

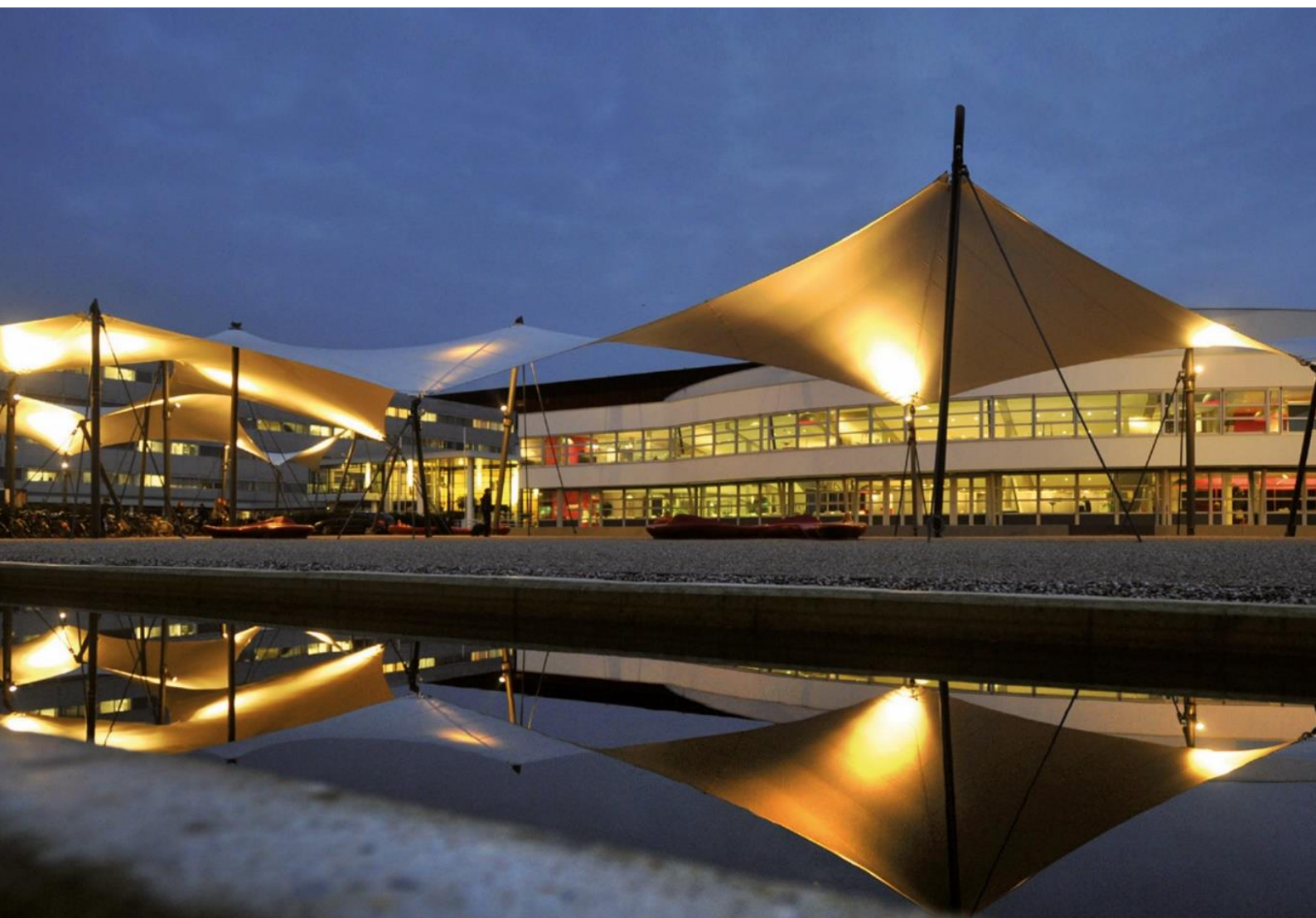
**APPLYING THE PRINCIPLES OF EVIDENCE-  
BASED MANAGEMENT IN AGILE PROJECTS: A  
CASE STUDY OF POSTNL E-FULFILMENT**

**BACHELOR THESIS**

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04-05-2023

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## Acknowledgement

The research was performed as a part of this thesis performed at the department PostNL e-fulfilment at Koninklijke PostNL B.V. (PostNL) commissioned by the bachelor program Industrial Engineering and Management at the University of Twente. PostNL is a customer of CAPE Groep B.V. which handled the graduation assignment in this case. Therefore, supervising was done by Chelsea Veenstra working at CAPE Groep and overall permission had to be granted by Kees Zwaan working at PostNL. The research was supervised by Lucas Meertens and Gayane Sedrakyan as representatives of the University of Twente.

First, I would like to thank Kees Zwaan and Chelsea Veenstra for their thoughts, feedback and guidance throughout this process. I would also like to thank all the other current and former members of Spiderman for their time and input. Due to their contribution, my progress has been pleasant and interesting.

Second, I would like to thank Lucas Meertens for the supervision he has provided me with during my thesis. His insights into my problems have helped me a lot. I would also like to thank my second supervisor Gayane Sedrakyan. Even though she was asked to be my second supervisor when I was already working on my first draft, she provided me with a lot of useful feedback. This feedback has guided me to improve my research qualitatively and academically.

Lastly, I would like to thank my friends and family for their support. In particular, I would like to thank my father, Jan-Willem Torken, for providing expertise on Evidence-Based Management, Agile and management techniques in general. He supported me with finding the right theory and helped me come to the final Evidence-Based Agility model.

Eva Torken

18-04-2023

## Executive Summary

The Evidence-Based Agility (EBA) model enables project teams to work problem-preventative instead of problem-solving. Herewith, the issue of deciding based on solely reasoning is dealt with. By extending the original ScrumXP model with an Iteration 0, an Iteration 0 Revision, a Mega Review and a Mega Retrospective, EBA is created. These events are used for high impact decisions that cannot be made without research. That research should be performed via the 6 As of Evidence-Based Management (EBM). In the added events the Product Owner and the project manager play a key role. The Product Owner is accountable for the content of an Iteration and has the power to discontinue an Iteration. The project manager is responsible for the team and the functioning of the team. Both must decide on the impact of a decision within their responsibilities and therefore decide when EBM is necessary.

EBA was constructed on the basis of a case study of 'Spiderman', a PostNL e-fulfilment project team. Spiderman focusses on replacing one of PostNL e-fulfilments applications. Spiderman is facing organisational and content-related issues which cause a lack of ownership. The following problem was found after performing research within Spiderman: 'The members of Spiderman are making decisions on the basis of logical thinking instead of theory combined with logical thinking.'

The five-stage approach called Design Science Methodology is used to construct and validate EBA. Stage four and five of this approach are out of scope for the thesis. The first stage of this research consists of observing the case of PostNL e-fulfilment and mapping out the construction of Spiderman as a project team. Based on the information found, the scope of the EBA model is determined to be Agile low code project teams handling the replacement of applications within the e-commerce sector in the Netherlands. The current and desired situation are sketched and compared in this stage. Stage two involves literature research into Evidence-Based Management, Agile methodologies and other project management techniques. By using the gap analysis of the current and desired situation the elements for the EBA model are defined. On these findings the Evidence-Based Agility model is constructed. Lastly, EBA is validated on the case study.

The Evidence-Based Agility model aims to be applicable in Agile low code project teams handling the replacement of applications within the e-commerce sector in the Netherlands. The combination of existing elements and the addition of two new elements which are the Mega Review and the Mega Retrospective provide project teams with a new manner of implementing Agile Iterations. Further research may show EBA to be applicable in Agile project teams within a broader context.

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# 1 Introduction

Using theory to support making the right decision is commonly used within companies. However, it is often overlooked what form of evidence is the most suitable for each decision (Briner & Walshe, 2012). In the nineties, the phrase Evidence-based Medicine was first mentioned. This term described the theory within medicine to help professionals make medical decisions based on rationality. (Thoma & Felmont, 2015) When this theory was created, only about 15% of the decisions in the medical sector were evidence-based. (Pfeffer & Sutton, 2006) From evidence-based medicine, the business sector saw potential in this strategy. Accordingly, evidence-based management (EBM) arose. It recognises the limits of human cognitive processes and takes into account bias and aims to improve decision quality by combining a family of principles, processes and decisions practices. These practices aim to help overcome the limits mentioned (Rousseau D. , 2020).

This research focuses on providing a model for applying the principles of EBM in project teams by the help of a case study based on PostNL e-fulfilment. Within the project team studied problems were identified that are likely to be avoided when decisions are made according to evidence-based management. This model will be called Evidence-Based Agility, EBA.

This chapter introduces the research overview. First, the case study is introduced. Next, the problem faced in the case study is identified and afterwards the derived core problems are explained. Last, the research design is provided.

## 1.1 Case study introduction

PostNL is a Dutch mail, parcel and e-commerce company which is active internationally. The headquarters are located in The Hague. The company is divided into three segments: parcels, mail throughout the Netherlands and international activities. It has 37,000 employees, which makes them one of the biggest current employers in the Netherlands (PostNL, n.d.). PostNL started as a delivery company under the name PTT Post in 1928. In 1998 the company switched to being TPG Post, which was part of the TNT Post Groep. In 2006 it was decided to take on TNT as the new name for the company. From 2011 until now, the name has been PostNL. The signature orange colour originates from the TNT period and was kept when the switch to PostNL was made. Their e-fulfilment department is the focus of this case study (PostNL, n.d.).

PostNL e-fulfilment has different applications helping them run their department. These applications are built in cooperation with third parties. This case study focuses on one of these applications called

“the Integrator”. The Integrator is an eCommerce solution that offers customers of PostNL e-fulfilment the possibility to store their stock into one of PostNL’s warehouses. Whenever one of the PostNL customers receives an order on their website, the order will be sent to the system which will then manage the fulfilment and the delivery of the order. This market is rapidly growing which leads to an increase in the volume of orders. The current system is a legacy system, which is not able to manage this increase in volume, therefore, replacement with a new and future proof application is necessary. The project team managing this change consists of three parties; PostNL, CAPE Groep and TIBCO. TIBCO is outside of the scope of this thesis due to their limited input into the project. The part of the project team that is within the scope is divided in three subgroups called ‘Spiderman’, ‘OOM Fulfilment’ and ‘Klant Integratie Portaal (KIP)’. Spiderman focuses on the business side of the project, OOM Fulfilment covers the information technology (IT) side and KIP is the front end through which the users of the new build application can access the application. This research focuses on Spiderman, because the representatives of OOM Fulfilment and KIP are also members of that team. Therefore, the research population consists of the current and former team members of Spiderman.

