged to take ownership of their tasks and decisions, which fosters a greater sense of accountability. This autonomy often results in a high level of motivation among team members, as also underlined by Thesing et al.

2.2.4. Agile Disadvantages
Agile methodology has several disadvantages that can impact the success of a project. According to Thesing et al., an obstacle is in the iterative nature of the development

process, which, while promoting innovation, has the potential to extend timelines and strain budgets. The flexible environment that allows for adaptability also introduces uncertainties, making it challenging to adhere strictly to initial forecasts.

Another crucial challenge results from the necessity for team members to fully dedicate themselves to the project. The need for full-time commitment may limit their participation in other critical tasks or projects, potentially compromising the overall efficiency of the project. Moreover, this customer-centric approach poses a challenge when customers are not readily available.

Additionally, they underscore how Agile's iterative approach "may not fit the corporate culture, in terms, for example, of planning, reporting, hierarchical structures, and leadership" (Thesing et al., 2021). Moreover, Agile presents a potential downside as it requires specific skills and knowledge that may not be present across all team members.

According to Pargaonkar, Agile's preference for minimal documentation might result in less comprehensive documentation of specific design decisions and processes, potentially impacting the long-term understanding of the project.

Moreover, "frequent changes and evolving requirements in Agile can lead to scope creep, where the project's scope expands beyond the initially defined boundaries" (Pargaonkar, 2023). This expansion places strain on resources and adversely affect the process.

2.3. Hybrid approach

2.3.1. Hybrid Overview
A hybrid project management methodology combines elements from two or more distinct project delivery techniques, especially Waterfall and Agile. This process entails the amalgamation of elements from various methodologies to leverage their advantages, thereby "achieving flexibility without unsettling project planning" (Reiff et al., 2022), as articulated in *Hybrid project management – a systematic literature review*. The objective is to customize the approach to fulfil the specific needs of the project.

Despite certain misconceptions, opting for a hybrid project management approach is a prevalent practice. Indeed, a recent survey conducted by ProjectManager.com found that "nearly 60% of respondents said that they use either a hybrid of Waterfall and Agile or many styles within a single project" (ProjectManager, 2022).

2.3.2. Hybrid Methodologies

According to the studies conducted by Reiff et al., they have recognized four hybrid methodologies and arranged them in a uniform structure comprising three generic project phases, as shown in Table 6. The following subsections provide a more detailed explanation of the four different hybrid approaches.

Approach	Initial Phase	Development Phase	Final Phase
Water-Scrum-Fall	Waterfall - Requirements analysis - Planning	Scrum - Design - Development - Implementation	Waterfall - Integration - Testing
Waterfall-Agile	Waterfall - Requirements analysis - Planning	Agile approach - Design - Development - Implementation	Agile approach - Testing
Hybrid V-model	V-model - User requirements - System requirements - Planning	Scrum - Design - Implementation - Unit test	V-model - Integration - System testing
Agile-Stage-Gate	Stage-Gate for administrative/Agile for operation - Discovery - Idea generation - Scoping	Stage-Gate for administrative/Agile for operation - Development - Implementation	Stage-Gate for administrative/Agile for operation - Testing - Validation - Launch

Table 6 - Hybrid methodologies presented in Hybrid project management – a systematic literature review

2.3.2.1. Water-Scrum-Fall model

The Water-Scrum-Fall model was explained by Dave West in his work, *Water-Scrum-Fall Is The Reality Of Agile For Most Organizations Today*. This hybrid project management methodology combines the sequential completion of phases of the Waterfall methodology with the Agile elements of the Scrum methodology during the development phase. In this model, projects follow a sequential progression of individual phases, where each phase must be completed before moving on to the next, reflecting the typical step-by-step progression of Waterfall. In contrast to the rigid framework of Waterfall, the Water-Scrum-Fall model incorporates flexibility into its process. Indeed, if adjustments are required, it allows revisiting a previously done stage.

As can be seen in Figure 4, the Water-Scrum-Fall model can be divided into three macro phases: an upstream planning phase, an Agile development phase, and a downstream traditional phase.
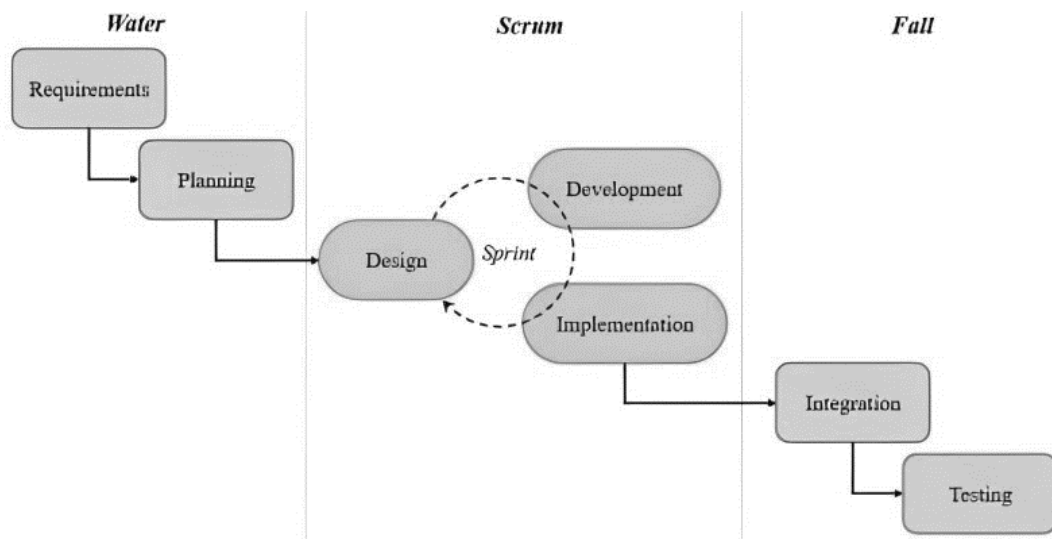
Figure 4 - Water-Scrum-Fall diagram presented in Hybrid project management – a systematic literature review

The initial phase, termed as "Water defines the upfront work" (West, 2011), signifies the preparatory work that is crucial before the starting of a project. In this stage, the

organization is tasked with defining the project's needs, including both user and system requirements, and formulating a plan. Occasionally, these plans form the basis of a contractual agreement between the business and the IT department, providing an overview of the project's direction, timeline, and budget. This stage can present challenges when the business lacks clarity about its needs or when the architecture is new.

The second phase involves the development and is where "teams use scrum to develop software in the middle of the process" (West, 2011). This signifies that the development adheres to Agile methodologies, with implementation occurring in iterative stages that produce incremental results. During this procedure, the analysed hybrid methodology can facilitate a distinct demarcation between testing and development phases.

In the final phase, the solution is once again delivered via a conventional method "establishing gates to limit software release frequency" (West, 2011). At this juncture, the product has usually undergone some degree of testing.

2.3.2.2. Hybrid V-model

The Hybrid V-model was proposed by Hayata et al. in their *A Hybrid Model for IT Project with Scrum*. It is similar to the Water-Scrum-Fall model in that it uses a traditional approach at the beginning and end, with an Agile phase in between. However, it is not based on the Waterfall methodology but on the V-model, another traditional type of methodology.

As elucidated by Hayata et al. in their study, in this hybrid model, the "upper" abstraction levels within the V-model, emphasizing user and system requirements, are more compatible with a planning approach aligned with traditional methodologies. In contrast, the "lower" abstraction levels in the V-model, focusing on design, implementation, and unit testing, are better suited for the application of Agile methodologies. As underlined in *Hybrid project management – a systematic literature review*, "Scrum is particularly suitable for this, because here communication within the development team is exercised very intensively and thus supports the implementation phase through joint iterative thinking" (Reiff et al.,2022).

This conceptual framework is shown in Figure 5.
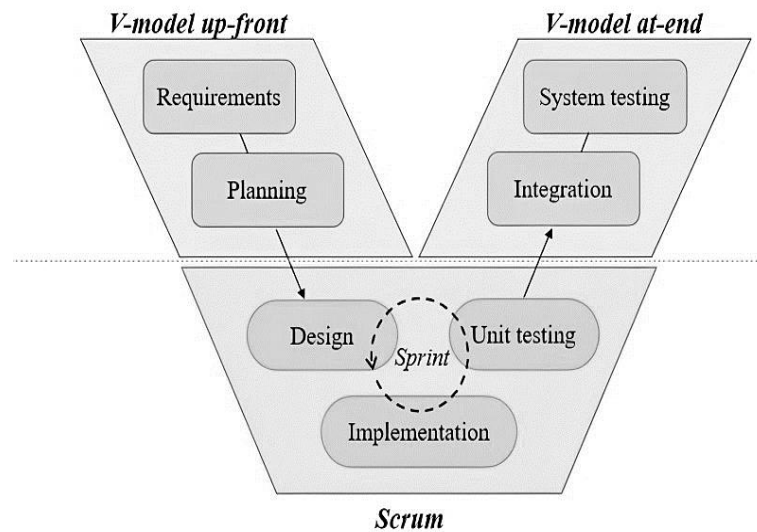
Figure 5 - Hybrid V-modell diagram presented in Hybrid project management – a systematic literature review

On the initial side of the V, the collection, specification, and analysis of user and system requirements take place at the start of the development. This approach aids in reducing potential conflicts over project goals by guaranteeing they are clearly stated. At the bottom of the V, the Agile approach establishes an iterative way of working and thus reducing the risk for delays. Subsequently, on the right side, the implementation that has taken place is tested according to the specifications from the left side. Through these tests, the V-model provides a high level of product safety and quality.

2.3.2.3 Waterfall-Agile model

During a session at the Agile2013 Conference organized by the Agile Alliance, Erick Bergmann and Andy Hamilton introduced the hybrid Waterfall-Agile approach. Reiff et al. point out that initially, this model might appear to closely resemble the Water-Scrum-Fall methodology outlined in section 2.3.2.1. Nevertheless, an important deviation becomes evident in the ultimate step of the project. In contrast to the Water-Scrum-Fall method, which transitions to a conventional project approach in its final stages, the

Waterfall-Agile model maintains its commitment to the Agile framework until its completion.

The Waterfall-Agile approach involves scoping the project plan and planning the initial Agile sprint before the project officially begins.

As depicted in Figure 6, the development, design, implementation, and testing phases all adhere to Agile methodologies. In each iteration, requirements are outlined, customer feedback is actively asked, tests are carried out, and adjustments are made accordingly. The implementation within each distinct phase reflects a highly Agile approach, contributing to the reduction of delivery timelines and enabling the early collection of feedback to enhance alignment with customer requirements. The development and testing processes take place within concise Agile sprints, frequently employing methodologies such as Scrum.
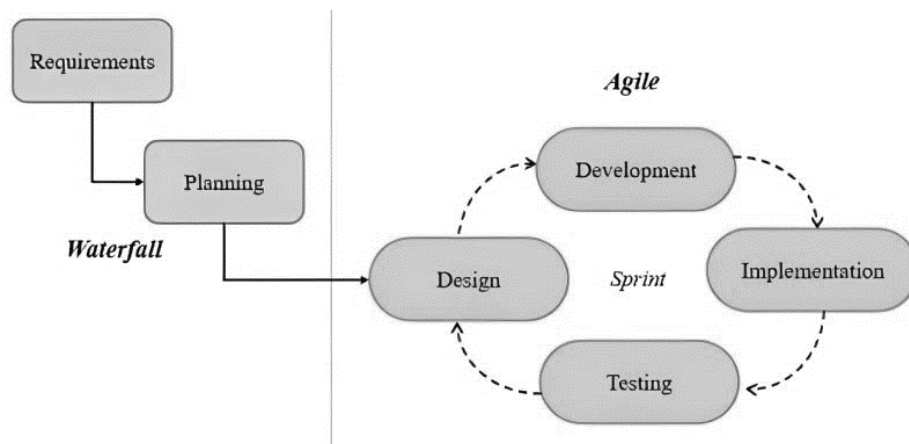
Figure 6 - Waterfall-Agile diagram presented in Hybrid project management – a systematic literature review

The distinctive aspect of this hybrid method is in the absence of a predefined specification regarding the exact point, timing, or method of transitioning from traditional planning to Agile implementation. This determination is often made based on the project. Furthermore, it is possible that a project may initially be defined and planned to use an Agile approach, only to be later developed and implemented through traditional

procedures. The flexibility in choosing the integration points reflects the adaptable nature of the Waterfall-Agile model.

2.3.2.4. Agile-Stage-Gate model

The Agile-Stage-Gate approach is a hybrid project management methodology that merges the structured phases and gates of the traditional Stage-Gate process with the flexibility of Agile's self-organized teams and short cycle iterations.

