



## The improvement of already existing information systems

Charlotte van der Meulen

*Management of Product Development*

*Graduation date: January 25, 2023*

For many companies the implementation of information systems is more difficult than expected. During the implementation and use of an information system many pain points occur. Current literature mainly focusses on the implementation phase of the information system, however, does not explain how to find and improve problems after the implementation of the information system. Therefore, this paper proposes the improved information system approach. The improved information system approach supports a company in finding and improving the pain points within their information system. The improved information system approach consists of two phases, the analysis approach and the solution approach. The analysis approach supports a company in finding the core of the problem. While the solution approach helps translate and solve the problems with the information system. The improved information system approach was developed with the use of a case study.

Approach; information systems; product development; pain points

### 1. Introduction

The development process of a product nowadays is getting increasingly advanced, resulting in companies creating excessive amounts of data during the lifecycle of a product. To cope with these excessive amounts of data companies choose to implement one or several information systems. An information system consists of 6 components: hardware, software, database, network, people and procedure [2][3][4]. The combination of these components is used by an organization to process and distribute useful information and data. When used properly, an information system supports an organization with decision making, coordination and controlling their products by representing, analysing and visualizing data and information [2][3][4]. Manufacturing businesses for example benefit a lot from the effectiveness of information systems. In the ideal situation, information systems help manufacturing businesses to improve decision-making, planning, and efficiency of product development which will help these businesses to improve the product quality and bring their products to the market faster [1]. Therefore, the scope of this research will be on information systems used within manufacturing companies.

However, information systems are difficult to implement due to the large number of functionalities, the vast volumes of data that must be incorporated into the system and the fact that every company has their unique combination of systems, processes, and stakeholders. Therefore, a lot of research has been done on the implementation of information systems within companies. This research often describes "the perfect way of implementing an information system". However, it is impossible to have one perfect way of implementing an information system, as every company has their own unique needs. Companies experience problems with their newly implemented information system and do not understand where the problems come from, as they believe the followed implementation procedure should implement the system perfectly. Therefore, it is believed that it might be impossible to directly implement the information system correctly and it is necessary to also solve pain points after the implementation process. The current literature lacks when it comes to describing

how to find and reduce the pain points that occur during the implementation and use of the information system. As a result, companies have difficulties with finding and improving the pain points within their information systems. The goal of this research is to investigate a method to find and reduce the core of pain point within an implemented information system at a company.

#### 1.1. Research approach

This paper investigates how already existing information systems within companies can be improved. To help a company in finding and reducing the pain points they encounter with their information system, the improved information system approach was developed. The improved information system approach consists of two phases, the analysis approach and the solution approach. This paper shows the steps that are taken to come to the design of this approach. It starts with gaining background information to understand the current role and definition of information systems. This is followed by the introduction of the analysis approach, explaining how the core problem can be found. Consequently, the solution approach is introduced to explain how the found problems can be improved. Finally, the designed improved information system approach will be evaluated, followed by a conclusion and future recommendations.

### 2. Literature research

Literature can be used to gain background information, to understand the current role of an information system

#### 2.1. Stakeholders

Within an information system many stakeholders are involved. A stakeholder is someone that has an interest in the information system and can either affect or be affected by the system [5]. The unique viewpoints and requirements of all stakeholders are essential for the improvement of an information system. For an information system management is essential for decision making and support of the improvement of the information system. The user plays an essential role in finding what specific pain point

apply to the information system of the company. Additionally, the key-users have close contact with the user and help gaining insights in user and system information. Finally, the vendor of the information system can help with gaining insight in pain points and their solutions, as they often have experience with the application and implementation of the same information system at other companies.

## *2.2. Pain points*

As explained during the implementation and use of an information system many pain points can arise. This results in many issues and challenges for the company as well as the user. The user becomes dissatisfied with the system as the system does not function as wanted. These causes have affected the implementation of the information system, what later leads to issues and challenges in the use of the information system. These issues and challenges could also be called pain point. Literature research was done to support finding additional pain points within an information system. It is important to find these pain points within the information system, as when they are not solved the dissatisfaction and misunderstanding of the system increases. The different pain point found in literature can be categorized in 3 different categories: functional, support and process pain points.

A functional pain point is affecting the ability to perform a certain activity within the system, as a result of functional problems. This could affect the productivity, comfort, and convenience of the user [6]. Support pain point occurs when the user of the system does not receive the right support, they need to use the system [7] This could also affect the productivity, comfort and convenience of the user. Process pain points have everything to do with issues associated with the process within and around the information system.