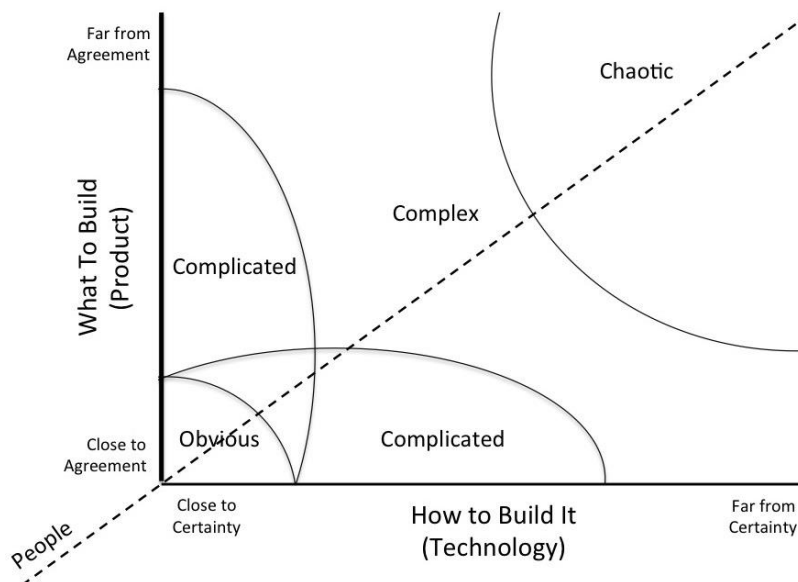
PostNL has been transferring to working Agile. They have chosen Scaled Agile Framework (SAFe) to be the method used throughout the company, which is a scaling framework. Therefore, it is applied to keep a clear overview for all project teams. However, there has not been a decision on what Agile method should be used in each project team. Therefore, the project teams do work Agile, but each team has their own interpretation. There are distinct roles within project teams of PostNL that all teams have whatever way of Agile is chosen. Most project teams work along Scrum, which is one of the Agile methods. Spiderman combines different Agile methods. The following roles were described as roles all project teams contain.

A key role is *the architect*. The architect is an employee of PostNL who provides the project team with a high-level vision for the project which is in line with the future vision for PostNL as a company. Then, based on the results of the architect, *the solution architect* provides the team with an overview of the different applications associated with the application that the team is developing. It also defines the extent to which those applications interact with each other. Within those applications it is described which functionality belongs to which part of the application. Combined, it forms the EBA model for the project team to assign functionalities within applications. On the lower level, *the process information analyst* (PIA) maps out the processes of an application. When faced with a replacement project, the PIA also identifies the improvement possibilities within the processes of the application to be replaced.

On the other hand, there are roles which focus on the content of the application. *Client management* represents the wishes of the client. By asking for the opinion of the eventual user it is ensured that the application will deliver value. The *functional service owner* (FSO) reviews the wish of the client together with management. *The Product Owner* prioritises the wishes the FSO passes on and prioritises the importance of each according to the high-level vision provided by the architect and the improvement possibilities identified by the PIAs. *The solution consultant* then puts those wishes into suitable features for the DevOps team. Which team members find the best solution for providing the customer with the feature. The last role is *the project manager*. The project manager oversees the whole project and directs the whole team in the right direction.

### 1.1.1 Agile

Spiderman works along the Agile methodology. The Agile methodology is suitable when parameters of a project are not all known upfront. Ralph Stacey describes this in a matrix which is seen in 'Figure 1; Ralph D. Stacey. Matrix for "Complexity and Creativity in Organizations"'. In this matrix, Agile is described to be necessary in the regions which are 'complicated' or 'complex'. For the region called 'obvious', Agility is not needed because the parameters are known upfront. The 'chaotic' region defines a project which should not be tackled before parameters are made clear. (Stacey)



Ralph D. Stacey matrix for "Complexity and Creativity in Organizations"

Figure 1; Ralph D. Stacey. Matrix for "Complexity and Creativity in Organizations"



This uncertainty can occur in three different forms or any combinations of them; (Agile Alliance, 2022)

- Change is predicted as time progresses.
- The team has not agreed on certain important issues yet.
- There is no knowledge on how to handle the project.

There are twelve principles which represent agility in a project. Regardless of what Agile method is chosen, may it be Scrum or any other method, these twelve principles must be followed.

These principles are: (Agile Alliance, 2022)

1. The highest priority is to satisfy the customer. This is done by early and continuous delivery of valuable software.
2. Welcome changing requirements throughout any time in the process.
3. Deliver working software on a frequent basis. Time periods may vary from a couple of weeks to a couple of months, shorter periods are preferable.
4. The developers and the business people must work together daily throughout the whole project.
5. Projects must be built around motivated individuals. Create the environment and support they need. Provide them with trust to get the job done.
6. Efficiency and effectiveness in conveying information to and within a development team is by having face-to-face conversation.
7. Working software is used as the primary measure of progress.
8. Sustainable development is promoted by Agile processes. A constant pace is required.
9. Continuous awareness of technical excellence and quality of design enhances agility.
10. Simplicity is essential. The amount of work performed should be minimised.
11. The best designs, requirements and architectures stem from self-organising teams.
12. The team reflect on how to become more effective on a regular interval, behaviour is tuned and adjusted accordingly.

PostNL aligns their project teams by using SAFe, which is suitable for organisations containing more than fifty employees. The core values of SAFe are alignment, built-in quality, transparency and program execution. SAFe is an overarching method and leaves space to determine what method is used on the lower levels, the project teams. Four different levels are defined. From the highest level to the lowest these are; Lean portfolio management, Business solution, Program and Team. The higher the level, the more strategic the approach is. Typically Scrum, Kanban, Lean or DevOps are used on the Team level in combination with SAFe on the higher level (ScrumGuide, n.d.).

Spiderman uses both Scrum and Kanban in their team. Scrum defines the Scrum team to contain three distinct roles. These roles are developers, a Product Owner and a Scrum master. In the case of Spiderman, more roles are defined to be necessary. These roles can be taken on by the Scrum defined developers of the team. The Product Owner is responsible for ensuring the product is delivered as expected. The Scrum master's responsibility is to oversee that all team members are up to date on the Scrum process and the responsibilities they have. The team works with Sprints of one to four weeks, which are iterations. The Product Backlog stories which need to comply with the Definition of Ready (DoR) to be actionable. Each Sprint has a Sprint Planning which contains stories from the Product Backlog that need to comply with the Definition of Done (DoD) by the end of the Sprint. Daily Scrums are daily sessions of fifteen minutes used to update each other on the progress toward the product goal by talking about the stories taken on. In each Sprint a Sprint Review and a Sprint Retrospective are used to review the content and the organisational process, respectively. If stories are not compliant with the DoD at the end of a Sprint, they are put on the Sprint Backlog (Schwaber & Sutherland, The Scrum Guide, 2020).

In Kanban different steps of a process are identified. A roadmap is used to visualise where in the process a certain task is at the moment. This ensures an overview of what tasks have to be done, what tasks are in progress etcetera. What steps each process has, is defined by the team itself. Kanban works along four principles; visualisation of the work, limit the 'work in progress', focus on flow and monitoring, adapting and improving (Bureau Tromp, n.d.).

### 1.1.2 Problem identification

The research problem was identified by interviewing nine different project team members of Spiderman and OOM Fulfilment. Of those nine interviewees, two are former project team members and seven are currently working on the project. These interviews were conducted after which the answers were used anonymously such that all interviewees felt they could speak freely. The interviews were personal online semi-structured interviews. This meant that they were conducted on a one-to-one basis, on an online platform with some 'yes or no' questions and a lot of open questions on which follow-up questions were asked. From these interviews different problems surfaced. Below, the individual problems are explained.

1. Common opinion was that there was no clear view on whether the application should be innovative, new and not based on the Integrator or that the Integrator should be taken as a basis for the new application.

2. In the other project teams, some members have experience with a Product Owner taking responsibility over delivering features. In the project team there was no Product Owner and no one taking responsibility over the tasks of a Product Owner.
3. The process flows of the Integrator were not accurately described as well as the process flows for the new application.
4. There was a lot of replacement within the project team. Team members switched after only a few months of being part of the team. Therefore, new members constantly needed to be updated on the project and its progress, which costs a lot of time and effort.
5. The features delivered were not usable. This was due to missing attributes of the features explained. There was no understanding about what elements a feature description must contain.

All these problems combined created frustration and stress for the members of the project team. It also resulted in features having to be rebuilt because of unclear communication. Team members described that other team members were not fully taking on their role properly. According to the results of the interview this resulted in that tasks of which was not implicitly described which role takes it on, no one felt the responsibility to take them on. Combining the problems mentioned leads to the problem 'scarcity of ownership within the project team'. An overview of the problems addressed in each interview can be found in 'Table 3; Interviews Spiderman'.

### 1.1.3 Problem owner

The problem owner defines an entity which is affected by the problem at hand. This can, for instance, be a person, a group, but also an entire organisation. The problems identified in 1.1.1 are all affecting the team members of Spiderman. Therefore, all team members of Spiderman are to be considered as problem owners. OOM Fulfilment representatives who are members of Spiderman are also affected by these problems. Other team members of OOM Fulfilment are not influenced directly by these struggles. Therefore, OOM Fulfilment is not mentioned separately as a problem owner.

### 1.1.4 Core problems

The problem cluster describes the cause-effect relationships between different problems. By using a problem cluster one can lead a problem back to its origin. The problems described above all relate to each other in a way. These relations were discovered during the interviews performed. When tracing back these relations through 'Figure 2; Problem cluster Spiderman and OOM Fulfilment' from 'Little

ownership within the project team’ to the end points, five causes are identified. The action problem faced is; ‘Within the project teams, consisting of Spiderman and OOM Fulfilment members, it is felt that there is less ownership over roles and tasks than desired.’