In this methodology, each project stage is advanced on both tactical and operational sides. As it is possible to see in Figure 7, the traditional and Agile methodologies run simultaneously, enabling strategic decisions to be made through the Stage-Gate process, while Agile leads operational decisions. This process aligns with a superior Stage-Gate process, with standard phases and a flexible number of Scrum iterations contained within the stages. The Agile-State-Gate methodology is designed for teams to perform activities simultaneously.
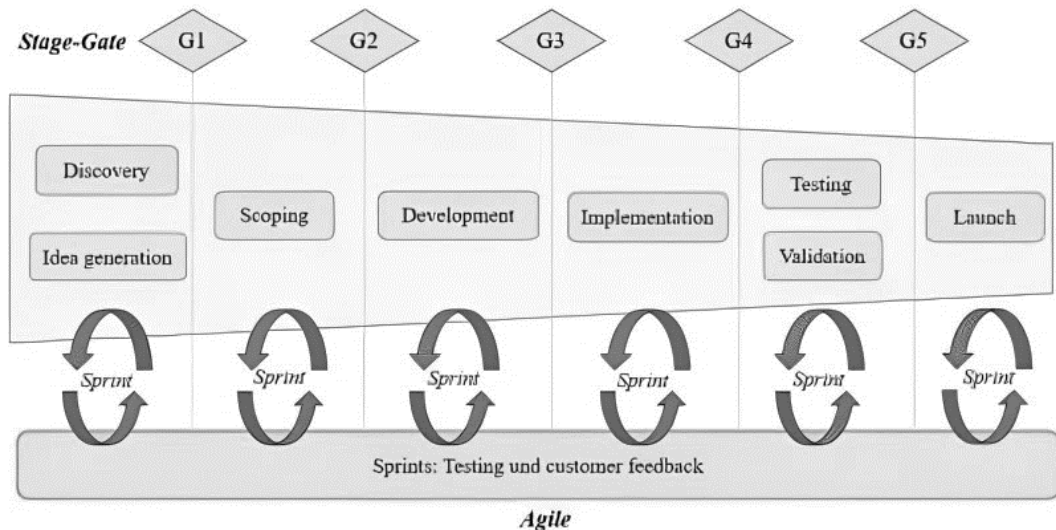
Figure 7 - Agile-Stage-Gate diagram presented in Hybrid project management – a systematic literature review

In the Agile-Stage-Gate method, each project phase is segmented into brief, time-bound increments known as "sprints", generally lasting from one to four weeks. The interpretation of "sprint" varies across different methodologies. In the traditional Agile approach, the objective of a sprint is to release new products or product features. This contrasts with the rigid nature of the Stage-Gate process, which necessitates more time to go through all the required stages and gates. However, in Agile Stage-Gate, sprints are focused on producing tangible outcomes at each stage. These outcomes can be evaluated, given feedback on, and be approved by users at various gates. The aim of each stage is not a final product, but a near-completion deliverable that, once approved, allows the project to go to the next stage in the process.

The Agile-Stage-Gate model was created to address the limitations of the traditional Stage-Gate process, which has been critiqued for its linearity, rigidity, and bureaucratic complex environments. This hybrid methodology addresses these limitations by integrating Agile sprints into the development process, replacing conventional project management tools such as Gantt charts, milestones, and critical path planning with Agile tools and methodologies. The objective is to obtain agility and speed while keeping the beneficial structures inherent in the Stage-Gate process.

2.3.3. Hybrid Advantages

Hybrid project management methodologies, by integrating Agile and conventional methods, facilitate the development of a customized approach that take advantage of the strengths of each method. Especially, the hybrid approach addresses a major challenge within the Agile framework: the lack of structure and the initial planning. In contrast, after the planning phase, it not only resolves this issue but also presents a considerable advantage by offering greater flexibility when compared to the Waterfall method. This balance between structure and adaptability is the key strength of hybrid methodologies.

The principal benefits of hybrid methodologies, as reported in *Hybrid project management – a systematic literature review*, are articulated below.

By including Agile components into the implementation process, hybrid methodologies provide a significant level of flexibility. This makes it possible to respond quickly to any

changes that can arise in the setting of generally constant requirements. Additionally, it facilitates the integration of new needs or changes in priority, without necessitating a complete reorganization of the project.

The motivation that the hybrid technique inspires in project teams is an interesting result. Team members are empowered to take responsibility for the project's objectives when traditional leadership roles are removed. This not only increases their motivation but also helps them develop personally in terms of their social and professional skills.

The hybrid approach offers a wide range of methodologies that can be customized to suit the nature and status of the project. This adaptability not only results in better project's outcomes, but also promotes faster target completion and reduced costs.

The route toward achieving the project's objectives might not be completely clear from the beginning of the project. However, the project's objective plan may be gradually defined thanks to the hybrid method. Even with long-term planning of duration, expense and milestones, this gradual achievement of goals is feasible. Because it can deal with changes and uncertainties along the way, the hybrid method offers a dynamic and adaptable direction to project success.

2.3.4. Hybrid Disadvantages

As proceeding with the examination of the Reiff et al.'s paper, it is important to be aware of the related disadvantages and difficulties despite the many benefits of the hybrid methodologies.

The requirement for the project management and team members to have an extensive understanding of both Agile and traditional methodologies represents a considerable challenge. High methodological expertise is required for each person involved in the project. To completely realize the benefits of the method, for people it becomes essential to select the right tool and then use it appropriately. As a result, the need for familiarization and training has grown.

Additionally, the hybrid method necessitates an elevated level of interaction and transparency. Constructive negative feedback is valued within this context, promoting a

collective effort in looking for solutions. Risks and mistakes are addressed directly, encouraging a proactive approach to continuous improvement and learning.

Hybrid project management enables decision-making based on the most data available by managing information openly. But doing so requires strong communication, particularly between different approaches. As a result, there is an augmentation of administrative work, such as producing relevant reports and documentation.

Since it essentially unites two opposite techniques, compromise will need to be reached by the two sides making concessions, especially with regard to requirements and adaptability.

Lastly, all iterations have to follow the pre-established financial and scheduling restrictions.

3 Methodological approach

This chapter explains how the thesis was developed, from the initial approach to the detailed analysis of the problem.

The opening section of the chapter provides an introduction of the company, which gives the context for the interviews that were conducted. Every subsequent section is used to describe a step that has been achieved. A six-step process was used to do the study:

1) Literature review
2) Macro-topics identification and categorization
3) Structured interview frame
4) Respondents' identification
5) Interview execution
6) Data analysis

3.0. Company background

In order to facilitate a deeper understanding of the scenario, an examination of the organization under analysis is necessary. For confidentiality purposes, the company is anonymized and referred to as "XYZ" throughout the thesis.

XYZ is a large-scale corporation with a workforce exceeding twenty thousand. It operates globally, with production sites and headquarters located in various parts of the world. The advent of the pandemic has increased the hybrid work models, leading to a greater collaboration between employees from different countries on the same projects, despite the geographical distances. The employee base at the studied organization is a blend of newcomers and those who have dedicated their entire careers to the company.

To fully comprehend the shift that XYZ is currently experiencing, it is essential to examine the company's initial adoption of the Agile methodology and the first actions taken towards this change. In 2019 the company embraced a distinctive Agile-based methodology, creating a customer-centric, value-driven project delivery. This method is centered on achieving project outcomes and quickly delivering value in small,

manageable pieces through an independent team. The aim is to customize this framework for each project, thereby remove organizational and functional barriers.

In order to put this special framework into practice, the organization has established a specific group. This team is made up of a varied mix of people from different departments who, in addition to their regular jobs, contribute to the framework.

Essentially, the methodology requires that the team must present a measurable outcome to the customer every ninety days, thereby demonstrating progress and continuing to build upon it. This strategy resulted in the cessation of certain projects that were not aligned with the business objectives, avoiding potential financial losses.

For this methodology, a comprehensive training program was developed. It covers the fundamentals of the Agile approach, along with more specific instructions on how to perform certain tasks, such as utilizing Azure DevOps. The IT and Digital departments have received this training to guarantee the knowledge of the XYZ's framework.

3.1. Literature review

The first step for this thesis was to conduct an extensive literature review and identify more than twenty articles that address the issue of the shift to Agile in non-software development companies. These articles were retrieved mostly from Scopus and Google Scholar, applying some criteria, such as date, language, or document type. The objective was to examine only articles in English that were recent, thus from 2015 onward, and that were not part of conferences. Furthermore, only open-access and non-paying articles were used.

Whenever an article was relevant to the topic of interest, it was read, saved, and entered into an Excel summarizing: "Date", "Article name", "Who published it", "Writers", "Objective", "Methodology", "Results", "Context".

3.2.   Macro-topics   identification   and categorization

The summarizing document facilitated the identification of common macro-topics among multiple articles. Only when a macro-topic appeared in more than five articles, it was considered significant for the analysis. Based on the defined criteria, twelve statements represent the identified macro-topics. These statements have been properly grouped in four categories order to permit an in-depth examination of that particular company. The categories are as follows:

1) Prerequisites for Agile Adoption
2) Agile Team Structure
3) Challenges in Agile Transition
4) Success Factors in Agile Transition

Each category is elaborated upon in the subsequent sections, providing a generic overview of the category's theme, followed by a detailed explanation of the individual statements that constitute it.

3.2.1. Prerequisites for Agile Adoption

According to the examined studies, Agile methodology works most effectively in situations characterized by innovative projects, challenging problems, and ambiguous requirements. These conditions illustrate scenarios in which Agile outperforms traditional Waterfall techniques.

More information about each macro-topic in this category are provided below.

- **Agile approach is best suited for innovative projects.**

  According to the Harvard Business Review *Agile at Scale*, "Agile teams are best suited to innovation—that is, the profitable application of creativity to improve products and services, processes, or business models" (Rigby et al., 2018). In fact, by using a flexible and collaborative approach to project management, Agile teams are well suited for innovative projects, which require creating and applying original and valuable ideas to improve products, services, processes, or business models.

The purpose of this sentence is to compare the effectiveness of managing innovative projects using an Agile approach.

- **When requirements are unclear it is better to use Agile.**

This sentence expresses the idea that Agile methodology is beneficial for dealing with change and uncertainty, which are common challenges in projects with unclear requirements. Agile teams embrace changes in requirements, even late in development, and use them as opportunities to improve the product or service. This idea is also aligned with one of the values of the *Agile Manifesto*, which states "Responding to change over following a plan" (Beck et al., 2001).

The purpose of this sentence is to assess the level of agreement of the respondents with the notion that Agile is the best choice when the requirements are likely to change.

- **Agile framework is best suited to solve complex problems.**

The sentence aims to explore how an Agile approach enables solving a large and complex problem by applying the following steps: splitting the problem into modules, developing solutions for each module through quick prototyping and regular feedback, and combining the solutions into a unified whole. This explanation is based on what is stated in the report *Agile at Scale* too.

This question aims to examine the suitability of Agile methodology for complex projects compared to a more traditional approach.

3.2.2. Agile Team Structure

This section investigates the characteristics of the team in the context of Agile adoption. According to studies from reference materials it is preferable if the team is small, multidisciplinary, and has more autonomy. The conventional hierarchical system is replaced by a flatter structure, which encourages equal collaboration among all team members.

In the following part, a more detailed explanation of the individual statements that constitute the "Team Structure" category is provided.

- **To be more successful, the Agile model requires to build teams that are small and multidisciplinary, with a greater autonomy.**

  This topic is also very common among the articles analyzed. The report *Leading Agile Transformation* states that some of the principles that guide all Agile methods of working are "build teams that are diverse, empowered, and connected. Small, dynamic, and high-performing teams are the main organizing units of Agile organizations" and also "multidisciplinary teams that can help break down silos" (De Smet et al., 2018).

  When discussing team sizes, it's important to establish a threshold that delineates a small team from a large one. The Harvard researcher Richard Hackman explored this topic in his work, *Effects of Size and Task Type on Group Performance and Member Reactions*. His research findings suggest that the ideal team size falls between four to six members. He further proposes that a team should not exceed 10 members. Therefore, for the purpose of this discussion, 10 is considered as the upper limit for what constitutes a small team. Teams exceeding this number are classified as large.

  The purpose of this question is to see if the respondents agree that Agile methodology is more effective when using small teams with different skills and more autonomy.

- **The hierarchical structure is replaced by a more horizontal one (more team collaboration).**

  This point explores whether Agile leads to a more horizontal structure.

  The idea in the articles is that with this methodology, the leadership is shared, and the team members are essentially at the same level, without the typical hierarchy of the Waterfall model. This way, Agile promotes more collaboration within the team, as everyone is equally accountable for completing the work.

3.2.3. Challenges in Agile Transition

The purpose of this section is to look into the key problems encountered while transitioning to Agile methodology. According to the study, these challenges are primarily focused on human elements, identifying the complexities of such a change, particularly for established organizations. It also emphasizes that the successful implementation of Agile sometimes requires a hybrid approach, combining Agile with traditional structures for certain functions.

The following sentences are the ones included in the category of challenges during the shift to Agile.

- **Most challenges of the transition to Agile are related to the human aspects (change management).**

   The question explores the challenges that the interviewees faced from company employees who resisted changing their traditional way of working.

   The McKinsey Company's report *The journey to an Agile organization* remarks on the importance of culture and change management for the transformation in a company. It also recommends to "coordinate and communicate transformation, remove roadblocks, and start culture refresh" (Brosseau et al., 2019) for achieving success.

- **Moving to an Agile operating model is hard, especially for established companies.**

   Some articles underline that "managers experience severe difficulties with implementing agility across their organizations in large-scale settings" (Hutter et al.,2023). In fact, Agile is a shift that involves moving away from rigid rules and procedures. This can be hard for large organizations that have a long history of doing things in a certain way, and may face resistance from employees, managers, or stakeholders who are used to the traditional way of working.

The purpose of this question is to assess whether the interviewees think that the transition is harder for an established company, which in *FasterCapital*[6]'s website is defined as "business that has been operating for a number of years and is well-known in its industry or market".

Investigating people's perspectives can be interesting, particularly when examining whether the challenges faced are solely due to the size of the company. The larger the group, the more mindsets that need to adapt. Additionally, the company's years of establishment could play a role. It's often perceived that employees who have maintained the same work methods for many years may find it more difficult to adapt to change, primarily due to their comfort and familiarity with existing procedures.