Additionally, expert interviews were conducted to get a better understanding of pain points occurring at other companies during the implementation and use of the information system. The semi-structured interview was conducted with two product lifecycle management (PLM\_ consultants. They have supported different companies with their PLM systems and therefore can help to give insights in the industry wide (manufacturing companies of various sizes) usage of PLM systems.

The expert interviews showed that most of the problems within information systems were a result of lack of explanation why a certain system was implemented, lack of explanation how to work with the system, over customization of the system and cultural differences.

## *2.4. Requirements solution*

The goal of this project is to help companies find and reduce their pain points. When reducing these pain points, it will lead to the increase of four main concepts. The user experience, acceptance, effectiveness, and efficiency. To support a company in finding and improving the pain points and increase the four main concepts, a solution needs to be created. With the help of the found information in literature and the expert interviews, requirements to solve the research question can be made.

1. The solution should contribute to the improvement of the efficiency, effectiveness, user experience and overall acceptance of the information system within a company.

2. The solution should help improve functional, support, process and cultural pain points.

3. The solution should support the company in finding the specific pain points that affect their company negatively.

4. The solution should be adaptable to every company as every company is unique.

## **3. Analysis approach**

The described solution can be achieved by the development of the improved information system approach. The approach was developed to help a company find and solve the pain points within their information system. This approach consists of two main phases the analysis approach and the solution approach.

The analysis approach helps to gain information to find and understand the pain points within the information system. The analysis approach consists of the following steps. The determination of team roles, gaining background information, interviews with the user of the system and defining the problem definition. Each step will be elaborated on in this section.

### *3.1. Research team roles*

To execute the improved information system approach, a research team is needed. This research team should consist of a critical eye, a management representative and key-users. Together the team needs to be open to change and needs to be motivated to really dig into the problems the company is dealing with. Moreover, they should have mandate to be able to make a change.

### *3.2. Gaining background information*

Gaining background information is helpful in determining the research direction for later analysis. Additionally, background information helps to understand the first directions of underlying problems which are causing the pain points within the information system. Background information can be gained by participating within the company and by doing a survey with the users of the system.

### *3.3. Interview*

Often more information is needed to find underlying problems. The gained background information can be used to set up and execute a semi-structured interview. The interview will help with better defining the underlying problems as well as, finding out how the expectations of the users can be improved.

Ideally the interviews will be conducted with at least two people from every department within the company. Preferably one relatively new employee and one more experienced employee. This could give valuable insights on if the problems these users encounter has something to do with the work experience.

### *3.4. Defining the problem definition*

With the help of the found background information and the information gained from the interviews, a problem definition can be defined. This problem definition starts defining the underlying problems responsible for the dissatisfaction with the information system at the company. Additionally, an inventory can be made of which problems need further defining, as the underlying problem is not completely clear yet.

### *3.5. Requirements solution approach*

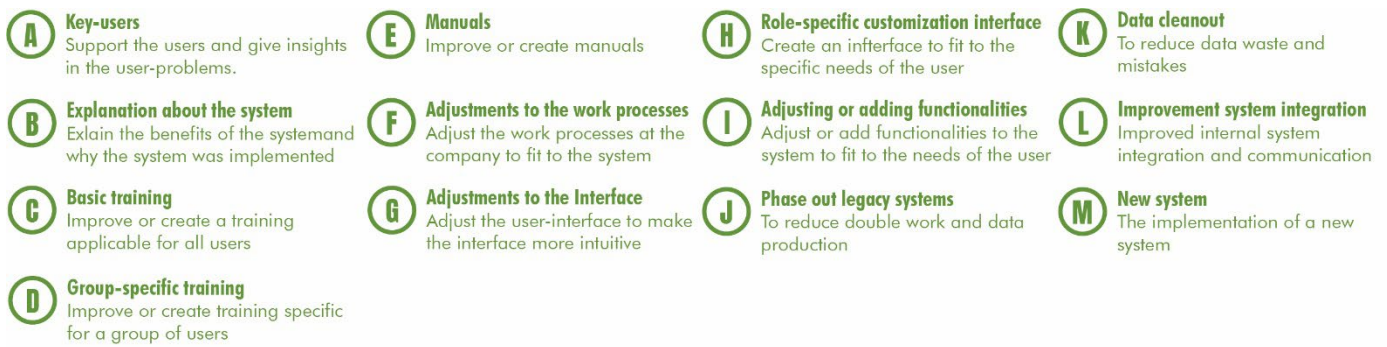


Figure 1: Toolbox

The analysis approach explains how the problems can be found. However, to improve already existing information systems, a solution for these defined problems needs to be found as well. To support companies in solving their problems, the solution approach is needed. This approach must meet a number of requirements.