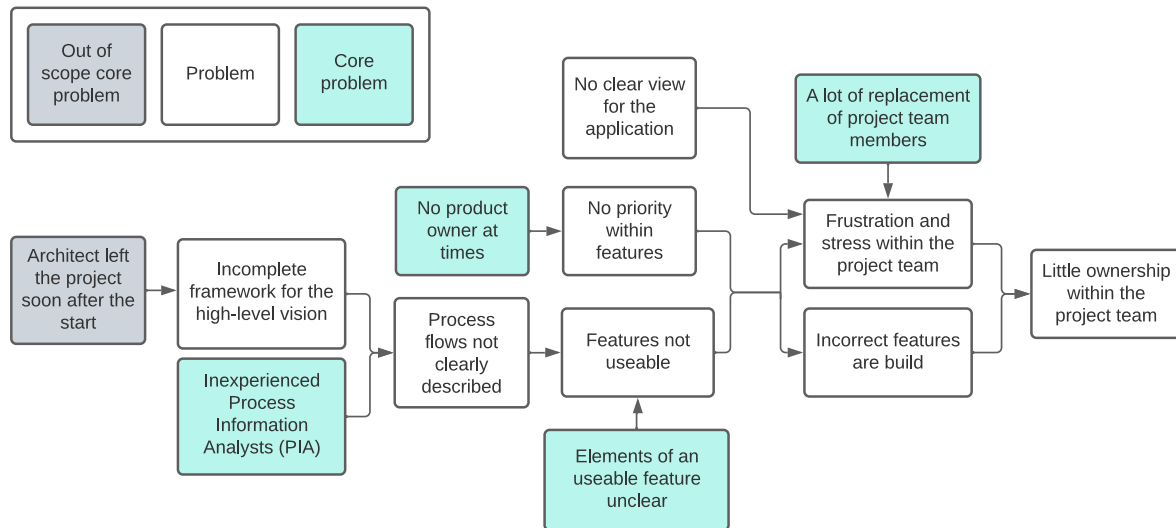


Figure 2; Problem cluster Spiderman and OOM Fulfilment

The different causes are expected to be different in solvability. Also, it is expected that each cause impacts the problem in another matter. Therefore, each cause is discussed separately. The architect on this project left soon after the project started due to illness. Architects are not easy to replace, so there was no architect for a while. It does not happen often that an architect leaves a project due to illness. Therefore, this cause is viewed as out of scope.

During other projects at PostNL, the level of experience of the PIAs would not be a problem. There would be at least one experienced PIA on the project. In Spiderman this problem was solved by replacing them with more experienced PIAs. However, the lack of experience still had an impact on the project team when solved, because the process flows were not clearly described during the start-off of the project. Due to this, the unexperienced process information analysts are viewed as a core problem.

A Product Owner takes on a vital role withing the project team. The team did not have a Product Owner at times and other Product Owners did not take on their responsibility fully. Thus, the role of Product Owner was not fulfilled correctly. For this reason, this cause is seen as a core problem.

The frequent change within the project team has caused annoyance within the team. This change of team members is normal at PostNL project teams. So, the frequent change of team members is seen as a core problem.

It took just over a year for OOM Fulfilment to explain to Spiderman how they would like to see their features described. Still, not all feature descriptions were useable. Therefore, the elements of a useable feature being unclear is also seen as a core problem.

Concluding, the core problems that will be focussed on are; the unexperienced PIAs, no Product Owner at times, frequent replacement of project team members and the elements of a useable feature being unclear. The unexperienced PIAs, no Product Owner and frequent replacement of project team members can all be led back to choosing the right people. Therefore, these core problems are combined to 'Importance of choosing the right employees for each role in a project team'.

Looking at the different core problems described, preliminary research shows that each of the problems has a potential solution in existing research. Taking a step back results in the question; 'Why is available theory not used for each of these problems?' The available theory refers to theory about feature writing, the role of a Product Owner and the impact of frequent change. This question will therefore be the core of the research.

Due to the problems and core problems described in the problem cluster having a solution in existing theory, the action problem cannot be found in the problem cluster given in 'Figure 2; Problem cluster Spiderman and OOM Fulfilment'. The action problem is defined as follows; 'The management of PostNL e-fulfilment and Spiderman seem to not be making decisions based on available theory, on which the decisions should be made.' PostNL e-fulfilment management and Spiderman are the problem owners in the case of this action problem. PostNL e-fulfilment management is limited to those deciding on Spiderman specifically. The norm and reality are not measurable in this case but can be validated by asking a simple question; 'Is your decision based on available theory and reason instead of only reason?' These questions will be asked to the problem owner.

## 1.2 Research design

The previous section identifies and describes the problem of the case study. Based on that section the main research question is formed. The main research question aims to solve the issues mentioned in 'Figure 2; Problem cluster Spiderman and OOM Fulfilment'. It is formulated as follows:

*'How can the management of a project team within the scope of this thesis make decisions which are based on theory and reasoning instead of logical thinking alone?'*

However, the main research question cannot be answered without the use of the case study. Therefore, a sub-question is used to answer the main research question. This research question is as follows:

*'How can the management of PostNL e-fulfilment and the team members of Spiderman make decisions which are based on theory and reasoning instead of logical thinking alone?'*

This research results in the EBA model for making those decisions. The method chosen for this research is Design Science Methodology (Wieringa, 2014). This method focuses on the statement that research in all disciplines is problem-solving and is useful for any research in which an artefact is designed; the EBA model. Design Science Methodology consists of the following steps:

1. Problem investigation; *What phenomena must be improved? Why?*
2. Artefact design; *Design one or more artefacts that could treat the problem.*
3. Artefact validation; *Would these designs treat the problem?*
4. Artefact implementation; *Treat the problem with one of the designed artefacts.*
5. Implementation evaluation; *How successful has the artefact been?*

Step one; Problem investigation, the Managerial Problem-Solving Method is used. (H. Heerkens, 2017) Thus, the problem is defined as an action problem, a norm and reality, a core problem and a problem owner. The action problem and the core problem are derived from the problem cluster made. Based on this research, a research design is formed.

Step two; Artefact design handles the creation of the EBA model. This is done based on research into the current knowledge of EBM and defining the needs for EBM in project teams.

Step three; Artefact validation is used to confirm the usability of the EBA model. The outcome of the research will be tested based on the opinion of the problem owner; do they think the solution will work? Questions will be asked to test the completeness, feasibility and clarity of EBA.

This bachelor thesis aims to provide PostNL e-fulfilment with a model which allows them to solve the problems identified. The implementation of the provided solution is not a part of this bachelor thesis. Evaluation is not feasible without that implementation. Therefore, steps four and five are outside of the scope for this assignment.

In the problem investigation the current situation at PostNL Spiderman will be researched with the goal to provide complete insight to that situation. The following research questions are discussed:

1. What do the current situation and the desired situation of Spiderman look like with regard to features and choosing the right people?
  - 1.1. What does the desired situation of Spiderman look like with regard to choosing suitable people for each role?
    - 1.1.1. What elements should a complete feature contain?
    - 1.1.2. What is the impact of frequent replacement on team members?
    - 1.1.3. What tasks are performed by a Product Owner in a desired situation?
    - 1.1.4. What tasks are performed by a process information analyst in a desired situation?
    - 1.1.5. What elements are essential for an Agile project team as an element of SAFe?
  - 1.2. What does the current situation of Spiderman look like with regard to choosing suitable people for each role?
    - 1.2.1. What components of Agile methods are represented in Spiderman?
    - 1.2.2. What elements do features contain currently?
    - 1.2.3. Why was each project team member chosen to fulfil a certain position?
    - 1.2.4. Which of the tasks normally performed by a Product Owner are and are not performed?
    - 1.2.5. What tasks process information analysts normally perform are and are not performed?
    - 1.2.6. Which project members have been replaced and why were they replaced?
2. Considering EBM, how is knowledge used currently?

Concluding the problem investigation, PostNL is provided with several deliverables:

- An analysis of the current situation related to the decisions made.
- An analysis of the desired situation.
- The gap between the current and desired situation. Which is visualised via the use of a table.

In the artefact design, the objective is to design the EBA model to support decision making on a rational basis. The EBA model aims to close the gap between the current situation and the desired situation described in the problem investigation. To design the artefact, the following questions must be answered:

1. What is evidence-based management and for what is it used?
2. How can evidence-based management be implemented in Agile project work?

According to the results of these questions, the value of EBM in projects is identified. Moreover, it is identified for which elements EBM is suitable.

The scope of this thesis is important for the results presented. The EBA model delivered will be applicable for Agile project teams handling the replacement of applications in the low code sector within the e-commerce sector in the Netherlands. Any project team not in the applicable area is out of scope.

Concluding the artefact design, the following deliverables will be provided:

- The Evidence-Based Agility model for Evidence-Based Management within project teams.
- An insight into the feasibility and impact of the EBA model will be given.
- Recommendations to Spiderman on how to implement EBA.



## 2 Problem investigation

### 2.1 Case study: PostNL

This chapter describes the case study based on the research questions provided in 'Research design'. This is divided in three different sections; desired situation, current situation and the gap between the desired and current situation. The desired situation explains theory on the different subjects identified as troubling. The current situation describes the subjects as they are now. The gap represents the change needed to improve the situation of Spiderman.

#### 2.1.1 Desired situation

*What elements should a complete feature contain?*

The aim of a feature is to describe a system feature which is desired by users in a standardised manner. (Amna & Poels, 2022) The feature must contain three elements which may be expressed as Card, Conversation and Confirmation (O'hEcocha & Conboy, 2014). Card is the part of the feature which describes the intent of the feature. Details may be provided when they are needed at a later point in time. The Card is often written in the form of a standardised sentence; 'As a <role> I want to <action> so that <result>'. Conversation describes the discussion between the stakeholders (team, customers, end users et cetera). The conversation between those stakeholders must be held, however, it does not need to be described in written detail. The goal of the Conversation is to create discussion, so that all stakeholders agree on the feature. Confirmation describes the requirements of the feature which need to be fulfilled for the feature to be considered as implementable. Card and Conversation must be written down. Also, it is of importance to mention the business value into the described feature. A benefit hypothesis must also be added to describe why the feature is necessary.

*What is the impact of frequent replacement on team members?*

The replacement of one team member is different from the replacement of another team member and its effects also differ. When a project manager is replaced, it affects the perception of the project for the other team members. Many feel that that is done because the project needs rescuing (Vartiainen & Pirhonen, 2007). The impact can be minimalised by replacing the project manager professionally with the right way of knowledge transfer. However, without the professional manner employees are affected negatively. A professional transfer must include elaborate communication between the former and new project manager.