- **Some functions may require a combination of Agile and traditional structures, rather than a complete shift to Agile.**

    As the article *Agile at Scale* suggests, not every function can benefit from Agile methods; some activities are better suited for other approaches. However, when Agile and non-Agile teams coexist in an organization, they need to be aligned and supported by each other, otherwise they will encounter bureaucratic barriers or lack of collaboration between operations and innovation teams. This will result in organizational friction that will affect the performance and satisfaction of both teams. Therefore, it is essential to make some adjustments to harmonize the non-Agile functions with the Agile ones.

    This answer allows the respondents to express their opinion about whether to adopt a full or partial Agile approach.

3.2.4. Success Factors in Agile Transition

Through analysis of reference sources, key factors crucial for effectively implementing Agile methodologies within companies have been determined. At the core of Agile's

---

[6] FasterCapital is an online incubator and accelerator that upports startups

success there is the adoption of a specific mindset. It goes beyond simply following a set of rules; it triggers a paradigm shift.

Furthermore, for an organization to really embrace Agile, it must invest in team training. Agile is not a standardized solution, it demands an extensive knowledge of its concepts and practices. Agile coaches play an important role in guiding teams through the transformation. They are experienced professionals who understand the particulars of Agile methods. Their presence guarantees that Agile principles are integrated into the organization's structure. In addition, having internal experts who have successfully understood the methodology, motivates others and establishes an example for best practices.

Lastly, Agile grows with collaboration, particularly with the client. By including customers throughout the development process, teams can refine their ideas and ensure that the end result meets client requirements.

The following sentences provide a more detailed explanation of the difficulties encountered during the transition period.

- **If the team stays focused and iterates with the customers, there's a much better possibility that it will deliver the right product.**

  This last point is common to almost all the articles, and it reflects one of the four values of the *Agile Manifesto*: "Customer collaboration over contract negotiation" (Beck et al., 2001). In the Agile methodology, customer interaction is essential because it enables the Development Team to understand and meet the customer's expectations. The team involves the customers in every stage of the project, showing them what they are building, testing, validating their assumptions, and adapting their plans based on the customers' feedback. This way, the team can avoid spending time and resources on features or solutions that the customer does not value or need and focus on delivering quality and value. Therefore, it is important to have a customer-centric approach and to iterate often with the end customer or with the Product Owner.

  The purpose of the question is to investigate how often the respondents interact with customers.

- **Agile is a mindset.**

  The Agile mindset is a vague concept, but it involves some common characteristics, such as trust, continuous improvement, willingness to learn and adapt. Agile is not only a project management method with certain practices and routines, but also a mindset, a behavior, and an attitude that individuals, teams, and organizations should adopt.

  In this question the goal is to evaluate the importance of developing an Agile mindset for the respondents to succeed in the Agile transformation, and the degree to which this mindset is widespread in the company according to them.

- **Any successful Agile transformation needs to train and recruit a team of Agile coaches and new staff already familiar with the approach.**

  The article *Human Aspects of Agile Transition in Traditional Organizations* emphasizes the need for training to succeed in Agile: it mentions "staff's recruiting", "investing in training, not only for the project members, but also for the members of all departments, including the ones of higher hierarchical levels" and "hire an external coach to support this transition, by guiding the organization through this process and providing feedback about the ongoing process" (Pinton et al., 2020).

  The aim of this question is to find out how much training the interviewees received and how much they value the role of Agile coaches or new staff already familiar in supporting the team.

- **Top leadership must embrace Agile values to scale it up successfully through the organization.**

  The report *Leading Agile Transformation* by McKinsey Company emphasizes that leadership is even more vital in Agile organizations. Leadership and the culture that leadership creates are the main barriers and enablers of successful Agile

transformations. Therefore, having strong support from the top is crucial for achieving success during the transformation.

The question aims to assess how much the leadership is facilitating and promoting the Agile transformation in the company.

3.3. Structured interview frame

After the macro-topics were identified, the interview was composed. The interview guide can be found in Table 7.

- Respondent number:
- Position in the company:
- Department:
- Years in the company:

- Considering all the projects you have participated in for XYZ, more or less how many of them were organized following Agile project management?
    - All
    - Most
    - Few

- What do you think of these conditions for Agile (compared to Waterfall)? How do you rate them based on your experience from 1 (I don't agree) to 5 (I completely agree) in your projects? Why?

    Prerequisites for Agile Adoption
    1) Agile approach is best suited for innovative projects.
    2) When requirements are unclear it is better to use Agile.
    3) Agile framework is best suited to solve complex problems.

    Agile Team Structure
    1) To be more successful, the Agile model requires to build teams that are small and multidisciplinary, with a greater autonomy.
    2) The hierarchical structure is replaced by a more horizontal one (more team collaboration).

    Challenges in Agile Transition
    1) Most challenges of the transition to Agile are related to the human aspects (change management).
    2) Moving to Agile is hard, especially for established companies.
    3) Some functions may require a combination of Agile and traditional structures, rather than a complete shift to Agile.

| **Success Factors in Agile Transition** |
| 1) If the team stays focused and iterates with the customers, there's a much better possibility that it will deliver the right product. |
| 2) Agile is a mindset. |
| 3) Any successful Agile transformation needs to train and recruit a team of Agile coaches and new staff already familiar with the approach. |
| 4) Top leadership must embrace Agile values to scale it up successfully through the organization. |
| • What is your experience with XYZ Agile project delivery methodology? What do you think of it? Do you think it was successful or not? Why? |

Table 7 - Interview guide

The data in Table 7 shows the initial questions asked to the respondents: their identifier, role, department, and number of years of working in the company.

The respondents also report how many projects they have done using the Agile approach, which helps to evaluate their level of experience with Agile.

The next part of the interview consists of twelve statements about the main topics discussed in section 3.2., which the respondents have to rate from 1 to 5 based on their agreement and experience, where 1 is strongly disagree and 5 is strongly agree.

The interview ends with an open-ended question, which asks the participants to share their opinions and experiences about the XYZ's internal initiative of adopting Agile. The aim of the question is to evaluate the effectiveness and challenges of XYZ's internal framework and to identify areas for improvement.

3.4. Respondents' identification

Once the interview frame was prepared, the important thing was to identify the people to interview. To collect the greatest number of interviews, each person interviewed, once the questions were finished, was asked to suggest some names of people who has used Agile within the company. Obviously, Agile in the company is mostly used in the IT department, so in the interview's respondents there is a prevalence of IT employees.

However, the aim was to maintain a certain balance in terms of newer people in the company and more experienced people, as shown in Table 8.

Years in the company	Number of respondents
< 1 year	7
1 - 3 years	9
3 - 7 years	6
> 7 years	6
Total	28

Table 8 - Respondents' years of experience within XYZ

In Table 9 it is possible to see the list of participants, who for privacy reasons are kept anonymous, with their position, department, and years of experience in the company.

Respondent	Position	Department	Years in the company
1	Digital Integration Director	Digital	> 7 years
2	Lead Auditor	Internal Audit	1 - 3 years
3	Sr. IT Project Manager/Scrum Master	Information Technology	1 - 3 years
4	OCM Change Partner	Information Technology	< 1 year
5	Product Manager, Sustainability	Information Technology	> 7 years
6	PMO Analyst	Information Technology	1 - 3 years
7	Program Delivery Manager	Information Technology	3 - 7 years
8	Digital Business Partner	Digital	3 - 7 years
9	Sr. Project Manager/Scrum Master	Information Technology	3 - 7 years
10	Senior Manager, SAP CoE	Information Technology	1 - 3 years
11	Director Planning & Integration EMEAI	C & LCS	3 - 7 years
12	Software Engineer III	Digital	< 1 year
13	Customer Advocate	Customer & Commercial Excellence	< 1 year
14	Product Mgr. Engineering & Capital Proj.	Information Technology	3 - 7 years

15	Data Scientist Supervisor	Digital	1 - 3 years
16	Product Team Manager, Treasury,Risk&Tax	Information Technology	> 7 years
17	Sr. Digital Project Manager	Digital	1 - 3 years
18	ADir., Global Business Processes	Global Supply Chain	> 7 years
19	Customer Centricity Project Director	Customer & Commercial Excellence	> 7 years
20	Customer Project Owner	Customer & Commercial Excellence	1 - 3 years
21	Project Manager/Scrum Master	Information Technology	< 1 year
22	Customer Advocate	Customer & Commercial Excellence	< 1 year
23	Chief Digital & IT Officer	Digital and Information Technology	< 1 year
24	Sr Mgr Digital Project Program Delivery	Digital	> 7 years
25	Sr. Project Manager/Scrum Master	Information Technology	3 - 7 years
26	Team Lead, Results Delivery	Customer & Commercial Excellence	< 1 year
27	Customer & Comm Centricity Champion NA	Customer & Commercial Excellence	1 - 3 years
28	UI-UX Designer Developer	Digital	1 - 3 years

Table 9 - Respondents' characteristics

3.5. Interview execution

With the names of the potential people to interview, the approach was to send an introductory email in which the thesis work was also briefly described, and availability was requested, preferably in person. As people responded, meetings were arranged, with the goal of completing data collection in less than a month.

The questions were also attached to the introductory email, to allow interviewees to review them in advance if they wished.

The meeting was conducted either in person or remotely, depending on the geographical location of the respondent. The purpose and scope of the thesis work were explained in detail, as well as the structure of the interview. The interview was recorded with the consent of the respondent.

The type of interview chosen is semi-structured. In fact, the researcher had a predetermined list of topics and questions to cover, as seen in section 3.1.3., but during the conversation further questions were also posed to delve deeper into themes or issues that the respondent was mentioning.

3.6. Data analysis

After completing the data collection process, the next step is to analyze the data. The analysis process consists of the following steps:

1) Data summarization;
2) Coding;
3) Triangulation with other data;
4) Interpretation;

The next subsections explain these steps in more detail.

3.6.1. Data summarization

The next step after the interview was to transcribe the recording using a specific software. The software-generated text was then verified by listening to the recording and making the necessary corrections. Once the transcription was done, the text analysis began.

An Excel file which summarizes the respondents' answers was created. It shows their scores for each question and the number of Agile projects in the company. This file helped to identify the questions with higher or lower scores overall, revealing strengths and weaknesses of the company.

3.6.2 Coding

One of the essential steps in qualitative data analysis is coding, which involves examining the data closely and assigning labels or concepts to the significant parts of the text. Coding helps the researcher to identify the main themes and patterns in the data and to relate them to the research question and objectives.

Coding can be done in different ways, depending on the researcher's style and approach, but it generally consists of "examining data line by line or paragraph by paragraph (whatever is your style) for significant events, experiences, feelings, and so on, that are then denoted as concepts" (Corbin et al., 1998). A code is a word, a label or a concept and it can be descriptive, interpretive, or theoretical, depending on the level of analysis.

Codes can be derived from the interviews itself or from existing literature or theory. The researcher can label the important information in the text using its own words or using the words of the participants. The latter are called "in vivo codes" (Glaser et al., 1967) and they reflect the language and perspective of the participants. They can be used as a starting point for further analysis, or they can be combined with other types of codes, such as conceptual ideas or academic theory terms.

3.6.3. Triangulation with other data

After the first coding of the data, the researcher should revisit the theory and triangulate the data with the theory. By triangulating the data with the theory, the researcher can enhance the credibility and rigor of the analysis and identify the key concepts and relations in the data.

The researcher should then go back to the data and refine the categories and relations based on the theoretical triangulation. This may involve adding, deleting, merging, or splitting the codes and categories, and establishing the connections and patterns among them.

3.6.4. Interpretation

The researcher should also examine any inconsistencies or conflicts between the data from the interviews and the theory and try to explain them.

The aim of this final phase is to draw conclusions based on the triangulated data.

4 Findings

Table 10 provides a high-level overview of the prevalence of the Agile methodology across the company's projects. Obviously, the sample of interviewees is constructed in such a way that it excludes individuals who have never used this methodology, as their input would not have been relevant for this survey.

How many projects organized with Agile?	All	Most	Few	Total
Frequency	4	11	13	28

Table 10 - Answers to "How many projects organized with Agile?"

As indicated in Table 10, a small number of respondents, particularly those from the Advanced Analytics team, answer "All" to the question, as they always use Agile in their projects. The remaining respondents are evenly split between those who primarily execute projects using the Agile approach and those who, in the context of all the projects they were involved in at the XYZ company, only used this methodology for a minor portion.

It is important to underline the growing adoption of the methodology throughout the company, although its usage is more prevalent in some teams than others and is not yet the dominant practice in many departments.

4.1. Prerequisites for Agile Adoption

The analysed literature highlights that the Agile approach is particularly advantageous in environments characterized by ambiguous specifications, complex problems, and innovative projects. While these conditions are partially confirmed through interviews, some aspects are enhanced or contradicted.

In projects requiring investigation, exploration, and experimentation, Agile emerges as the more effective technique. However, its efficacy depends on the industry or business

type, as it necessitates an environment in which it is possible to fail without causing dangerous consequences. Another element that is mentioned in the interviews is that it does not have to be part of a capital[7] or infrastructure project.

The interviews give mixed feedback on the condition of having unclear requirements. Some emphasize the need to have a clear vision of the expected outcomes, while others suggest that traditional or hybrid methods are more suitable when dealing with unclear requirements.

To implement Agile effectively, the company must avoid or dissolve the steering committees, which implies significant changes in the organization.

The need of solving difficult problems is emphasized, with a focus on the need to break down the problem into smaller and easier components. However, some respondents argue that the choice of project management approach should be based on the type of project rather than its degree of complexity.

Moving forward, each specific question regarding the prerequisites for Agile adoption is individually examined, considering the perspectives of the interviewees.

- **Agile approach is best suited for innovative projects.**

Rating	1	2	3	4	5	Total
Frequency	0	1	4	4	19	28

Table 11 - Answers to "Agile approach is best suited for innovative projects"

Based on the data presented in Table 11, it is evident that Agile is the most suitable approach for innovative projects, according to almost all respondents. Indeed, only five respondents out of the entire sample disagree or are neutral.

The term "innovative" is interpreted differently by the various candidates. Some interpret it as something new, for example using Interviewee 14's terms: "Something new in terms

---

[7] A capital project is a long-term, capital-intensive investment aiming to expand, or improve a capital asset. These projects are distinguished by their huge scale, significant expenses, and extensive planning in comparison with other investments.

of technology and approach […] a proof of concept basically", while others defined it as something which others have not done before.

Many respondents emphasize that innovative projects are based on research, brainstorming within the team, exploration, and experimentation. They believe that the investigative nature of such projects is very much suited to the Agile framework. In fact, this approach allows the team to build small pieces, check them, and tweak them if needed, proceeding in an iterative manner.

The extensive analysis of various literature, with a special focus on the perspectives from Rajamani and Patrucco et al., affirms the beliefs of survey participants. The research resources indeed highlight the capacity of Agile methodologies to inspire individuals to present innovative ideas, embrace risks, and concentrate on experimentation. In this environment, team members are empowered to experiment, make mistakes, and face no adverse consequences. This mindset promotes a positive attitude towards failure, considering it as an opportunity for growth and progress instead of something to be feared and avoided.

During the interviews, a concept emerged that can integrate the concepts from the literature that are just discussed. The core of this idea is the notion of "failing fast", which highlights the benefits of the speed at which the failure can be identified. Basically, while attempting to prove something, it is more efficient to determine early whether the proposed solution is ineffective rather than spending significant time and resources only to realize later that the chosen answer is not effective or not the desired one. Indeed, based on the feedback provided by the interviewees, the key benefit is the speed at which teams realize failures and immediately shift to an alternative solution.

The preceding section underscores the areas of consensus among respondents. Conversely, the following ideas represent the aspects where respondents exhibit the greatest divergence of opinions regarding this question.

Examining Table 11 reveals that sixteen, over half of the sample, rate the statement as 5, indicating full agreement. These participants, based on the projects they have participated in at XYZ, firmly believe that Agile is more successful than Waterfall in any scenario

involving innovative projects. For instance, Candidate 24, who has been in the company for a long period, remembers "Many examples in which we were trying to solve a problem or just achieve something by trying a new application or trying some sort of software and we spend a lot of time and effort […] just to figure out that this is not the right answer for this problem. […] So, approaching those things in an Agile way, would have better". Moreover, Candidate 3 emphasizes that, in his view, Agile lacks effectiveness in non-innovative projects, underscoring the notion that Agile is meaningful only in the context of innovation-related projects. This notion has been emphasized a bit also in the literature, as indicated in *The Importance of Innovation in Agile Project Management*, where the conclusion highlights that "for agile projects to succeed there should be some degree of innovation that is consistent throughout the life of a project" (Peege et al., 2021).

Continuing the analysis of Table 11 reveals that seven respondents have assigned a score of 4. These people believe that Agile is superior to Waterfall when it comes to innovative initiatives, but they also recognize a limitation. They state that there are situations in which the Agile method is not more successful than the conventional one. Candidate 14 provides an illustrative example, stating: "Waterfall is mainly used for traditional projects like capital projects, infrastructure projects, like if you want to implement a 5G network Wi-Fi connection […] you can't use Agile delivery for that […]. Everything is defined from A to Z. Agile has different types of archetypes, it needs to be suited for the types of projects that you're delivering. Not everything is Agile."

A minority of interviewees express neutrality regarding this question by assigning a score of 3. They assert that Agile is effective for all project types, regardless of whether they are innovative or not. Candidate 5 also provides few examples from his experience, illustrating how his team successfully adopted an Agile approach even in non-innovative projects.

The final perspective regarding this question comes from a lone Candidate who assigns a score of 2. According to this Interviewee, the opinion is that for any project, whether innovative or not, a combination of Agile and Waterfall methodologies is consistently more advantageous. The following are the sentiments expressed by this person: "In innovative projects, I think the tendency is to do it Agile, but I really think the tendency

should be, let's keep an Agile mindset. When I say an Agile mindset, I mean iterative thinking […]. It's a lot about we diverge, we think together, we co-create, we converge on other points. […] But to say I'm strictly like 'Let's do stand ups every day and two-week sprints' […] I don't think that works really".

- **When requirements are unclear it is better to use Agile.**

Rating	1	2	3	4	5	Total
Frequency	0	4	6	4	14	28

Table 12 - Answers to "When requirements are unclear it is better to use Agile"

As indicated by the majority of the 5s in Table 12, half of the participants concur that Agile is superior to Waterfall when the specifications are not well-defined. They contend that Agile surpasses Waterfall in terms of complexity, time, and costs. This framework enables to pivot, test, and change rapidly if something fails. Those who give this question a score of 5 support Agile's effectiveness in this situation and believe that the company really employs this approach when the requirements are vague.

Respondents who assign a score of 4 express their agreement but reiterate the notion that Agile may not be the optimal choice in all scenarios. In addressing the question, Candidate 16 introduces an inspiring perspective that is not present in the analyzed literature, expressing: "The project sponsor and project owner are very clear on what this product is trying to do. But as a team, we do not know exactly what to do. So, it's the difference between what and how". This observation reveals an essential aspect: project sponsors and product owners must have a clear knowledge of the product vision ("what"), even in the presence of ambiguous requirements. Despite this, there is a lack of understanding within the team over the details of the implementation ("how"). This dichotomy emphasizes how important it is for project sponsors, product owners, and the team to collaborate and communicate effectively in order to ensure uniform comprehension and effective execution.

This perspective is notably applicable within the Agile framework, which demands the creation of a minimum viable product[8]. However, the realization of an MVP necessitates a clear comprehension of the intended deliverables. Consequently, when requirements are too ambiguous and the desired outcome is uncertain, the Agile approach may face difficulties in establishing an MVP. In such scenarios, as suggested by Interviewee 23, it becomes crucial to start a systematic process of clarification, by revisiting the ideation phase. This initial groundwork serves as an essential step in defining project requirements and providing a clearer direction towards the solution. It ensures a more structured progression of the project, even when starting with unclear requirements.

Another perspective comes from those who vote 3. They agree with the sentence, but they observe that the company still uses Waterfall in many cases, even when the requirements are unclear. They attribute this to the pressure from the steering committee, who want to know the exact timeline and scope of the project, which Agile cannot provide. Interviewee 24 shares an example from his experience: "Situation where the requirements are changing or are unclear, if we would have taken an Agile approach […] that would have been a completely different approach and we would have completed the project, a lot sooner and really do only what we needed to do to comply, versus having these 18 month project that at the end deliver something more than what was necessary". He emphasizes the better results that would have been obtained in this instance, in his opinion, if Agile had been chosen instead of the company's chosen strategy.

In literature discussions, the role of a steering committee within Agile contexts receives limited attention. Although the theory suggests that steering committees may not hold as much importance or might not exist within Agile environments, responses from participants suggest that these groups are still present in projects implemented with Agile at XYZ and potentially in other organizations as well.

A web research on the role of steering committees in Agile contexts gives limited results. For instance, the Project Management Institute acknowledges the lack of extensive literature on the subject. In a notable post on the blogging platform Medium titled *We*

---

[8] An MVP (Minimum Viable Product) is the initial version of a product that contains just enough features to be usable by early customers.

Scrum, but we also have Steering Committees, Willem-Jan Ageling, an expert in the Agile domain, provides enlightening insights despite limited available information. In his piece, Ageling sheds light on a crucial element of Agile methodology. He explains how the conventional duties of a steering committee, such as reviewing timelines, budgets, potential capabilities, and market positioning for upcoming product releases, are integrated into the Sprint Review process. The author advocates for a shift in the approach: once Sprint Reviews are in place, the need for a distinct steering committee dissipates. Instead, it is recommended to invite key stakeholders directly to the Sprint Review to enhance transparency. This method eliminates the redundancy of hosting two highly comparable events with separate decision-makers and unrelated outcomes.

Lastly, a few interviewees who vote 2 disagree with the question. They believe that unclear requirements should not be an excuse to use Agile, but rather a reason to spend more time on gathering and clarifying the customer needs. They favor a hybrid or traditional approach that would ensure a clear vision and plan before starting the development. Interviewee 10 warns that using Agile with unclear requirements could lead to "multiple iterations of getting to clear requirement and wasting a lot of resources and effort by doing so" and mentions how his team uses a traditional method for the initial phase and then switches to Agile for the development phase.

This concept, which is absent in the analyzed articles, contradicts the prevailing notion in the literature. The reference materials repeatedly emphasize Agile's adaptability to changes, emphasizing its ability to start projects with ambiguous requirements and iteratively refine them over time. However, the concept outlined in the literature tends to ignore adequately accentuating the subsequent costs and time implications associated with each modification. As noted by Candidate 10, initiating projects with too unclear requirements carries the risk of needing gradual definition while still investing significant time and resources into these adjustments.

- **Agile framework is best suited to solve complex problems.**

Rating	1	2	3	4	5	Total
Frequency	0	4	14	7	3	28

Table 13 - Answers to "Agile framework is best suited to solve complex problems"

Proceeding with the examination of the circumstances that are more conducive to the use of Agile, as depicted in Table 13, the findings reveal that only ten respondents agree that this methodology surpasses others when addressing complex problems. They hold a common belief that projects tend to change due to unexpected challenges that may arise along the way. Consequently, this group of candidates values the Agile method for its adaptability and iterative nature, which allows for continuous improvement. Furthermore, they find it beneficial to decompose the complex project into smaller, simpler components and apply Agile to each, thereby making the project easier to manage and execute.

Upon analyzing the responses of those who disagree with the given statement, a visible pattern emerges from the data presented in Table 13. Half of the interviewees express a neutral stance, assigning a score of 3 to the question. Within this score, two primary perspectives come to light.

The prevailing perspective, held by the majority, advocates for a neutral position grounded in the belief that the choice of a project management approach is dependent on the specific type of project rather than the complexity of the problem. These respondents underscore the notion that each framework, including Agile, carries its own set of advantages when confronted with complex situations. Their emphasis lies in customizing the approach to align with the unique characteristics of the project in question.

Conversely, a notable minority, represented by the second perspective, rejects the idea of a direct link between agility and complexity. This perspective is encapsulated by the statement of Respondent 16, who argues, "It's just humans' skills and ability that you need to solve complex problems. Agility has nothing to do with it". This statement underlines a concept that can't be found in the literature and is considered relevant to the

current analysis. Specifically, it highlights that addressing complex problems depends on human abilities, regardless of the approach used, whether Agile or another.

As indicated in Table 13, there are four individuals who disagree and assign the lowest scores. The dominant views among these dissenters can be summarized as follows. A small number of respondents advocate for a more conventional approach to complex problems, arguing that such issues necessitate a comprehensive plan and well-defined requirements from the beginning. Some participants also suggest a hybrid approach, applying Agile for specific phases, particularly testing, and Waterfall for the rest.

An observation made by the Customer & Commercial Excellence Department highlights a notable trend among its interviewees who emphasize their belief that Agile methodologies are currently not being utilized within the company to tackle complex problems. Particularly intriguing is the perspective expressed by Respondent 27: "I think in some ways Agile is conflicting with our company culture because we're a manufacturing company. […] If you move too quick in a manufacturing setting, people could get hurt, people could die". He posits that there is a pervasive safety culture emphasizing intentional slowness in aspects of the company's operations. Despite being a recent addition to the organization, this employee brings substantial expertise in Agile gained through numerous years of experience with other organizations. This individual observes XYZ's inclination to proceed cautiously, even in projects not related to safety, as a notable issue.

4.2. Agile Team Structure

While the literature frequently indicates the positive implications of small teams, interviews provide a more diverse representation. Some respondents believe self-organization, clear roles definition, and full-time dedication to the project are more important than the team size. Indeed, having a small group does not guarantee success. For example, a large team may have this size due to the presence of inexperienced people who require support from more skilled colleagues. In contrast, a team may appear small but being part of a too big extended team. In addition, large groups may include positions

that may not significantly contribute to the project's success. Studying concrete instances inside XYZ demonstrates that effective adoption of Agile approaches does not always necessitate a small team.

In terms of multidisciplinary team, it is widely accepted that subject specialists are an essential component of an Agile team.

In the context of greater autonomy, two primary opposite perspectives emerge. One viewpoint agrees with the concept of increased autonomy in Agile teams. However, a contrasting perspective suggests that despite being defined as "greater autonomy", the reality is often different. The necessity to consult a large number of individuals and align with the company's objectives limit the team's ability to make autonomous decisions.

Additionally, two contrasting viewpoints emerge regarding the notion of a more horizontal structure during Agile implementation. Some individuals agree, asserting that apart from strategic decisions necessitating lead, the organization encourages equality among all members. Conversely, others contend that an implicit hierarchy persists or argue that a horizontal structure can exist even with conventional approaches.