When the transition is not performed professionally, different issues are faced frequently. The process is slowed down which also increases costs and it affects the schedule. New relationships have to be formed between the project team members and the new project manager. Team spirit is influenced by having to get to know the new manager and the new manner in which is worked. These issues together create chaos for the team members which influences the progress of the team (Vartiainen & Pirhonen, 2007).

A dynamic team, in which members are replaced more frequently, has general disadvantages to working in a team which consists of non-rotating members. Every member who leaves, is replaced or is added disrupts the team cohesion for a certain time period. A depletion of transactive team memory will occur. To counteract those issues a core of team members ensuring transactive memory and team cohesion will help. However, having a core of certain team members may also create status hierarchy. To counteract the status hierarchy, each new member of the team must have task competence or a high social status (Thomas-Hunt & Philips, 2013).

Both the replacement of the members and the managers of a team can affect the clients' trust. Frequent replacement of any team member can radiate incompetence, which influences trust (Vartiainen & Pirhonen, 2007).

Thus, the replacement of any project team member or manager is a delicate process which should be thought through carefully to reduce the effect on team dynamics, transactive memory and the clients' view on the progress.

#### *What tasks are performed by a Product Owner in a desired situation?*

Tasks of a Product Owner can be broad and overlapping with different roles within teams. (Remta & McLaughlin, 2022) However, generally performed tasks can be defined. These tasks are divided over different areas: (Remta & McLaughlin, 2022)

- Agile activities.
- Backlog management.
- Release progress.
- Customer communication.
- Internal communication.

Agile activities contain tasks such as prioritising the needs, overseeing the stages of development, accepting user stories and reviewing features and stories. By giving this responsibility to one team members, the Product Owner, stories and features are generalised in their definition and oversight of the project is created.

Backlog management also contains the tasks of prioritising needs. Here, it contains defining the order in which backlog items should be handled and defining the items for the next Iteration. Also, the Product Owner must decide on the relevance of a backlog item based on the change that has or has not occurred within the project.

Looking at the release progress, the role of a Product Owner is marginally smaller. It entails seeking approval for the release only.

Communication with the customer in this case study is defined to be different from a project team in normal situation. This is due to having project team members who are designated to communicate with the customer. The role of the Product Owner is therefore checking the team members who deliver the information from the customer on completeness, correctness and relevance.

Internal communication is about ensuring the stakeholders are up to date on the progress of the project team. The stakeholders consist of the project team itself and the people relevant outside of the project team. Internal communication leaded by the Product Owner creates a central point of communication, which ensures overview when performed properly.

It is of importance that these tasks are controlled by one person, a Product Owner, to prevent a loss of accountability. Having more than one Product Owner is known to reduce transparency and can also slow down inspection and adaption. The tasks above are best handled when done by one person because the tasks impact each other. A change in priority needs to be internally communicated and maybe also communicated to the customer. The change also needs to be considered throughout the agile activities and backlog management. One person coordinating all tasks, when performed well, has overview on the overlap. While advised against, multiple people may be assigned to the tasks by the Product Owner, but accountability should remain with the Product Owner. (Schwaber & Sutherland, Problem Owner, 2020)

*What tasks are performed by a process information analyst in a desired situation?*

A process information analyst evaluates and improves the processes of a company. After the process is evaluated and the requirements for improvement are defined, the process is to be translated into a process flow and the requirements are to be translated into a feature, which are used to build stories. When external stakeholders exist, these must be taken into consideration. Therefore, the PIAs must sit together with those stakeholders to define the process flow of the process that the stakeholders want to improve.

*What elements are essential for an Agile project team as an element of SAFe?*

A team should start by looking at the twelve different principles of Agile. From these principles the conclusion is drawn that a team should work in iterations of a by the team determined period. Working in those time periods guarantees the team to limit the number of tasks taken on at the same time. It also ensures the frequent delivery of software. Regular delivery of software and updates satisfy the customer. Besides determined iterations, the team should have a review on its effectiveness in each iteration held. By reviewing the team and its work, the behaviour of the team can be adapted accordingly.

The team should be self-organising. Therefore, the team must be able to assign tasks and track its own progress. Different roles within a team can guide a team to achieve self-organisation. There should be daily communication between the business and developers for which face-to-face communication is preferred.

Combining the Agile principles with SAFe, there are different obligations to be met. SAFe is based on the principles of Agile, however, SAFe defines them in more detail. The first defined necessity of SAFe is the presence of a Scrum Master and a Product Owner in each team. It does not matter what specific Agile method is chosen for that team. Therefore, these roles must be fulfilled. To be able to plan iterations correctly, SAFe obligates its team to estimate the size and the complexity of the work. The manner in which is not defined specifically. (Scaled Agile Framework, 2021)

### 2.1.2 Current situation

*What components of Agile methods are represented in Spiderman?*

Spiderman works along with SAFe by joining the Product Increment sessions which take place each quarter. These sessions are company-wide to determine the overall goal for that quarter. Spiderman introduces the features they plan to fulfil that quarter in that session.

Spiderman does work with Daily Scrums, often called stand-ups. In the team they have twisted this to their own stand-up. These take place twice a week instead of daily and last about half an hour. They work with features and not stories and during the stand-up the progress of those features is discussed. Sometimes a retrospective is planned to discuss the organisational process. The roadmap of Kanban is used to map out the progress of the features planned for that quarter.

*What elements do features contain currently?*

Currently, some features are provided with the Card describing the feature that is wanted instead of the intent of the feature. Therefore, the feature does not describe a problem, instead it describes a solution. This limits the receiver of the feature to one solution instead of a creative process leading to different solutions. The Confirmation should describe the functionalities of the feature solution which make the solution correct for the Card presented. At the moment, Confirmation contains criteria which are not specific enough for them to be used for the description of an implementable solution. Conversation, as it is not necessary to, is not given in the current features. However, when the Card of the feature describes the solution and therefore does not leave room for other solutions, the Conversation should explain why other solutions are not necessary; e.g. the customers want the feature to be exactly build as described.

*Why was each project team member chosen to fulfil a certain position?*

PostNL e-fulfilment which handles the replacement of the application is quite small with regard to employees. This also means that the choice of people is not broad and straightforward. Adding to that, Spiderman is not a fulltime project meaning that people have to have time available to join Spiderman. This also narrows the possibilities down. For the role of architect, solution architect, functional service owner, client management and project manager people were chosen who were experienced in that role. However, during the preparations of Spiderman, there were no experienced PIAs available. Therefore, a new PIA was chosen for this project together with another colleague who was not a PIA yet.

*Which of the tasks normally performed by a Product Owner are and are not performed?*

The different team members who were named Product Owner did not take on their tasks well. Currently, there is no named Product Owner and tasks are divided. The agile activities described are performed by the project manager at the moment. Backlog management is separated over the two teams; Spiderman and OOM Fulfilment. Backlog management for Spiderman is done by the project

manager and backlog management for OOM Fulfilment is done by their solution consultant. The release progress task is done by the team which is seeking to release. Customer communication is done by client management of Spiderman. Those employees represent what the customer value is.

However, there is no one person designated for checking them on correctness, completeness and relevance. The team receiving the features from client management does ask questions about those three topics to ensure the right features are built. Internal communication is mostly done by the project manager and partly by one of the employees representing client management.

Thus, the tasks described necessary for a Product Owner are all performed. However, the accountability does not lie with one person. Therefore, confusion is created about what specific tasks are done by whom and there is no one assigned to divide those tasks.

*What tasks process information analysts normally perform are and are not performed?*

The process information analysts have been delivering features throughout the project. However, the features delivered were not always contain the process flow, which was expected by OOM Fulfilment. The step of evaluating the process to deliver the process flow was passed over because there was already a working application with a working process. Contact with stakeholders is setup when it is considered to be necessary and not for each process in need of improvement.

*Which project members have been replaced and why were they replaced?*

The current rate of replacement is discussed per role within the team. Different roles have different rates of replacement and each role has its own knowledge to pass on.

Architect – The architect has been switched once throughout the project.

Solution architect – The solution architect working in this project is the solution architect working for CAPE Groep and has been active since the beginning of the project.

Process information analyst – The project started off with two process information analysts of which one was not a PIA at the time and one was just starting the role. One of the PIAs fell ill and was taken over after two months. The same person also took over the other PIA soon thereafter. Throughout the project, the PIA has been replaced twice more. Both switched to other roles within the company. Currently, the team has one experienced PIA.

Client management – Client management consists of two team members who have been representing the needs of the clients and the internal users since the beginning of the project. Both have not been replaced since.

Functional service owner – The functional service owner starting the project was not replaced throughout the project.

Product Owner – Different Product Owners have been named owner until this time. However, these Product Owners have struggled to fulfil this role. Currently, there is no Product Owner. Therefore, tasks are being performed by several project team members.

Solution consultant - There are different solution consultants within Spiderman representing different parties. The solution architects of the Integrator, KIP and OOM Fulfilment have all been present since the start of the project and have not been replaced since.

Project manager – The first project manager was replaced after four months from the beginning of the project. This was due to maternity leave. After three months the new project manager joined the project to have a transfer period of about a month. There were a few one-to-one meetings for the transfer and the former project manager made a document which contained the relevant information about the progress of the team. This contained detailed information about the features and their statuses, the rules discussed among the team members, contact persons for different roles, the goal of the project, the general planning of the project, the way of working in the project and an insight into the costs of the project.

*Considering EBM, how is knowledge used currently?*

Starting by looking at how the team was put together the first time, limited knowledge about how a team should be put together was used, due to the limited people available for the project. However, the process was quite thought through, because professional experience was utilised. Roles that needed to be fulfilled were identified before putting the team together. Based on these roles, the roles for which experienced employees were necessary were identified. Besides that, roles that needed more team members than standard were pointed out.

The transfer from the first project manager to the current project manager was done on the basis of professional experience. The former project manager had not been educated on how to transfer work from one person to another. So, what was done was based on personal ideas. The transfer document was opened on the computer throughout days such that new information could be added whenever necessary. In this manner, the aim was to make the tasks clear in a single document.

During the start of the project, the PIAs had a shortage of knowledge about writing features and what the basis for those features should be. Throughout the project, OOM Fulfilment started to notice that knowledge was lacking about features, after which a meeting was set up to explain the characteristics of a usable feature. The members of OOM Fulfilment are experienced in working with features and were therefore experienced professionals. Thus, the knowledge was available but not always shared with the people needing it. Afterwards, features improved but sometimes the description still contains a wish instead of an intent.