Below are the viewpoints presented by candidates regarding the two specific statements related to the team structure category.

- **To be more successful, the Agile model requires to build teams that are small and multidisciplinary, with a greater autonomy.**

The concepts of small teams, multidisciplinary, and increased autonomy have regularly appeared together in the literature. For this reason, a unique question has been created. However, to get interesting results, it is preferable to examine the candidates' responses with a distinct focus on each of the three concepts.

Initially, it is valuable to compare the perspectives of those emphasizing the greater efficacy of Agile in small teams with those asserting that Agile can function effectively in both small and large teams. The data presented in Table 14 illustrates the number of individuals who explicitly elaborate on this matter during the interviews.

Opinion	Agile works equally with small and large teams	Agile works better with small teams	Total
Frequency	8	12	20

Table 14 – Opinions about effectiveness of Agile in small teams

The following are the viewpoints of the eight individuals, as evident from Table 14, that collectively affirm the success of Agile regardless of the team size. As the size increases, coordinating collaborative efforts becomes more challenging due to the diversity of opinions, which can prolong decision-making processes. Some respondents attribute the success of Agile to factors beyond team size, such as the team's capacity for self-organization, clearly defined roles, and full dedication to the project. Existing literature has already underscored the importance of the first two aspects, highlighting the need for self-organized teams and that a "clear definition of roles and tasks […] ensuring individual accountability for the project tasks" (Patrucco et al., 2022) is essential. Despite this, the reference materials have not emphasized the crucial aspect of dedicating a team exclusively to a project.

Among the analyzed articles, only the study by Pinton et al. (2020) brings to light the significance of a dedicated customer. As a result, it becomes evident that a substantial gap exists in the current literature concerning this specific aspect. The identified gap affects the necessity for the entire team's full involvement in one project, surpassing the conventional focus solely on the client's full participation. Indeed, in order to comply with the recurring practices of Agile and to operate effectively, it is essential for the team to allocate a significant amount of time to the project under consideration. As also the last Interviewee answer to the question: "Smaller not per se, but if the team stays […] dedicated, then yes".

This individual brings attention to another aspect that is not present in the analyzed literature. While source articles discussing team size generally advocate for the effectiveness of smaller teams in the Agile approach, they commonly neglect the substantial impact of the team's level of experience in determining its size. Indeed, it has been observed that teams composed solely of experts tend to have less people, while those

including less experienced individuals frequently require a larger size. This is mainly because new team members often require the guidance and support offered by their more senior colleagues. This idea presents a stimulating observation. Efficiency in an Agile environment is not solely dependent on the size of the team. If given the right direction and assistance, a larger team with less experienced people can also succeed.

As shown in Table 14, most individuals assert that Agile methodologies tend to be more effective when implemented within smaller teams. The candidates' viewpoints indicate that in smaller teams with a limited number of members, the decision-making process is accelerated. This increased efficiency is attributed to the smaller number of individuals involved in the consensus process. Furthermore, it becomes more straightforward to schedule and facilitate discussions, thereby promoting more efficient and in-time communication.

Furthermore, Candidate 19 highlights how process efficiency can be enhanced by replicating successful strategies from one team across others: "When you get really into the execution from an Agile perspective, then the team is small, you just move from one team to another".

In the context of multidisciplinary teams, candidates highlight that such teams consist of individuals from diverse backgrounds and experiences. This diversity is crucial as it brings a multitude of perspectives, ensuring that every viewpoint is valued equally.

A few interviewees underscore the importance of subject matter experts[9] in a multidisciplinary Agile environment. Their specialized knowledge and expertise are indeed fundamental for deeply comprehending and tackling project challenges.

Lastly, in relation to the greater autonomy, the general sentiment among respondents is that teams are made up of competent and skilled individuals who are given trust by their managers. This trust translates into empowerment, giving team members the liberty to

---

[9] Subject Matter Experts (SMEs) are people with extensive knowledge in a particular field. As experts in specific areas or topics, they are especially able to offer guidance and strategy.

perform their tasks as they want and later share their goals achieved with the rest of the team. For some interviewees, autonomy also includes the creation of tasks under certain circumstances. Specifically, if a team member identifies a high-priority requirement, he has the freedom to create tasks to address it, ensuring that crucial aspects of the project are not ignored.

Following the theoretical insights from the candidates, it is of interest to investigate the practical application of the three characteristics specified in the question within the XYZ teams.

Table 15 allows for the quantification of respondents who have, and have not, reported experience with small teams within the organization.

Opinion	Have experienced small teams in XYZ	Have not experienced small teams in XYZ	Total
Frequency	12	6	18

Table 15 - Opinions about small teams in XYZ

Within the XYZ company, individuals who have been part of small teams in Agile projects, particularly in the SAP or CCE teams, note the success achieved through this structure. In certain situations, several small teams are observed to collaborate, necessitating subsequent coordination to ensure alignment.

However, there are people who express skepticism about the prevalence of small teams within XYZ. They argue that while a team may appear small, the lack of success indicates that the extended team might be too large. They emphasize that the company tends to involve too many individuals in each project, such as sponsors and steering committees, who ultimately hold authority, overshadowing the small teams adhering to Agile practices. Another perspective that has been voiced among those who are skeptical about the success of team size at the company is the existence of too many roles that do not contribute productively. This sentiment is underlined by Interviewee 11, who remarks,

"The issue is more not so much the size, is whether you are productive or not, what are you contributing to the project or you there to manage the Agile process. But, in my view, there's a lot of roles that are just managing the Agile process not contributing to anything".

In numerous studies, including *20 Years of the Agile Manifesto: A Literature Review on Agile Project Management* by Pacagnella et al., it is frequently cited that the Agile methodology enhances productivity and efficiency in the execution of the project. However, the perspective expressed by the last-quoted interviewee is not present in the existing literature. It is crucial to investigate whether the roles defined by the Agile methodology truly contribute to productivity. The stringent practices of this methodology should not result in an overemphasis on unproductive meetings, merely to adhere to the frequency prescribed by the approach. A careful equilibrium is necessary to ensure the methodology's efficacy.

Shifting the focus to multidisciplinary, a considerable number of participants confirm its presence in their teams, as shown in Table 16.

Opinion	Have experienced multidisciplinary teams in XYZ	Have not experienced multidisciplinary teams in XYZ	Total
Frequency	14	2	16

Table 16 - Opinions about multidisciplinary teams in XYZ

The necessity of having individuals with diverse skill sets and SMEs within teams adhering to Agile, is emphasized. Candidate 19 describes the reason of the need of these SMEs as "that expertise to be able to understand the 'as is' and get to the 'to be' right together with them". Only the article by Rajamani discusses the concept of subject matter experts, indicating a noticeable scarcity of this concept in the existing literature.

When considering the perspectives of those who do not perceive the presence of multidisciplinary teams within XYZ, the prevailing opinion is that the company retains a functional orientation. This viewpoint is exemplified by Candidate 14, who states: "My

product team is a subject matter expert for certain areas. And basically, they do not have the autonomy to execute […]. It needs to be done through another team. So, although we are structured in a kind of Agile fashion within product teams, but we still are functional in nature. So, we are not fully multidisciplinary".

As observed in Table 17, a considerable proportion of respondents report to have experienced more autonomy within XYZ's teams in Agile projects.

Opinion	Have experienced greater autonomy in XYZ	Have not experienced greater autonomy in XYZ	Total
Frequency	13	4	17

Table 17 - Opinions about teams with greater autonomy in XYZ

Interviewees from the Advanced Analytics team highlight that their managers place considerable trust in them, thereby negating the need for micromanagement. This concept is also present in few papers, like the one by Patrucco et al., where the authors express: "An aggressive leadership style is discouraged as it is considered to lead to micro-management (MH), an aspect to be avoided in Agile teams" (Patrucco et al., 2022). In Agile, although supervision remains essential, the need for a detailed evaluation of each task is eliminated, rendering micromanagement obsolete.

Conversely, for those who have not experienced increased autonomy in their Agile projects at the company, the recurring issue is the necessity to consult with numerous individuals within the company. As expressed by Candidate 7, "Core team, which that will be the Agile team, and then the extended team which needs to be consulted or engaged. But the multidisciplinary, small team and greater autonomy should be able to take decisions on their own". Moreover, the Candidate highlights a significant need for alignment with the organization's objectives. These elements collectively imply that the team's autonomy in decision-making is compromised, negating the concept of greater autonomy. This particular aspect is ignored in the literature. Although research articles

underscore the greater autonomy of Agile teams, they do not address the necessity of consulting a larger group or aligning with organizational goals.

Additionally, a significant concern within the organization is the practice of assigning individuals to various initiatives, thereby preventing them from focusing solely on one project. Some respondents suggest that a team's success is more likely if its members are fully committed, regardless of other variables. As per Candidate 27's statement, "I think what's not very clear and what's not working well is RACI[10]. We really struggle to understand who's supposed to be doing what". The lack of distinct role definitions is a notable challenge, as confirmed by most of the interviewees.

- **The hierarchical structure is replaced by a more horizontal one (more team collaboration).**

Rating	1	2	3	4	5	Total
Frequency	0	3	9	8	8	28

Table 18 - Answers to "The hierarchical structure is replaced by a more horizontal one (more team collaboration)"

Table 18 shows that most of the interviewees agree with the question, giving it a score of 4 or 5. They think that Agile makes the organization more horizontal and that they experienced this change in their teams within the company. Some of them mention the fewer levels of reporting, as exemplified by Respondent 16: "Our project governance is typically two tiers or three tiers. In the minimum two tiers there is a project team and there is a steering committee. And the three tiers sometimes come in when you also have a core team and an expanded team […]. Typically, it's two tiers and then there's good collaboration".

---

[10] In project management the RACI model serves for delineating roles and responsibilities. The acronym RACI stands for Responsible, Accountable, Consulted, and Informed. The 'Responsible' is entrusted with the ownership of the project, task, or work. The 'Accountable' is tasked with approving the work, assessing its completion, and ensuring it meets quality standards. The 'Consulted' possesses the requisite skills or knowledge to execute the work. The 'Informed' needs to be kept updated about the progress of the work, but do not necessarily need to be consulted.

It is acknowledged that a decision-maker must be present when a change in strategy is under consideration. In spite of this, there is no hierarchical structure in the operating mode. In addition, Candidate 5 explains that approvals are still present but are streamlined using Agile methodology: "With Waterfall, it was usually three levels of approval. With Agile […] you still have some approvals. What we've done is we've reduced it, so you get approval for the project at the onset. […] So then as you're working, you do not have to keep coming back up for approval. So, we've taken that out and then the team can just go". Concerning the notion of decreasing approval levels, it is only highlighted in *Agile At Scale* by Rigby et al., and in *Leading Agile Transformation: The New Capabilities Leaders Need to Build 21st-century Organizations* by McKinsey & Company. This represents a conspicuous void in the literature within this context. It's crucial to remember that while approvals remain necessary, their frequency is significantly less compared to the other conventional methodologies.

The majority of respondents who give a score of 3 do so for multiple reasons. Some are indifferent to the statement, believing that a horizontal structure could be achieved even with a more traditional approach. They argue that Agile methodology is not the sole determinant of a project's horizontality. Several respondents provide examples of projects that maintained a non-hierarchical structure despite being managed using Waterfall.

Moreover, while some respondents theoretically agree with the statement, but they do not perceive a significant increase in collaboration or a more horizontal structure within the company when Agile is implemented. For instance, Respondent 9 articulates this perspective as "For XYZ, there's still desire to have steering committees and that hierarchical approach, sponsor calls or sponsor updates. But if you really do true Agile, steering committees go away, sponsor updates go away, you have a ceremony called a sprint review that replaces all any sponsor update or steering committee meeting".

In terms of the lack of cooperation currently observed, Respondent 21 shares his viewpoint as "In terms of team collaboration, the teams are still in silos. So, one person's deliverable is not easily accepted by the other team […]. So that connection between the teams I have not seen that effective, it's always like a finger pointing". Candidate 11's insights on this matter are also remarkable: "Collaboration is not about always talking; it

is working together […]. This is the issue with Agile. It's very hungry in meetings and updates".

While those who perceive the Agile structure as non-horizontal are in the minority, as indicated in Table 18, their viewpoints are still interesting. They believe that an implicit hierarchy exists, with the product owner at the top. This perspective is underscored by Respondent 7's comment, "The most critical thing is to have a very strong product owner. If the product owner doesn't have a clear view of what we're trying to achieve, the other roles are redundant".

In environments where numerous small teams operate independently and subsequently coordinate with each other, it is noted that a team might be relatively horizontal internally. However, when interacting with other teams, there are still individuals who take the lead. Candidate 12's example illustrates this concept well: "It is not one triangle, maybe two or three smaller ones, but still a triangle".

4.3. Challenges in Agile Transition

The conducted interviews confirm certain difficulties described in the literature while also shedding light on new ones in the shift to the Agile approach. The main obstacles identified through the literature analysis for this section include human factors, the absence of effective change management, the organization's size and durability, and a complete transformation of all functions. These challenges are reinforced by respondents, with new ones emerging.

Firstly, it is stated that if the benefits of Agile are not clearly shown, it becomes an enormous obstacle. Individuals may not see the need to change unless there is convincing proof that Agile can improve, accelerate, and simplify their work.