### 2.1.3 Knowledge Gap Analysis

Below, the difference between the current situation of Spiderman and the desired situation of Spiderman is put together in 'Table 1; Knowledge Gap Analysis'. This table summarises the main differences between the current situation and the desired situation.

	Current	Gap	Desired
Features (at the start)	Incomplete features	Knowledge about writing features	Complete and implementable features
Features (now)	Card describing the feature wanted	Agreement on the goal of Spiderman	Card describing the intent of the feature
Management transfers	Based on professional experience	Theory on transfers of management	Based on professional experience and theoretical knowledge
Choice of team members	Based on available employees	Shortage of available personnel	Based on professional experience and theoretical knowledge



<b>Product Owner</b>	Product Owner task accountability dispersed	One person designated as Product Owner	Product Owner with all the accountability
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Table 1; Knowledge Gap Analysis

## 2.2 Generalisation of the case study

Spiderman is facing different problems which are specific their project team. However, generalities can be drawn from the situation. First, the project does not follow theory as it is described in an Agile theory. A good combination of two different theories is used, however, both are not used to their full potential. Different basic elements of the theories applied are missing. Second, inexperienced employees were put on roles which play a key role in the project and key role team members fell away because of varied reasons. Third, some team members have a shortage of knowledge needed to fulfil their role within the team. This is due to the knowledge not being shared timely or due to the knowledge not being available. Lastly, frustration about responsibilities and task performance were not dealt with timely, which created polarisation.

### 3 Artefact design

This chapter is used to design an artefact to enable Agile project teams, within the scope of this research, to work with Evidence-Based Management. EBM is explained in this chapter. Then, the specific needs in project teams for EBM is described. Last, the Evidence-Based Agility model is created.

#### 3.1 Evidence-Based Management

The first definition of evidence-based medicine is 'A systemic approach to analyse published research as the basis of clinical decision making.' (Jeffrey, Claridge, Timothy, & Fabian, 2005). For evidence-based management, these decisions are based on published research and critical thinking. However, evidence for evidence-based management may be different than evidence for evidence-based medicine. EBM delivers a solution for the decision that is probably the most favourable one. This solution aims to be qualitative, which makes it easy to substantiate. Therefore, this technique strives to provide a decision which is based on evidence. To arrive at that decision, certain steps have to be taken. These are the 6 As of EBM (Barends, Rousseau, & Briner, 2014).

1. *Asking; Formulating the problem into an answerable question.*
2. *Acquiring; Acquiring evidence in a systematic manner.*
3. *Appraising; Deciding on the relevance and reliability of the acquired evidence.*
4. *Aggregating; Assigning weights to and pulling together the evidence acquired.*
5. *Applying; Using the evidence into the process of decision-making.*
6. *Assessing; Evaluating the outcome of the decision.*

Step one is used to define the problem or practical issue in such a manner that a solution in the form of an answer to a question can be given.

Step two defines the different types of sources for evidence mentioned which are viewed as suitable. Scientific research is commonly mentioned as suitable evidence. Besides scientific research, professional experience and judgement is also frequently explained to be suitable for EBM. However, it is also noted that this is a source of evidence which should be carefully approached when used. This is due to the fact that people are named experts in certain fields fairly easily while they are not (Pfeffer & Sutton, 2006). Organisational data, facts and figures are also mentioned as suitable sources for evidence-based management. Note that this evidence is only suitable when that data is applicable for the situation in which the decision should be taken. Experience from other similar decision scenario's

may be used (Shillabeer, Buss, & Rousseau, 2011). Lastly, stakeholders' values and concerns are noted as suitable evidence. In this case only the values and concerns of people who may be affected by the decisions should be included (Barends, Rousseau, & Briner, 2014).

Step three is used to ensure the evidence acquired is suitable for the question that is raised based on reliability and relevance. Therefore, throughout this step one must ask simple questions to ascertain the suitability of the evidence. These questions may be: 'How and where was the evidence gathered?', 'Is the evidence the best evidence available?' and 'Is the conclusion based on enough evidence?'. When contradicting evidence is found, more research is needed into why the evidence is contradictory and whether one is more applicable in the particular situation faced (Barends, Rousseau, & Briner, 2014).

Step four is used to gather all the evidence after which each piece of evidence is given a weight individually. Not all evidence is as applicable, therefore, a weight is given to divide the evidence in a range from most suitable to least suitable.

Step five combines the evidence that was found to be most suitable in step four. This is done to arrive at the decisions which is projected to be the most favourable.

Step six is used to evaluate the decision made. This step is of importance for similar problems that may arise in the future.

The six steps of EBM describe an extensive decision-making process. Therefore, EBM is used for decisions with a high impact. EBM is never used for decisions which require system 1 thinking. System 1 thinking is a process of thinking which is almost instantaneous. These decisions are taken within a split second. EBM is useful for the decisions which are more thought through and take time; system 2 thinking. (Hollingworth & Barker) System 1 thinking makes up for 95% of our decisions (Purcell, 2020).

### 3.2 Agile-based Evidence-Based Management

In 'Figure 3; The Waterfall Model' the five steps of the Waterfall model are visualised. In this model it is clearly seen that the steps are sequential. The Waterfall model rests on the idea of documenting all decisions before designing. Therefore, all project requirements must be known upfront. The next step is designing the solution before implementing the design, verifying the solution and maintaining it.

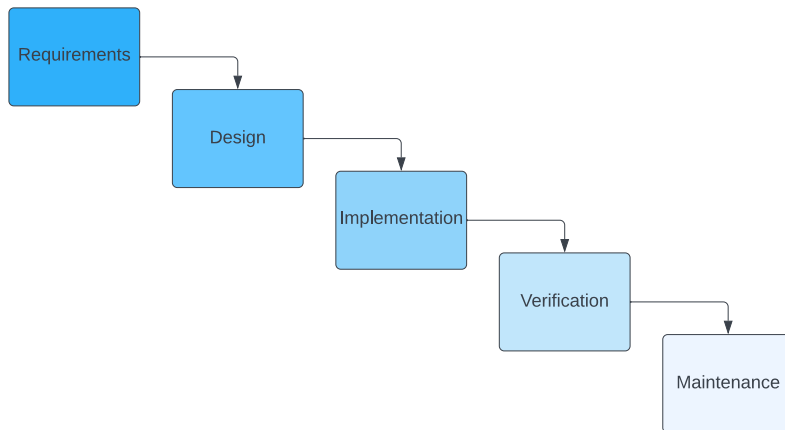


Figure 3; The Waterfall Model

Utilising EBM in the Waterfall model is therefore easily done. The decisions needed to be taken are defined at the start of the project and can thus be marked high impact when necessary. Then, the 6 As are used to arrive at the best projected decision.

When implementing Project-based EBM in an Agile method, the methodology described for the teams is of interest. In SAFe this is called the Team level. SAFe does not provide an own methodology to work in this level and refers to Scrum(XP), Design Thinking or Kanban to be utilised. Whatever methodology is chosen for the Team level, the team must contain a Scrum Master and a Product Owner. SAFe recommends using the SAFe ScrumXP methodology on the team level as the primary methodology and Kanban to manage activities not defined in ScrumXP. It is a methodology which defines a general iterative method.

ScrumXP, as Scrum, defines the team to consist of one Product Owner, one Scrum Master and developers. The SCRUM Master is responsible for educating the whole team and the organisation with SCRUM theory and practice. The Product Owner is responsible for the tasks described in 1.1.3. The developers then plan what items are handled throughout the iteration, maintain quality by adhering to the Definition of Done (DoD), adapt their plan toward the goal of the iteration daily and preserve team and individual accountability as professionals (Schwaber & Sutherland, The Scrum Guide, 2020).

ScrumXP works in iterations which may have a duration from one to four weeks. The duration is decided upon at the start of the project. Iterations are used to reach the product goal by cutting the main goal into smaller parts. The Team Backlog consists of items which are pushed from the Product Increment Planning (PI Planning). The Product Owner ensures that the Team Backlog is arranged

correctly before each new iteration is started. For the period of the Iteration a Iteration Planning is used to determine what should be done during that Iteration based on items of the Team Backlog. These items are handled by the development team throughout that Iteration Therefore, the Iteration Planning is determined by the developers. The Iteration Backlog consists of items planned for a certain Iteration but could not be handled throughout that Iteration. On each day throughout the Iteration, the Daily Stand-up is used to inspect progress and adapt the Iteration Backlog if it is necessary. This is a 15-minute meeting and often planned at the same time every day throughout the Iteration to reduce complexity. What is built, the content of the Iteration, is reviewed in the Iteration Review. The outcome of the Iteration is the point of focus. Progress towards the product goal is presented to key stakeholders. The Iteration Retrospective is used to increase team efficiency and the quality of what is performed in the Iteration. This entails a retrospective on individuals, processes, interactions, tools and the DoD. The complete ScrumXP process is seen in 'Figure 4; ScrumXP '.

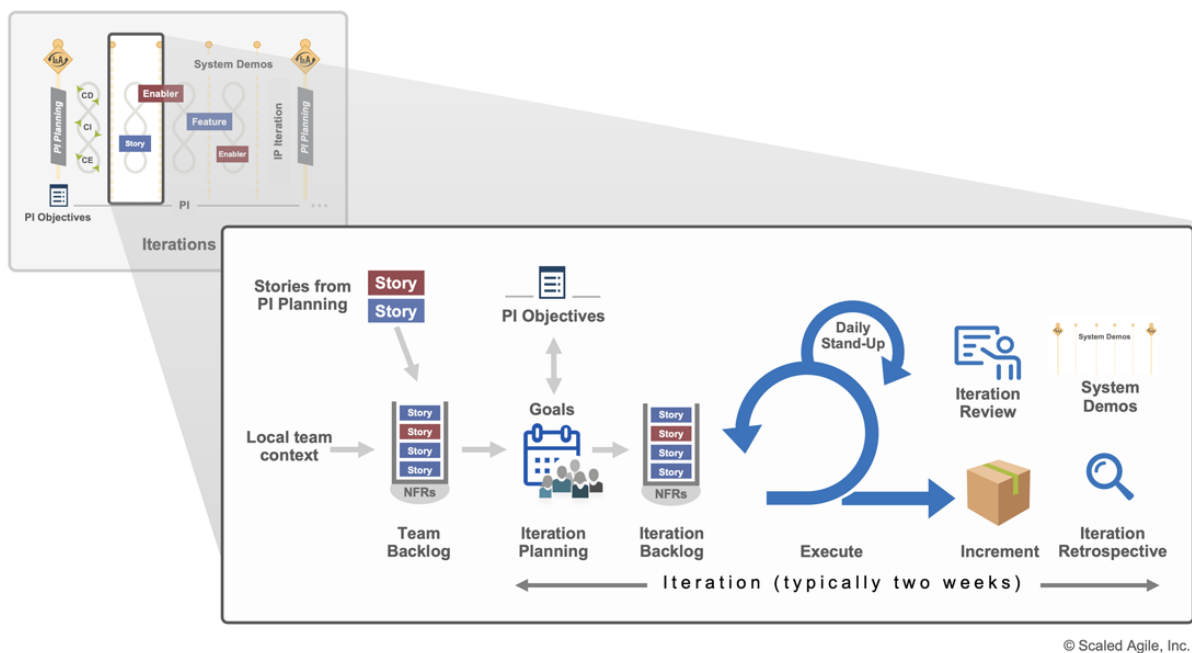


Figure 4; ScrumXP (Scaled Agile Framework, 2013)

As described, adaption is predicted to be constant with the ScrumXP methodology. Therefore, it is difficult to decide what decisions have a high impact upfront. Thus, the ScrumXP methodology must be adapted to be able to implement EBM in the methodology.

### 3.3 Evidence-Based Agility model

The Evidence-Based Agility (EBA) model is an extension on the original ScrumXP model. Therefore, iterative methods are to be recognised in EBA. EBA augments an iterative methodology by incorporating novel components as well as components derived from other (Agile) theories. The components added are elucidated below:

- Impact scaling; *Frequently used in Agile methods.*
- Iteration 0; *Frequently used in Agile methods.*
- Impediment management; *Frequently used in Agile methods.*
- Mega Review; *New component.*
- Mega Retrospective; *New component.*
- Iteration 0 Revision; *Frequently used in Agile methods.*

To be able to use EBM in any Agile methodology, impact scaling is necessary. Impact scaling is used to determine the impact of the item built. This is inherent to the extent to which the item should be extensively considered. For scaling the impact of an item different manners of scaling can be used. A simple scaling from a very low impact to a very high impact may be used. According to the scale used, categories for which EBM is used must be identified. In every element in which impact scaling is used, the Product Owner should define whether they are capable to make a decision on the impact or whether team participation is crucial.

The original SAFe methodology does not provide a theory with the components necessary to implement EBM as described in 3.2 Agile-based Evidence-Based Management. The first adaption to the original SAFe methodology is adding an Iteration 0. An Iteration 0 is not uncommon in Agile practises. An Iteration 0 is started after the project team has been put together. It is used to determine the generalities of the project. These generalities are all categorised with one of the higher impact categories and have to be determined before the project officially starts, thus before its first Iteration starts. An Iteration 0 is not used for the details and is suitable for the use of EBM. As seen in 'Figure 5; Iteration 0', an Iteration 0 is finished before any other Iteration is started.

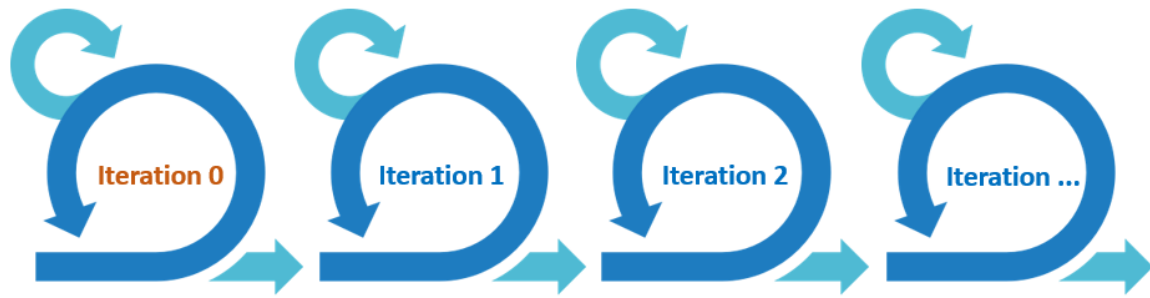


Figure 5; Iteration 0

After Iteration 0 is finished and the generalities of the project have been ascertained, the first Iteration can be started. Before each normal Iteration starts, the Product Owner arranges the Product Backlog correctly. For the use of EBM, each item in the Product Backlog should get an impact category. The Product Owner is responsible for the impact scaling of the Product Backlog and ensuring EBM is used for the items with a high impact. These items cannot be put on the Iteration Planning before the EBM process is finished. The Definition of Ready (DoR) defines whether a story is clear, concise and actionable. A story cannot be put on the Iteration Planning before it complies with the DoR. The DoR is not described in the Scrum Guide itself, but it is frequently used in all Agile methods. Therefore, it is not seen as a new addition to the ScrumXP model.

The team may run into immediate issues during Iterations. Handling these issues can be done with impediment management. Often, these issues are raised in the Daily Stand-up, the Iteration Review or the Iteration Retrospect and must be handled from there on. In Agile teams, impediments are often managed with the use of Issues Snakes or Issues Calendars. (Hamilton-Withaker, 2009) However, issues may be managed in any manner that is preferred as long as the issues are logged, handled and solved. In order to use EBM these issues must be labelled with an impact category.

During the Iteration Review, impediments may be found which are fundamental for the project with regard to the content. During the Iteration Retrospective impediments may arise which are fundamental for the organisation of the project team. These impediments are of the highest impact category. A Mega Review is used for the content related impediments and a Mega Retrospective is used for organisational issues. A Mega Review and a Mega Retrospective can also be necessary in general without one single impediment triggering them. The Mega Review may be triggered by the amount of rework which has to be done in each Iteration. The amount of rework indicates that the general process within the team is faulty. In the case of a Mega Retrospective, a change in velocity of the team members is the indicator. In all cases, it depends on the effect the impediments have on the

Iteration items whether the next Iteration may be started. Mega Reviews and Mega Retrospectives involve using the 6 As of EBM to find the solution which is probably most favourable. 'Figure 6; Evidence-Based Agility Iteration' is created by zooming in on an Iteration and adding these features to the original ScrumXP methodology.

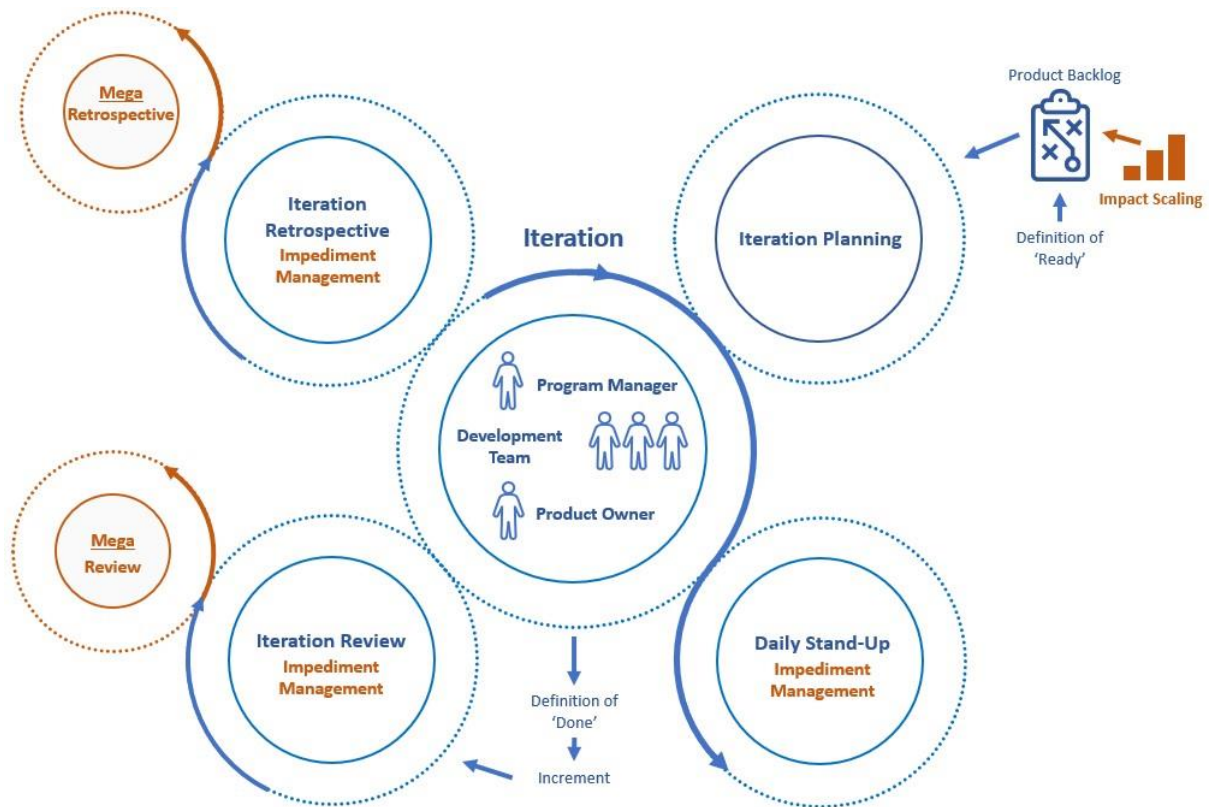


Figure 6; Evidence-Based Agility Iteration

Issues may arise during Iteration Reviews or Iteration Retrospectives which cannot be solved without adapting the project generalities decided on in Iteration 0. Thus, both a Mega Review and a Mega Retrospective are not suited. Therefore, an Iteration 0 Revision is needed when those issues arise. An Iteration 0 Revision is done in between Iterations, therefore, no other Iteration is active. A periodical Iteration Revision can be used to ascertain that the team is still on track with the goals set. These goals might need adjusting, which can be done preventative or reactive in an Iteration 0 Revision. Especially in projects which are extensive, using Iteration 0 Revisions preventively can be helpful, because the parameters determined during Iteration 0 might change more often and some parameters might not be predictable during Iteration 0. Doing an Iteration 0 Revision timely will ensure that the whole team status on the same track.