Another difficulty identified during the interviews is the resource availability, one of the few areas on which all candidates agree. For Agile to be effective, it presupposes that team members are available for frequent meetings. This is a significant challenge

since, in a company that has not yet completely adopted Agile, individuals are frequently involved in numerous projects simultaneously and may not always be available.

Additional problems noted by candidates include the lack of the necessary knowledge to execute Agile practices and the geographical distance between individuals, which complicates the shift.

A lack of comprehension on how to apply Agile is also recognized, particularly among business employees. According to the candidates, this creates a further major problem. The challenge is that numerous people who should be involved in Agile steps do not understand the methodology, rendering it useless.

Another difficulty is determining whether to use Agile, which, as previously said, is not always essential or appropriate. Agile can be challenging to adopt in some types of projects, departments, sectors, and businesses due to the inherent characteristics of these environments. For example, in the manufacturing industry, many engineers have a natural preference for a traditional approach.

An additional obstacle emerges in terms of individual determination. In some circumstances, the difficulties can result directly from a lack of willingness to successful transformation.

Some candidates indicate that a "big bang" switch is difficult. A transition time can help people.

In the following part, the responses provided by the interviewees for each specific question within this category are analyzed and elucidated in greater depth.

- **Most challenges of the transition to Agile are related to the human aspects (change management).**

Rating	1	2	3	4	5	Total
Frequency	2	5	4	7	10	28

Table 19 - Answers to "Most challenges of the transition to Agile are related to the human aspects (change management)"

In the interview segment under discussion, it is evident from the data in Table 19 that a significant majority, over half of the respondents, identify human factors as the primary challenge in transitioning to Agile. Indeed, based on their experience at XYZ, they explicitly mention encountering resistance within the company from individuals who were hesitant to transition towards a more Agile approach.

Many factors have been mentioned by respondents as reasons why people are reluctant to adopt Agile. This represents an additional gap in the current literature. While some reference articles touch upon the concept of resistance to change among individuals, they do not investigate into the root causes of this resistance. As a result, analyzing the motivations expressed by the interviewees becomes an interesting area of study. First of all, it is human nature for people to depend on familiar methods of working.

Moreover, fear may arise from Agile's unpredictable nature, especially in its early stages.

Successful transitioning is made even harder by managerial resistance to completely adopt Agile, as evidenced by their insistence on strict deadlines that go against the principles of the approach.

Lastly, for Agile to really motivate and promote this profound shift, its advantages must be viewed as surpassing those of conventional approaches. Regarding this final point, many respondents stress how crucial it is to demonstrate the benefits of Agile to people, because they can't see the need to change their current practices unless they are fully aware of these advantages. The crucial role of education in driving motivation is effectively illustrated by Candidate 13: "Explain to people this is what Agile is, this is why it's important, this is how much it can help you in your role, what it can do for you, how it can make you more efficient, how could make you more structured, how could add value to the customer. Once you started expanding in that message, then you have a better success rate of converting people". Similarly, Candidate 2 shares his team's experience: "That's what we tried to do in our team, we did a few workshops to share how our goals go in an Agile way. Because if people do it, they start losing the fear".

Several respondents who concur with the statement also underline the significance of change management in facilitating any form of organizational transformation, including

the transition to Agile. They note that, in fact, the company has seen a substantial expansion of its change management team in recent years. In numerous reference articles, the principle of change management has been extensively discussed. For example, in *Human Aspects of Agile Transition in Traditional Organizations,* it is expressed that deploying a change management process is critical. This process aims to minimize the impact on the organization's human elements and facilitate the adaptation of individuals at all organizational levels to the new framework.

The four candidates who assign a score of 3 perceive the human element as a challenge in the transition towards Agile methodology. However, they identify other bigger obstacles. These include resource availability, the lack of necessary skills, the project's compatibility with Agile methodology, and the geographical location of team members. The first Interviewee, a professional with over 30 years of experience in the company, emphasizes the importance of regular in-person meetings, stating "It is better if these resources can meet in person regularly". This concept, despite being mentioned in just one of the analyzed articles, merits emphasis, as affirmed by many other interviewees. As proposed in the paper, it is beneficial to "allocate distributed teams at the same physical location at project outset" (Pinton et al., 2020). This perspective underlines the value of co-locating teams in Agile project management, especially at the start of the project.

Interestingly, respondents who attribute the lowest scores to this question do not consider the human aspect as a relevant difficulty in this transition. They articulate their belief that it's not a matter of resistance to change, but rather a lack of understanding of how to implement it. To illustrate this point, it is useful to consider the words of Candidate 24: "I think it's more than just people aspect. Sure, you need people to be on board, but you need a lot of other things. One is you need the knowledge […], you need those people to have the right skills, the right knowledge to do it […], you need to identify a product owner and that product owner needs to know what his role is, how to do things and how to work effectively in Agile teams […].The other thing is technology, like having the right tools for executing projects in Agile".

The feedback from participants underscores a notable barrier: the lack of Agile methodology knowledge within business roles. This concept is conspicuously absent

from the referenced sources, which do not sufficiently emphasize the importance of training business people in Agile practices. Indeed, while the literature sources underline the significance of training, they often ignore the necessity of educating individuals in business positions. These individuals frequently assume the role of product owners, so they need to truly understand the implications of working within an Agile framework and be familiar with the practices associated with this methodology.

Candidate 18 perceives the most substantial challenge in this transition to be the inappropriate implementation of Agile where it is either unnecessary or unsuitable. As articulated by the Candidate: "The challenges of the transitions to Agile to me, are related to management choice to apply Agile and not the people".

- **Moving to an Agile operating model is hard, especially for established companies.**

Rating	1	2	3	4	5	Total
Frequency	0	0	10	5	13	28

Table 20 - Answers to "Moving to an Agile operating model is hard, especially for established companies"

Every participant admits the difficulty of implementing the Agile methodology within an organization. Their opinions, however, differ on how they interpret the last part of the sentence "established company". For the purpose of this study, as stated in section 3.2.3., an established company is considered as one that has a considerable size and an extensive amount of years of industry experience. The individuals who score a 4 or 5 on this question are those who believe that the company's age and/or size are the primary impediments to the transition process. They all agree that for larger corporations, the process of change is significantly more difficult, as there is a larger number of individuals who need to alter their mindset. The greater the size of the employee group, the longer it takes for this new way of thinking and working to become ingrained in the organization. In addition, traditional work practices have been deeply embedded in

the organization over the years, as evidenced by the large number of workers who have been with the XYZ company for a long period of time. These long-term professionals often find difficult to understand why change is necessary, particularly when the conventional techniques have worked well in the past.

Instead, respondents who assign a rating of 3 concur with the initial segment of the statement but express disagreement with the final part: "especially for established companies". They believe that factors other than the size and age of the organization have a more significant impact on the challenges encountered during the transformation process. The group of interviewees recognize a number of factors that contribute to the complexity of the transition, which are notably significant due to their absence in existing literature. One key factor is the determination of the individuals involved, as articulately expressed by Candidate 21: "It is not related to the size, the business value, the domain […] what matters are people and their mindset: if they are able to change and they are able to adopt it".

The nature of the industry is another factor that comes up frequently. Many interviewees draw comparisons between XYZ, a manufacturing company, and tech-focused companies like Google or Apple. They note that for companies in less traditional sectors, the Waterfall method is almost always ineffective, making it easier for such companies the transition to Agile.

Other candidates believe that the type of business the company is involved in also contributes to the difficulty of the transition. In this regard, the viewpoint of Candidate 16 is shown: "We have a very stable set of products and the technology itself […] hasn't changed for many years. We have plants, which are 50 years old, and they still produce same good quality product. If you work in such a company for 20 years […] you're like 'Hey, why should I change? Why should I be innovating? Why should I suddenly become Agile?' It's normal".

Lastly, a few respondents emphasize the role of the employees' nature in the difficulty of the shift. In a manufacturing company like XYZ, there is a high percentage of engineers. These professionals are inherently inclined towards a more traditional approach. They are

used to planning and proceeding accordingly, a way of working that is not entirely aligned with Agile.

- **Some functions may require a combination of Agile and traditional structures, rather than a complete shift to Agile.**

Rating	1	2	3	4	5	Total
Frequency	1	2	3	7	15	28

Table 21 - Answers to "Some functions may require a combination of Agile and traditional structures, rather than a complete shift to Agile"

This question gathers substantial agreement among the respondents. As evident from the data in Table 21, twenty-two participants concur that a hybrid approach, rather than a complete shift to Agile, is sometimes more beneficial. They elaborate that this mirrors the current scenario within the company, where Agile is implemented for projects compatible with this methodology. As Respondent 12 remarks on, a project must be capable of being broken down into smaller, self-sufficient segments to be suitable for Agile.

However, some respondents suggest that the decision to implement Agile is more influenced by the department than the project itself. As highlighted by Candidate 2, while some departments have distinct deliverables and methodologies, others can potentially benefit from Agile.

Many respondents convey that for certain project types, particularly those of a capitalistic and engineering nature, a full transition to Agile is not feasible as not all aspects align with this framework. This viewpoint is exemplified by Interviewee 7: "You're not going to tell an engineering team that is going to build a site […] that we're going to do Agile, because there's already a handbook on how to do these things because […] plants for the last 80 years, and nothing is going to really truly change". Additionally, Respondent 26 emphasizes that straightforward projects do not necessarily require the strictness and practices associated with Agile.

Some respondents underscore the significance of a transition phase when shifting towards Agile. A notable instance is Candidate 5, who witnesses a successful complete transition to Agile within his team. However, this candidate suggests that having a combination of both methodologies, at least for a certain period, would have been preferable.

Among the minority who dissent with this question, the prevailing views are that it's preferable to choose one methodology, as blending both is not efficient. They believe Agile can be applied to all projects, except for engineering ones, as the participants in such projects tend towards a more traditional methodology. In addition, the third Candidate advocates for the transformation of even the most conventional structures by incorporating Agile principles.

4.4. Success Factors in Agile Transition

Literature findings highlight the numerous attributes required for Agile success, emphasizing the importance of frequent customer interaction, a fundamental mindset shift, leaders' adoption of Agile concepts, and the importance of training provided by Agile coaches and individuals who are already experts. Interviews provide insights that confirm, modify, and sometimes expand on these literature results.

Effective client involvement is dependent on two key success factors: resource availability and dedicated time allocation. This dedicated time provides significant interaction and promotes a better understanding of customer preferences. Furthermore, it is emphasized the importance of including the product owner as an integral component of the team. This integration requires the product owner's full commitment to the project, allowing him to contribute crucial insights and guidance throughout the development process.

Regarding the shift in mindset, interviews emphasize the importance of establishing a clear definition of Agile within the organization. This clarity is essential for aligning team members' understanding and expectations with Agile concepts and practices.

Top-level support is another crucial factor for initiating a successful Agile transformation. For this shift to be effective, leaders must have an extensive understanding of Agile concepts and the implications of utilizing this approach. Furthermore, they must develop a shared vision of what Agile means within the organizational environment.

In terms of training, interviewees emphasise the value of educating business roles and ensuring a solid knowledge of Agile principles before their application. While some interviewees recognize the vital role of coaches, especially external ones, others express scepticism, preferring to rely on people who are already familiar with the Agile approach. In terms of training modalities, the majority of respondents preferred the creation of customized organizational training programs over generic ones, asserting greater effectiveness and relevancy in addressing specific company objectives and problems.

Below are the distinct viewpoints of the interviewees concerning each specific question within this category.

- **If the team stays focused and iterates with the customers, there's a much better possibility that it will deliver the right product.**

Rating	1	2	3	4	5	Total
Frequency	0	0	5	9	14	28

Table 22 - Answers to "If the team stays focused and iterates with the customers, there's a much better possibility that it will deliver the right product"

Opinion	Frequent interaction with customers in XYZ	No frequent interaction with customers in XYZ	Total
Frequency	16	5	21

Table 23 - Opinions about interaction with customers in XYZ

All interviewees agree on the significance of regular engagement with the customer or the product owner. Referring to the statement from Candidate 6, which summarizes the prevailing point of view among the respondents: "Important to be focused and to have a close contact with your customer because then you have the opportunity to change or to

steer super quickly if you're like going off the path that your customer has in mind or if they switch".

Numerous survey respondents emphasize the importance of including the product owner as a key component of the team. They concurrently insist that this individual should have a thorough understanding of Agile methodologies. Regarding this, Candidate 3 underlines a notable obstacle within XYZ, observing that, in his view, there is a lack of suitable training for business people in the role of the product owner, echoing notions previously discussed in section 4.3.

The experience shared by Candidate 21 is noteworthy. In this scenario, direct communication with customers is absent, and instead, two or three intermediary levels relay messages between him and the customers. According to this person, correcting this aspect is essential, as direct interaction could streamline the process and significantly improve the understanding of customer requirements by directly engaging with them.

Regarding the frequency of interaction, candidates share the perspective that it varies based on the nature of the project. Some engage with the customer daily, others weekly, some based on specific requests or when deemed necessary, and some at the conclusion of each sprint. Notably, sprints may adhere to the conventional two-week duration typical of Agile methodologies or extend to a longer period, such as four weeks.

As outlined in Table 22, five individuals assign a rating of 3. While they theoretically support the concept of frequent customer interactions, they convey a belief that such practices are not commonly implemented within the company. Once again, the issue is in the insufficient availability of resources. Some team members report that they frequently perform tasks without the immediate chance to consult with product owners, either due to their inability to attend all meetings or because other priorities have been assigned to them. It's essential to remind stakeholders and product owners that dedicating a portion of their time is a critical factor for the successful execution of a project. This idea is closely linked with the requirement for a fully dedicated team, which is missing the literature, as previously discussed in section 4.2.