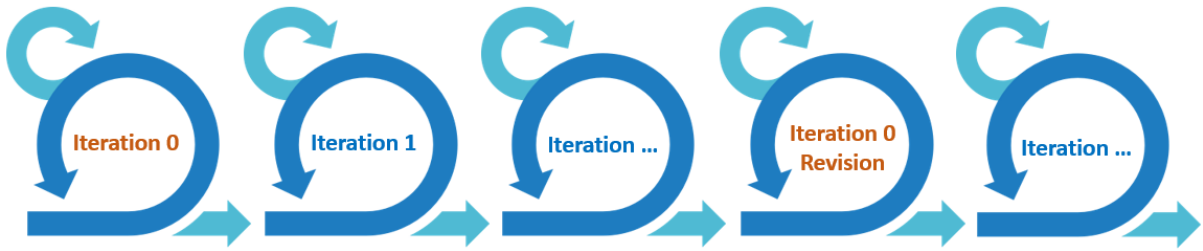


Figure 7; Iteration 0 Revision

By combining the additions mentioned above the Evidence-Based Agility model is formed, which is seen in 'Figure 8; The Evidence-Based Agility Model'. In this model, the new additions are coloured orange and the components of the original ScrumXP model are coloured blue.

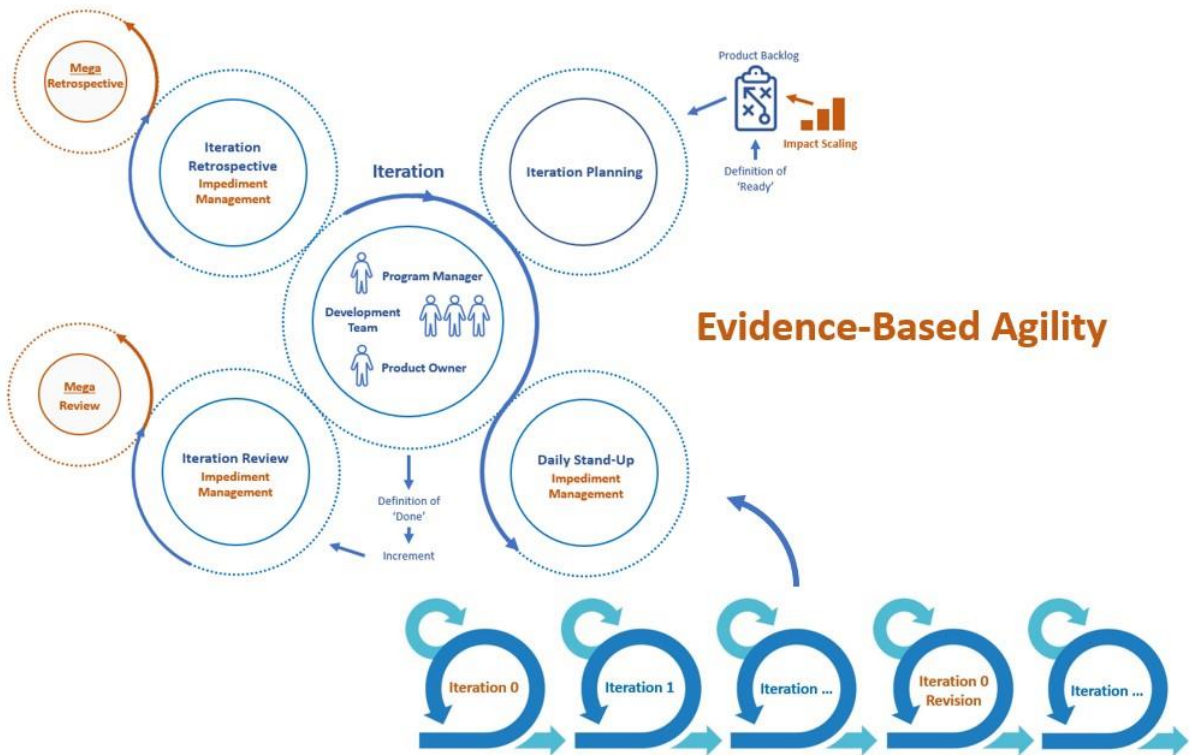


Figure 8; The Evidence-Based Agility Model

## 4 Artefact validation

EBA is validated on the basis of the case study introduced. There are different methods which can be used to validate EBA with the problem owner. The different identified methods can be found in ‘Table 2; Validation techniques’.

Qualitative Research		Quantitative Research	
Formal	Informal	Formal	Informal
Surveys (open-ended questions)	1 -on- 1 interviews	Surveys (close-ended questions, ratings, rankings)	Polls
Focus Groups		Experiments	

*Table 2; Validation techniques*

Quantitative research is not suitable for this artefact validation. This is due to the depth of the questions needed to confirm whether EBA would work for Spiderman. Therefore, qualitative research is of necessity for the artefact validation. To properly validate the model, questions need to be asked which can be followed-up directly in a conversation. To ensure different team members do not influence each other, the questions should be asked on an individual basis. Thus, 1 -on- 1 interviews were chosen to validate EBA. In these interviews EBA is validated on the basis of feasibility, clarity and completeness. The interviewees consist of three different team members with their own experience and view on the project. The first interviewee is the former project manager, whose focus was on the start-up of the project. The second interviewee is the current project manager, whose focus is on guiding the project organised. The last interviewee is a team member who has been present since the beginning of the project and still is. This interviewee made the problem that was faced in the project team known. The project managers were chosen for their high-level view and their power for implementing the solution. The other interviewee was chosen because of their involvement in the project.

The team members believe that sticking to EBA will provide them with more structure. However, we discussed that it is important to take on an iterative methodology correctly first. This will increase the feasibility of EBA. Due to the size of Spiderman, parameters of the project are prone to change often. Therefore, the Iteration 0 Revision is seen as a component which can help them keep the team on track. An Iteration 0 Revision which is planned timely in response to changing parameters is identified to guide team alignment. The Mega Review and the Mega Retrospectives are viewed as essential to

stay on track with regard to the contents and the organisation of the team. The different elements mentioned as useful above are only effective if the whole EBA model is applied. It is stressed that defining the necessary elements during the Iteration 0 to prevent the same problems from occurring more often is critical. Thus, for EBA to be feasible, it is recognised that the right roles should be fulfilled. The model is described to be clear in its explanation and its visual presentation. The colours used are mentioned to clarify what components are newly added and which components stem from existing Agile theories. The different elements of the model are viewed as sufficient to enable EBM in Agile project teams. Therefore, EBA is considered complete in this aspect. However, the model does not provide an advice on how to deal with any delay that may occur from the Mega Review, the Mega Retrospective or the Iteration 0 Revision.

## 5 Conclusion

### 5.1 Conclusion

The main research question of this research is as follows:

*'How can the management of a project team within the scope make decisions which are based on theory and reasoning instead of logical thinking alone?'*

This research question was answered based on a case study of PostNL e-fulfilment, in particular the project team 'Spiderman'. Therefore, the main research question is answered based on the following research question:

*'How can the management of PostNL e-fulfilment and the team members of Spiderman make decisions which are based on theory and reasoning instead of logical thinking alone?'*

We found that Spiderman was facing different issues of which several could be traced back to shortcomings in the decision-making process. As stated in the research question, a manner of decision-making is sought to improve their process from professional rationality to informed and rational decisions. We found that Evidence-Based Management would be applicable. EBM is used for decision which have a high impact.

To enable the use of EBM in Spiderman, we looked at their project structure. The claim was made that the team works along the Scrum methodology. However, we found that it was more of a combination between Kanban, SAFe and Scrum. Therefore, we decided on combining EBM with the ScrumXP methodology, due to PostNL working with SAFe. The original ScrumXP model does not allow for EBM to be used right away, therefore, the model needed to be revised. From existing theories, we added impact scaling, impediment management, an Iteration 0 and an Iteration 0 Revision. These elements allow for defining the decisions which have a high impact and are therefore necessary to make EBM effective in projects. The existing Iteration Review and Iteration Retrospective are not suitable for the use of EBM due to the duration of these sessions. We introduced a Mega Review and a Mega Retrospective to deal with the high impact decisions that are content and organisational related, respectively. Due to these cycles merely being used for high impact decisions and the opportunity to spend time on those decisions, these cycles are suited for EBM. We call the revised model of ScrumXP the Evidence-Based Agility (EBA) model. This model was validated on the basis of the case study.

Concluding, Evidence-Based Agility provides the opportunity to base decisions with a high impact on theory and reasoning within project teams. By using the EBA model with an iterative Agile method, a

project team will be able to organise their team efficiently and effectively. It also allows the team to manage their impediments. The model guides the team to switch to the 6 As of EBM to find the decision which is probably the most favourable when it is imperative.

## 5.2 Limitations

This section addresses the limitations of the research performed. This research was performed for PostNL e-fulfilment. However, it was performed at the location of CAPE Groep. This meant that only a limited part of the research population was close by, the greater part had to be reached through email. This influenced the extent to which the research population could be investigated. The Evidence-Based Agility model is built based on the case study performed and it is also validated on that case study, but not tested. Therefore, Evidence-Based Agility has theoretically been proved to be valuable in the case study and it is assumed to be valuable for the scope described. However, it has not been proved to work in practice.

## 5.3 Recommendations

Spiderman has been working hard to provide features such that they can deliver an improved version of the application called 'Integrator'. In this process they have achieved to build the features they wanted to build. However, this process should have been more elaborately guided. We recommend Spiderman to work along an Agile methodology or a combination of multiple Agile methodologies. However, the methodology that is chosen should be taken on properly. PostNL works along SAFe and most project teams works along Scrum, therefore, we would advise Spiderman to take on Scrum.

Scrum defines the Product Owner and the Scrum Master to be obligated in any project team. The rest of the group are called developers. In the case of Spiderman there is no Scrum Master. We would recommend assigning the Scrum Master role to the person who is best known with the Scrum methodology. If no one is found to be suitable, one of the team members should educate themselves and take on the role of Scrum Master. A Product Owner should be named again to take on the Product Owner tasks. The Scrum master then needs to guard that the Product Owner performs these tasks.

Most project members do not work on Spiderman full time. Therefore, we would recommend using Iterations of three or four weeks. This is longer than most Iterations, due to inconstant presence of team members. Aligning the days on which the team members are working on Spiderman is recommended. Due to Spiderman being a part-time project daily stand-ups are redundant. Thus,

stand-ups should be performed two or three times per week, depending on the number of days all or most team members are actively working on Spiderman.

From the Product Increment features are talked about which need to be built throughout the next period. From this the product backlog is created. Items from the product backlog are chosen to be taken on in the Iteration Planning. Spiderman is used to Kanban to track their progress. Therefore, we would recommend Spiderman to use Kanban to keep track of the items on the Iteration Planning.

User stories must be built around the features which are desired. Stories should be made for the information that still needs to be acquired to define the feature. Features should be made by defining the Card, Conversation and Confirmation. Defining the stories correctly, ensures that the feature is correctly formulated for the next team to write user stories to build those features.

We recommend planning the Iteration Review and the Iteration Retrospective at the start of the last week of the Iteration. By choosing this moment in the Iteration, it is still feasible to adapt after the session.

We recommend using Evidence-Based Agility as an adaption to the iterative methodology chosen, which is recommended to be Scrum. This will help the project members handle the questions they face in a structured manner which will result in probably the best solution. This is not offered by any existing iterative methodology.

The Iteration 0 and the Iteration 0 Revision is recommended to be performed in combination with the teams involved in the process of building the new application. In this manner, alignment is created throughout the whole product. Representatives which represent the strategy of PostNL are recommended to join these sessions to ensure the company vision is followed. We recommend planning an Iteration 0 Review periodically. However, the possibility of an Iteration 0 Revision out of necessity should be taken if identified as necessary.

The Mega Review and Mega Retrospective are recommended to be used when structural problems have arisen in the Iteration Review or the Iteration Retrospective. The Product Owner can identify a problem in the Iteration Review to be of an impact which cannot be solved without stepping out of the Iteration. The program manager has that responsibility for the Iteration Retrospective. Issues which are found which impact other teams should be addressed in an Iteration 0 Revision. Throughout

the entire process impediment management is recommended to manage the issues that arise. To ensure that issues are scaled equally, impact scaling is recommended.

#### 5.4 Scientific Contribution

In this thesis research was done into how teams can make decisions on the basis of theory besides logical thinking. The Evidence-Based Agility (EBA) model constructed consists of different elements of which the basis is made out of existing theory and the additions are non-existent elements. EBA its basis is made of a standard iteration defined by Scaled Agile Framework (SAFe, 2023). This standard iteration is combined with an Iteration 0 and the Iteration 0 Revision. Besides these elements, two additions are made to manage impediments faced which are impediment management and impact scaling. The non-existing elements are the Mega Review and the Mega Retrospective. The combination of different existing elements with a standard iteration and adding the newly invented Mega Review and Mega Retrospective make up for the scientific contribution of this thesis. These elements will allow project teams to identify organisational or content related problems with a high impact and solve them adequately such that the impact of the problems remain minimal.

#### 5.5 Future research

Future research may be done into the implementation of the Evidence-Based Agility model. In this research the practical impact of the model on the project progress may be investigated. Another subject that may be of interest for future research is the scheduling challenges which may arise due to Iterations being stopped. It may be researched how to incorporate the possible delay into the scheduling most efficiently, upfront.

## 6 Bibliography

- Agile Alliance. (2022). *The 12 Principles behind the Agile Manifesto*. Retrieved from Agile Alliance: <https://www.agilealliance.org/agile101/12-principles-behind-the-agile-manifesto/>
- Agile Alliance. (2022). *Agile 101*. Retrieved from Agile Alliance: <https://www.agilealliance.org/agile101/>
- Amna, A. R., & Poels, G. (2022). *Systematic Literature Mapping of User Story Research*. Surabaya: Indonesio Endowment Fund for Education.
- Barends, E., & Rousseau, D. M. (2018). *Evidence-Based Management: How to use evidence to make better organizational decisions*. Kogan Page Ltd.
- Barends, E., Rousseau, D. M., & Briner, R. B. (2014). Evidence-Based Management, The Basic Principles. In E. Barends, *In Search of Evidence* (pp. 203-213). Amsterdam: VU University of Amsterdam.
- Briner, R., & Walshe, N. D. (2012). *Evidence-based Management and Leadership*. The University of San Francisco, United States of America.
- Bureau Tromp. (n.d.). *Kanban*. Retrieved from Bureau Trom: [https://bureautromp.nl/lean-tool-kanban/?gclid=CjwKCAiA85efBhBbEiwAD7oLQKEOR2Tu2eFBryl3PILAsHfyNAX-QqmFog6LheIEiWkvaxmd3sPXSRoClhAQAvD\\_BwE](https://bureautromp.nl/lean-tool-kanban/?gclid=CjwKCAiA85efBhBbEiwAD7oLQKEOR2Tu2eFBryl3PILAsHfyNAX-QqmFog6LheIEiWkvaxmd3sPXSRoClhAQAvD_BwE)
- CAPE Groep. (2021, October 20). Gedragdscode. Enschede, Overijssel, Nederland.
- Charlier, S. D., Brown, K. G., & Rynes, S. L. (2011). Teaching Evidence-Based Management in MBA Programs: What Evidence Is There? *Academy of Management Learning & Education*, 222-236.
- Dahl, M. S. (2011). Organizational Change and Employee Stress. *Management Science*, 240-256.
- H. Heerkens, A. v. (2017). *Solving Managerial Problems Systemetically*. Groningen/Houten: Noordhof uitgevers B.V.
- Hamilton-Withaker, T. (2009, July 26). *Agile Issue Management for Projects and Programmes*. Retrieved from Agile 101: <https://agile101.wordpress.com/2009/07/26/agile-issue-management-for-projects-and-programmes/>
- Hollingworth, C., & Barker, L. (n.d.). System 1 and System 2 Thinking. *The Marketing Society*.



- Jeffrey, A., Claridge, M., Timothy, C., & Fabian, M. (2005). History and Development of Evidence-based Medicine. *World Journal of Surgery*, 547-553.
- Job, J. (2015, December 7). My Scrum Diagram. *My Scrum Diagram*. Scrum.org.
- KNAW, Onderzoek, N. O., Hogescholen, V., Centra, N. F., federatie, T., & VSNU. (2018). Nederlandse Gedragscode Wetenschappelijke Integriteit.
- Middleton, F. (2019, July 3). *Reliability vs. Validity in Research*. Retrieved from Scribbr: <https://www.scribbr.com/methodology/reliability-vs-validity/>
- Monitoring Commissie Corporate Governance Code. (2016, December 8). Corporate Governance Code 2016. Den Haag, Zuid-Holland, Nederland.
- O'hEcocha, C., & Conboy, K. (2014). The Role of the User Story Agile Practice in Innovation. *Business Information Processing* (pp. 5-6). Galway: National University of Ireland Galway.
- Pfeffer, J., & Sutton, R. (2006). Evidence-Based Management. *Harvard Business Review*.
- PostNL. (n.d.). *History*. Retrieved from PostNL: <https://www.postnl.nl/en/about-postnl/about-us/history/>
- PostNL. (n.d.). *Our people*. Retrieved from PostNL: <https://www.postnl.nl/en/about-postnl/strategy/corporate-responsibility/our-people/>
- Purcell, M. (2020, August 1). Lessons from Thinking, Fast & Slow: System 1 and System 2.
- Remta, D., & McLaughlin, M. (2022). A Single Case Study on Product Owner Activities in SAFe: Preliminary Results from Focus Group Gatherings. *Digitalization of Society, Business and Management in a Pandemic*, 419-427.
- Rousseau, D. (2020). Realist Rationality of Evidence-Based Management. *Academy of Management Learning & Education*, 415-424.
- Rousseau, D. M., & ten Have, S. (2022). Evidence-based change management. *Elsevier Inc.*
- SAFe. (2023, March 15). *What is new in SAFe 6.0*. Retrieved from SAFe: <https://scaledagileframework.com/blog/say-hello-to-safe-6-0/>
- Scaled Agile Framework. (2013). *SAFe ScrumXP*. Retrieved from Scaled Agile Framework: <https://www.scaledagileframework.com/scrumxp/>
- Scaled Agile Framework. (2021, September 27). *Agile Teams*. Retrieved from Scaled Agile Framework: <https://www.scaledagileframework.com/agile-teams/>

- Schindler, P. (2019). *Business Research Methods*. New York: McGraw-Hill/Irwin.
- Schwaber, K., & Sutherland, J. (2020). Problem Owner. In K. Schwaber, & J. Sutherland, *The Scrum Guide* (pp. 5-6). Creative Commons.
- Schwaber, K., & Sutherland, J. (2020). *The Scrum Guide*. Creative Commons.
- ScrumGuide. (n.d.). *Wat is SAFe?* Retrieved from ScrumGuide: <https://scrumguide.nl/safe-het-scaled-agile-framework/>
- Shillabeer, A., Buss, T. F., & Rousseau, D. M. (2011). *Evidence-based public management: Practices, issues and prospects*. Armonk, London: M.E. Sharpe.
- Stacey, R. D. (n.d.). Matrix for "Complexity and Creativity in Organizations".
- Stonebraker, I., & Howard, H. A. (2018). Evidence-based decision-making: awareness, process and practice in the management classroom. *The Journal of Academic Librarianship*, 113-117.
- Thoma, A., & Felmont, F. (2015). A Brief History of Evidence-Based Medicine (EBM) and the Contributions of Dr David Sackett. *Aesthetic Surgery Journal*, 261-263.
- Thomas-Hunt, M. C., & Philips, K. W. (2013). Managing Teams in the Dynamic Organization: The Effects of Revolving Membership and Changing Task Demands on Expertise and Status in Groups. In R. S. Peterson, & E. A. Mannix, *Leading and Managing People in the Dynamic Organization* (pp. 115-133). Mahwah: Lawrence Erlbaum Associates.
- University of Twente. (2019, December 31). Code of Ethics / Gedragscode.
- Vartiainen, T., & Pirhonen, M. (2007). How is Project Success Affected by Replacing the Project Manager? In G. Magyar, G. Knapp, W. Wojtkowski, & J. Zupancic, *Advances in Information Systems Development Volume 2* (pp. 397-407). Springer.
- Wieringa, R. (2014). *Design Science Methodology*. Enschede: Springer.

## 7 Appendix

### 7.1 Interviews Spiderman

	No Product Owner	Unexperienced PIAs	Elements of a useable feature unclear	A lot of replacement of project team members	Longterm vision not clear	Team members fulfilling the wrong role	Frustration between IT and client management
Interview A		X			X	X	X
Interview B		X			X		X
Interview C	X	X	X	X		X	X
Interview D		X	X		X	X	X
Interview E				X	X		
Interview F					X	X	X
Interview G	X			X	X		X
Interview H		X	X		X		X

Table 3; Interviews Spiderman