- **Agile is a mindset.**

Rating	1	2	3	4	5	Total
Frequency	1	2	4	9	12	28

Table 24 - Answers to "Agile is a mindset"

The question that suggests Agile as a mindset is one of the most agreed-upon. As evidenced in Table 24, twenty-one respondents concur that the adoption of Agile methodologies signifies a profound shift in mindset from traditional approaches. Since this idea appears in over half of the referenced literature, researchers are aware of how crucial it is to adopt a different perspective in order to successfully complete the shift. One notable perspective is from Respondent 19, who states: "I think you cannot really move there without also changing the culture, and sometimes changing the culture means changing people […]. In my organization 40 plus percent of the team is coming from outside with a pretty good […] level […] in Agile and you see the difference". In fact, a number of candidates have noted that the CCE team is among the few groups that successfully implement Agile inside the XYZ organization. The fact that most of the team's members are external hires who are accustomed to similar working practices and don't need a mental change is one contributing reason, as previously mentioned by Interviewee 19. This contrasts with the majority of the company employees who have been adhering to traditional methods for years and for whom a mindset transformation is an essential part of the transition, as underscored by a multitude of respondents.

Few candidates underline the importance of fully understanding Agile before employing it. Furthermore, they accentuate the need for ongoing reinforcement of its principles to ensure its effective assimilation by employees. Although the literature recognizes the essential role of proper training, it leaves out one crucial component: the importance of continually reinforcing these concepts over time. Essentially, what some respondents indicate is that learning the methodology's principles requires more than just the initial training. They advocate for a continuous process of revisiting and reinforcing these principles over time.

Respondents who give a score of 3 agree with the statement argue that Agile is not merely a mindset, but it represents something more substantial. For instance, Interviewee 13 states, "It's good to think like an Agile way. But also, I think there are things that you needed to have in place to do that. For example, like just having retros, or just having sprint planning and just like activity had that in your calendar to get you into that habit of doing it". For this line of thinking, Agile is not just a mindset, but something that necessitates supportive conditions.

Lastly, among the few who disagree and assign low scores, some are of the opinion that Agile doesn't differ from the Waterfall method, considering them simply as two different approaches. In addition, Candidate 3 clearly delineates his viewpoint, making a distinct differentiation between Agile and agility: "While agility is about culture and mindset, Agile is a framework of tools, methods, techniques and ways of working". There is a lack of clarity in the literature regarding these terms, with occasional misuse. In Knowledgehut's website the explanation of Candidate 3 is confirmed. Indeed, as posted in the blog, "Agility is the ability of an organization to adapt to change quickly and easily. It is a mindset or philosophy that can be applied in different contexts", whereas "Agile follows a structured framework, such as Scrum or Kanban, with defined roles, ceremonies, and artifacts. It provides a specific set of practices and guidelines for software development teams".

In addition to commenting on the question, some interviewees explicitly share their thoughts on how prevalent this mindset is within XYZ. All people who express their views on this matter concur that an Agile mindset is not yet widespread in the company. Many individuals consider themselves Agile, but their work methods do not reflect this.

Another identified weakness is the lack of a clear definition of Agile within XYZ, leading to a misunderstanding of this approach among team members.

Some candidates highlight that only a handful of teams, such as Customer & Commercial Excellence and Advanced Analytics, have truly internalized Agile concepts and practices. However, as Candidate 14 emphasizes, this represents a small percentage, and the goal

should be to expand this adoption to a larger number of teams, thereby achieving greater success.

- **Top leadership must embrace Agile values to scale it up successfully through the organization.**

Rating	1	2	3	4	5	Total
Frequency	0	6	15	3	4	28

Table 25 - Answers to "Top leadership must embrace Agile values to scale it up successfully through the organization"

All respondents agree that embracing Agile values is crucial for a successful transformation, and that it should start with strong support from the top. However, the votes differ in terms of how respondents felt about the presence of support and understanding from leaders within the XYZ company.

As it is possible to see from Table 25, the highest votes, which corresponds to a quarter of the sample, is given by those who experienced top leaders in the company who support the Agile approach and understand the consequences of working in this way. The opinion that emerged most frequently within this sample of candidates is that leaders in XYZ understand the methodology and decide to apply it when possible.

Just over half of the respondents give a neutral rating of 3. The prevailing belief among these individuals is that while the XYZ's leaders express a desire to adopt an Agile approach, they lack a clear understanding of what it entails. In numerous reference articles, the significance of leader embracing Agile principles is underscored. However, the literature, excluding *Embracing Agile* and *The Stages of Agile Transformation: Moving from Theory to Practice,* often underestimates the explicit requirement for leaders. On one hand, leaders need training to achieve a comprehensive understanding of the methodology and of its implications. On the other hand, they play a pivotal role in "creating a shared vision and purpose for the organisation, which will guide the transformation efforts. They should communicate this vision effectively to all

stakeholders" (Rajamani, 2023). This aspect is summarized in the views of Interviewee 10, whose insights echo those from other interviews: "Embracing is one thing, but a lot of leadership, I don't think they necessarily sometimes understand the implications as well of working in an Agile manner". Indeed, there's also a need to comprehend the implications of working with Agile. For instance, leaders often request the final goal, deadline, and maximum budget, values that are inherently uncertain with Agile. Consequently, many interviewees feel that despite XYZ's claim the adoption of Agile, the demands of the leadership often result in a reversion to the Waterfall model.

A frequently recurring theme is once again the idea of "failing fast," a fundamental principle of the Agile methodology that appears to face resistance from many leaders. As the last-mentioned Candidate put it: "If you're working in Agile manner when you fail, you learn something. So not being afraid to fail".

A few respondents, indifferent to the statement, rate it a 3 too. A common idea that emerged is the crucial role of top-level support, regardless of the chosen project management approach. As Candidate 18 expresses: "Top leadership to be honest doesn't care. For them is just important if the project gets results. So Agile is not a goal, per se, it's a method. So, I don't think you should push people".

Lastly, respondents who assign low ratings concur that such practices are essential for a successful transformation. However, they express scepticism about XYZ's leaders, doubting their willingness to embrace Agile and their ability to support their teams effectively.

- **Any successful Agile transformation needs to train and recruit a team of Agile coaches and new staff already familiar with the approach.**

This question provokes significant debate among the respondents. Therefore, it would be more effective to separately concentrate on the three concepts embedded in the sentence.

Regarding training, it could be enlightening to consider the input provided by candidates who have specifically shared their experiences in the organization. Table 26 shows that

six people indicate they had good training at XYZ, but about three times that number complain about inadequate or nonexistent training in the organization.

Opinion	Successful training in XYZ	No successful training in XYZ	Total
Frequency	6	16	22

Table 26 - Opinions about training in XYZ

Among those who feel they have received proper education the majority are grateful towards outside consultants who stepped in to teach Agile techniques and to offer continuous support to make sure team members understood these concepts. A small fraction received this training internally, for instance, from the recently established Agile Center of Excellence Team at the company.

Many individuals who feel dissatisfied with their training have expressed that they only received few hours of coaching on the fundamentals of Agile. Others have shared that they attended the XYZ internal framework's sessions but that they lacked the necessary follow-up to fully grasp the methodology. This group strongly emphasizes the importance of comprehensive training in order to fully understand their tasks.

Furthermore, Candidate 21 highlights the significance of continuous refreshers in addition to initial training: "I think a refresher is key critical for this, training is required for new people, but also a refresher. It's because sometimes you're like so consumed in your work that you kind of forget and you do things in the wrong way. So, refresh is always good […]. It is about refreshing the skills".

Furthermore, Interviewee 27 underscores the necessity of improving the organization's training, clarifying that it should be advantageous for all: leaders, project members from all departments, and the IT team: "Trainings for leadership, which has a lot of Agile coaching there […] Trainings for the members of the projects, whether they're within the Agile team or they're in our marketing or others that are going to give stories […] Training on the IT team, so the Scrum masters that are supposed to be the ones running Agile".

The responses often bring up the topic of Agile coaches. A large majority of them – eighteen, to be exact, as shown in Table 27 – agree that having a good coach is crucial.

Opinion	Agile coaches are useful	Agile coaches are useless	Total
Frequency	18	5	23

Table 27 - Opinions about agile coaches

It is believed that having a coach on the ground is essential because training or documentation by themselves are insufficient. This group of respondents concur that individuals who are new to Agile may particularly benefit from the guidance of Agile coaches. In fact, they guarantee that everyone is working effectively, help teams get used to Agile, and offer real-time feedback.

While the literature recognizes the significance of Agile coaches, it remains ambiguous about whether these professionals should be internal or external to the organization. It would certainly be enlightening to investigate into the perspectives of the respondents on this specific matter. Overall, there's a preference for external coaches, as they bring in experience and best practices. However, it has been proposed from some candidates that internal people might also carry out similar coaching duties if they have the necessary skills.

Moreover, some interviewees emphasize that the role of Agile coaches theoretically is crucial in promoting Agile principles, but the XYZ company seems to lack such roles. Among those who are sceptical about coaches, the prevailing sentiment is that individuals already skilled in this methodology, who can guide less experienced Agile members by example, are more impactful. However, according to Respondent 11, having these coach roles may actually obstruct the process: "Agile coaches […] are killing the agility. They add so much overhead and meetings and talks to the process that is killing the work of the people that should do the work. […] I think you should have people that are contributing to projects, contributing to the process, not Agile coaches".

Lastly, just one person suggests that a coach isn't indispensable as Agile practices can be self-learned through training.

Opinion	New staff already familiar is important	New staff already familiar is not important	Total
Frequency	15	2	17

Table 28 - Opinions about new staff already familiar

According to Table 28, a significant percentage of interviewees who share their opinions regarding hiring people who are already familiar with Agile believe that this approach works. They emphasize how important prior experience is when training other team members. One young developer, for instance, explains that formal training is frequently skipped in his context, with the majority of learning occurring through colleagues who are already familiar with the methodology. Respondent 3 highlights that in order to ensure the success of an Agile transition, it is essential to onboard new leaders who are eager about initiating it.

During the interviews, a key finding regarding this question is how well the ad hoc Agile framework designed for XYZ performed. Respondents who participated in the first XYZ's Agile framework introduction note several challenges that occurred. One notable challenge was the necessity to educate stakeholders and project managers who lacked familiarity with the approach. Additionally, there were instances where user stories were too vague or failed to align with requirements, resulting in confusion. Moreover, stakeholders voiced frustration regarding the frequency of mandatory meetings.

Another highlighted mistake was the predominant emphasis on IT rather than business, leading to inefficiencies.

The core principle of the framework was to deliver a product within ninety days, yet not all projects align with this timeline. Some projects necessitate shorter or longer durations for delivery.

Numerous candidates perceive XYZ's internal training as too general and ambiguous, allowing for excessive interpretation. Several note a lack in guidance regarding project structuring within ADO[11] boards, resulting in inconsistencies and difficulties in performance evaluation across different teams.

The proposed improvements for introducing Agile in the company are elucidated in the following lines. Firstly, it's crucial to establish a clear and consistent Agile vision, elucidating its significance within the company and emphasizing the value of Agile and the company's current stage in the transition.

Setting up a standard way of working with ADO boards across different product teams is also important.

There's a need for extensive training in IT and Digital departments, as well as educating the business people about Agile.

Rather than adhering strictly to a 90-day rule, it's recommended to adopt a more flexible timeline that aligns with each project's characteristics. It's essential to evaluate project compatibility with Agile from the beginning, acknowledging that not all projects are suited for this approach, as also discussed in previous sections.

Lastly, conducting effective retrospectives is key. These sessions provide an opportunity to reflect on successes and failures and make necessary adjustments for future improvement.

---

[11] Azure DevOps (ADO) is a tool that enables teams to schedule, monitor, and discuss on tasks throughout the development lifecycle. It embraces Agile methodologies and provides a versatile solution for supervising work items.

5 Conclusions and discussion

The primary objective of this thesis was to scrutinize the transition towards Agile within a big international company operating in the chemical sector. This involved a thorough examination of literature including Agile practices, as well as a comprehensive study of more traditional and hybrid methodologies. Through this extensive review, the intention was to understand the company's initial state, its current position, and potentially, its destination along the transition. It's essential to note that the company's Agile journey is still in its early phases, and the ultimate goal of achieving a fully Agile implementation remains uncertain for this kind of organization.

The literature review was essential for identifying major themes common across numerous articles. These themes served as the foundation for the creation of the interview guide. Additionally, understanding the company's context was imperative to grasp the environment of the interview sample, which constituted the foundation of the study.

The purpose of conducting the interviews was to verify whether there were similarities or differences between the theoretical concepts from the literature review and the actual experiences of the individuals within the company under study. Certain questions highlighted the disparity between the interviewees' theoretical beliefs about how Agile should operate and their practical experiences within the organization. This contrast is articulated in the thesis.

The insights obtained from the interviews were later analysed in conjunction with the literature to identify gaps, draw parallels, or investigate deeper into existing concepts.

5.1. Benefits

During the initial literature study, no other examples of transitions towards the Agile approach in chemical companies were found. Therefore, this thesis has enhanced the

existing literature on Agile transformations within manufacturing firms, particularly in the chemical industry. This is a sector where companies may never fully adopt Agile. Other traditional contexts similar to this one can also be experiencing a transition that is obstructed or blocked due to inherent sector-specific factors, and they could potentially benefit from this analysis.

Moreover, this thesis served to identify gaps and investigate deeper into certain concepts that were only partially covered in the literature. This exploration revealed how certain principles, while effective in Agile theory, experience applicability issues in the reality of a company environment, suggesting that variations to a strictly Agile methodology might be more beneficial.

Lastly, it is hoped that this thesis will turn out to be useful to the XYZ company, inspiring its management to take inspiration from the identified issues and recommendations presented in this study.

5.2. Limitations

Certainly, there are some limitations to consider in this thesis. Firstly, in terms of the interview sample, an effort was made to ensure as much diversity as possible, incorporating individuals from various departments and with differing years of experience within the company. However, it's important to note that this is a sample of twenty-eight individuals in a company that employs over twenty thousand people. The results obtained are based on the perceptions of the interviewees, and a different sample might have produced different results. Nevertheless, given that many concepts were common among the interviewees, these notions can be considered valid.

Another constraint is that the company introduced its internal framework and to implement Agile practices just before the pandemic. It's uncertain whether the transition would have been quicker, or if the situation would have remained unchanged, in the absence of the national emergency.

Lastly, it is important to remark that the study was conducted by a student with no prior experience in the Agile field, relying solely on project management theory learned at university and through the study of the cited literature.

5.3. Future steps

The scope of this study could be expanded by conducting interviews with additional employees within the company, which would serve to further validate the concepts or identify discrepancies. Exploring similar contexts within other companies could help whether the outcomes obtained would align or not.

In certain teams, it might be beneficial to implement some of the recommendations proposed in the thesis, such as fully dedicating teams to a single project or providing appropriate training for both leadership roles and business people. Reinforcing Agile principles over time, beyond the initial training, could also be advantageous. Other suggestions include co-locating the team at the project's beginning and demonstrating to team members the tangible benefits of Agile and how it can enhance their work efficiency. By implementing these suggestions derived from the thesis, it would be interesting to observe whether the project achieves greater success in terms of time efficiency or overall effectiveness.

Moreover, as outlined in section 5.1, this study could serve as a starting point for potential future research in the context of Agile transitions within the manufacturing industry, an area currently lacking extensive research.

6 Bibliography

[1]Broza, G. (2019). *Agile for Non-Software teams: A Practical Guide for Your Journey.* 3p Vantage.

[2]Dikert, K., Paasivaara, M., & Lassenius, C. (2016). Challenges and success factors for large-scale agile transformations: A systematic literature review. *Journal of Systems and Software*, 119, 87–108. https://doi.org/10.1016/j.jss.2016.06.013

[3]Beck, K., Beedle, M., van Bennekum, A., Cockburn, A., Cunningham, W., Fowler, M., Grenning, J., Highsmith, J., Hunt, A., Jeffries, R., Kern, J., Marick, B., Martin, R. C., Mellor, S., Schwaber, K., Sutherland, J., & Thomas, D. (2001). *Manifesto for Agile Software Development.* http://www.Agilemanifesto.org/

[4]Strauss, A., & Corbin, J. M. (1998). *Basics of qualitative research: Techniques and Procedures for Developing Grounded Theory.* SAGE Publications, Incorporated.

[5]Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory: Strategies for Qualitative Research.* Transaction Publishers.

[6]Digital.ai. (2022). *State of Agile Report*. Retrieved from https://digital.ai/resource-center/analyst-reports/state-of-agile-report/

[7]Thesing, T., Feldmann, C., & Burchardt, M. (2021a). Agile Versus Waterfall Project Management: Decision model for selecting the appropriate approach to a project. *Procedia Computer Science*, 181, 746–756. doi:10.1016/j.procs.2021.01.227

[8]Kadenic, M. D., & Tambo, T. (2023). Resilience of operating models: exploring the potential of agile project management as enabler. *International Journal of Managing Projects in Business*, 16(3), 521–542. https://doi.org/10.1108/ijmpb-05-2022-0122

[9]Lindskog, C. and Netz, J. (2021) Balancing between stability and change in Agile teams, *International Journal of Managing Projects in Business*, 14(7), pp. 1529–1554. doi:10.1108/ijmpb-12-2020-0366.

[10]Agbejule, A., & Lehtineva, L. (2022). The relationship between traditional project management, agile project management and teamwork quality on project success. *International Journal of Organizational Analysis*, 30(7), 124–136. https://doi.org/10.1108/ijoa-02-2022-3149

[11]Hutter, K., Brendgens, F., Gauster, S. P., & Matzler, K. (2023). Scaling organizational agility: key insights from an incumbent firm's agile transformation. *Management Decision*. https://doi.org/10.1108/md-05-2022-0650

[12]Limaj, E., & Bernroider, E. (2022). A taxonomy of scaling agility. *The Journal of Strategic Information Systems*, 31(3), 101721. https://doi.org/10.1016/j.jsis.2022.101721

[13]Eddoug, F., Benabbou, R., & Benhra, J. (2023). Adapting P2M Framework for Innovation Program Management through a Lean-Agile approach. *International Journal of Information Technology Project Management,* 14(1), 1–18. https://doi.org/10.4018/ijitpm.318125

[14]Rigby, D., Sutherland, J., & Noble, A. (2018). Agile at Scale. *Harvard Business Review*, May–June 2018.

[15]Junker, T., Bakker, A. B., Derks, D., & Molenaar, D. (2022). Agile work practices: measurement and mechanisms. *European Journal of Work and Organizational Psychology*, 32(1), 1–22. https://doi.org/10.1080/1359432x.2022.2096439

[16]20 Years of the Agile Manifesto: on Agile Project Management. (2023). *Management and Production Engineering Review*. https://doi.org/10.24425/mper.2023.146021

[17]Serrador, P., & Pinto, J. K. (2015). Does Agile work? — A quantitative analysis of agile project success. *International Journal of Project Management*, 33(5), 1040–1051. https://doi.org/10.1016/j.ijproman.2015.01.006

[18]Rigby, D. K., Sutherland, J., & Takeuchi, H. (2016). Embracing Agile. *Harvard Business Review,* 94(5), 40–50.

[19]Patrucco, A. S., Canterino, F., & Minelgaitė, I. (2022). How do Scrum Methodologies Influence the Team's Cultural Values? A Multiple Case Study on Agile Teams in Nonsoftware Industries. *IEEE Transactions on Engineering Management*, 69(6), 3503–3513. https://doi.org/10.1109/tem.2022.3146717

[20]Pinton, M., & Torres, A. S. (2020). Human aspects of agile transition in traditional organizations. *Journal of Technology Management & Innovation*, 15(3), 62–73. https://doi.org/10.4067/s0718-27242020000300062

[21]Reiff, J., & Schlegel, D. (2022). Hybrid project management – a systematic literature review. *International Journal of Information Systems and Project Management*, 10(2), 45–63. https://doi.org/10.12821/ijispm100203

[22]De Smet, A., Lurie, M., & St George, A. (2018). Leading Agile transformation: The new capabilities leaders need to build 21st-century organizations. *McKinsey & Company.*

[23]Strode, D. E., Sharp, H., Barroca, L., Gregory, P., & Taylor, K. (2022). Tensions in organizations transforming to agility. *IEEE Transactions on Engineering Management*, 69(6), 3572–3583. https://doi.org/10.1109/tem.2022.3160415

[24]Brosseau, D., Ebrahim, S., Handscomb, C., & Thaker, S. (2019). The journey to an Agile organization. *McKinsey & Company.*

[25]Rajamani, V. (2023). The Stages of Agile Transformation: Moving from Theory to Practice. Retrieved from https://www.scrum.org/resources/blog/whitepaper-stages-agile-transformation-moving-theory-practice

[26]Cottmeyer, M. Agile Transformation. Retrieved from https://www.leadingagile.com/

[27]Royce, W. (1970). Managing the development of large software systems: Concepts and techniques. In: Proc. *IEEE WESCOM. IEEE Computer Society Press*.

[28]Institute, P. M. (2021). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Seventh edition and the Standard for Project Management (ENGLISH).* Project Management Institute.

[29]Saravanos, A., & Curinga, M. X. (2023). Simulating the software development lifecycle: the Waterfall model. *arXiv (Cornell University)*. https://doi.org/10.3390/asi6060108

[30]Petersen, K., Wohlin, C., & Baca, D. (2009). The Waterfall Model in Large-Scale Development. *Lecture Notes in Business Information Processing* (pp. 386–400). https://doi.org/10.1007/978-3-642-02152-7_29

[31]Bassil, Y. (2012). A Simulation Model for the Waterfall Software Development Life Cycle. Retrieved from https://arxiv.org/abs/1205.6904

[32]Pargaonkar, S. (2023). A comprehensive research analysis of Software Development Life Cycle (SDLC) Agile & Waterfall Model Advantages, disadvantages, and application suitability in software quality engineering. doi:10.31219/osf.io/v3fu5

[33]Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus Waterfall Project Management: Decision Model for Selecting the Appropriate Approach to a Project. *Procedia Computer Science*, 181, 746–756. https://doi.org/10.1016/j.procs.2021.01.227

[34]ProjectManager. (2022). Global Trends in Project Management. Retrieved from https://www.projectmanager.com/blog/2022-project-management-trends

[35]West, D. (2011). Water-Scrum-Fall Is The Reality Of Agile For Most Organizations Today. *Application Development & Delivery Professionals*.

[36]Hayata, T., & Han, J. (2011). A hybrid model for IT project with Scrum. Proceedings of 2011 *IEEE International Conference on Service Operations, Logistics and Informatics*. doi:10.1109/soli.2011.5986572

[37]Cooper, R. G. (2016). Agile–Stage-Gate Hybrids. *Research-Technology Management*, 59(1), 21–29. https://doi.org/10.1080/08956308.2016.1117317

[38]Sommer, A. F., Hedegaard, C., Dukovska-Popovska, I., & Steger-Jensen, K. (2015). Improved Product Development Performance through Agile/Stage-Gate

Hybrids: The Next-Generation Stage-Gate Process? *Research-Technology Management*, 58(1), 34–45. https://doi.org/10.5437/08956308x5801236

[39] Anand, R. V., & Dinakaran, M. (2016). Popular Agile Methods in Software Development: Review and Analysis. *International Journal of Scientific and Technical Advancements*, Volume 2, Issue 4, pp. 147-150

[40] Papadakis, E., & Tsironis, L. K. (2020). Towards a hybrid project management framework: a systematic literature review on traditional, agile and hybrid techniques. *Journal of Modern Project Management*, 08(2), 124-139. doi:10.19255/JMPM02410

[41] Peege, B., & Tshabalala, M. (2021). The Importance of Innovation in Agile Project Management. *IST-Africa Conference (IST-Africa)*. doi: https://ieeexplore.ieee.org/document/9576995

[42] Noleto, I. D., Pepino, A. L. G., & Deschamps, F. (2023). Agile Outside of Software Development – Systematic Literature Review. In *Proceedings of the 11th International Conference on Production Research – Americas*. https://doi.org/10.1007/978-3-031-36121-0_62

[43] Hackman, J. R., & Vidmar, N. (1970). Effects of size and task type on group performance and member reactions. *Sociometry*, *33*(1), 37. https://doi.org/10.2307/2786271

7 Websites List

[1]Scopus is a database of abstracts and citations from scientific publications.
https://www.scopus.com/

[2]Google Scholar makes it easy to conduct a broad search for scholarly literature.
https://scholar.google.com/

[3]Management.org is a website that provides free resources to help businesses and professionals grow, offering articles on topics such as project management.
https://management.org/

[4]*Agile Manifesto*'s website.
https://agilemanifesto.org/

[5]Michael Moore's post named *Agile Beyond Software: A Manifesto For All Industries* on Linkedin.
https://www.linkedin.com/pulse/20140722165441-3746406-Agile-beyond-software-a-manifesto-for-all-industries/

[6]OpenClassrooms.com is a website that offers training programs and free-access courses on different topics such as project management.
https://openclassrooms.com/en/

[7]Asana.com is a web application that helps manage team's work, projects and tasks online.
https://asana.com/

[8]Atlassian is a software company that provides Agile management solutions and a range of resources for learning about this methodology.
https://www.atlassian.com/

[9]ProjectManagement.com is a website for project managers that offers resources, information, and assistance on a range of project management subjects.
https://www.projectmanagement.com/

[10]Project Management Institute is a global organization that offers training, certifications, and resources to project management professionals.
https://www.pmi.org/

[11] Digitalprojectmanager.com includes courses, resources, and guides to assist project managers in successfully managing digital projects.

https://thedigitalprojectmanager.com/

[12] Planisware is a company that provides cloud solutions for project, program, and product management.

https://planisware.com/

[13] ProjectManager.com is a cloud-based project and work management platform that helps to plan, build and manage projects.

https://www.projectmanager.com/

[14] Medium.com is an online platform that hosts articles written by authors on a wide range of topics.

https://medium.com/

[15] Agile Alliance is a global organization that provides events and materials with the objective of supporting people and organizations who execute the Agile Manifesto's values.

https://www.agilealliance.org/

[16] FasterCapital is an online incubator and accelerator that operates on a global level.

https://fastercapital.com/

[17] KnowledgeHut is a professional training provider that offers a wide range of courses to help individuals and teams develop new skills.

https://www.knowledgehut.com/

[18] Agile Way is a resource on Agile methodologies that provides articles, guides, and tools for effective product management.

www.agileway.it/