1. The solution approach should help the company with improving the found underlying problems determined in the analysis approach.
2. The solution approach should support the further analysis of problems, whenever the core of the underlying problem is not completely clear yet
3. The solution approach should have a solution to improve the functional, support, process and cultural pain points that were found in literature and the expert interview.
4. The solution approach should support the company in deciding how the solution will be applied at the company
5. The solution approach should support the company in deciding what solutions are relevant for the specific company
6. The solution approach needs to be applicable for every company.

#### 4. Solution approach

As explained the improved information system approach was developed to determine and solve the pain point within the information system of a company. The analysis approach within the improved information system approach focusses on the determination of the pain points, while the solution approach helps improving and solving the pain points. The solution approach consists of a deeper analysis, a toolbox and tools to help the company decide what tool to use when.

##### 4.1. Deeper analysis

Within the analysis approach a first problem definition can be specified. This problem definition often gives a direction for the solution; however, the core of the problem is not always clear yet. The identified problems could be caused by an underlying problem, that simply cannot be found by doing interviews. In this case a deeper analysis is needed to specify the underlying problems that were not found in the analysis approach. This deeper analysis helps to define the underlying problem and supports in finding which exact solution can be used to solve the pain points. The deeper analysis consists of three categories: usability testing, analysis on the way of working and the analysis on the integration between systems.

Usability testing can help to gain more detailed insights on what causes the problems the user has with the system [8]. Analysis on

the way of working can give insights on the way the user is working with the system. This analysis can result in the tailoring of the

information system or the adjustment of how the user interacts with the system. Finally, the analysis on integration between different systems can help determine if certain system integration is possible.

##### 4.2. Toolbox

The mere definition of the problem and the underlying problem is not enough for actual improvement of the efficiency and effectiveness of the information system within a company. In order to improve, a fitting solution is required. As no company and information system is the same a toolbox is developed to support companies with improving the efficiency and effectiveness of an information system. The tools in the toolbox still need to be adjusted to fit to the specific needs of the company. The toolbox consists of the tools displayed in figure 1.

##### 4.3. Deciding what tool to use when

It is not always clear yet for a company when to implement what tool. The company does not have a clear view of the urgency and effectiveness of the tools and in what sequence tools are recommended to be implemented. The effort-benefit matrix, shown in figure 2, helps decide how effective implementing a tool is and how much effort the implementation will cost [9].



Figure 2.; effort-benefit matrix

The simultaneity and sequence of the tools, shown in figure 3, explains in what order it is most logical to implement the deeper analyses and tools.

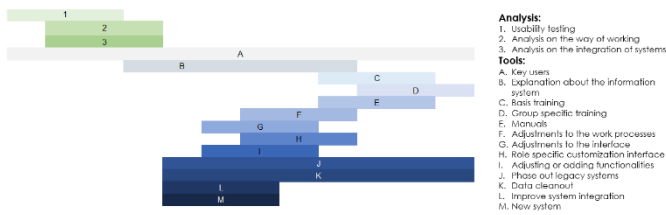


Figure 3.; Simultaneity of the tools

## 5. Evaluation

To evaluate the improved information system approach a verification and evaluation was done. The verification shows that all predefined requirements were met. The validation of the improved information systems was done with the help of a case study at Thales Nederland, improving their product lifecycle management system. This validation mainly tested the solution approach. As the improved information system approach was developed in collaboration with the case study. Therefore, it was not possible to test if the analysis approach was executable for someone who was not involved in the research. This validation has shown that the participants believed that the improved information system approach is useful and clear. They believed that the approach and the tools in the toolbox would help with improvement of the information system.

## 6. Conclusion

Where in previous research little to no information could be found on how to improve the efficiency and effectiveness, user experience and acceptance of an already existing information system. This research supports a company in finding and reducing the pain points found within their information system. The research question is answered by the design of the improved information system approach. This approach consisting of a roadmap, to find and improve the core of the problems within an information system. The improved information system approach was designed to fit to the needs of every unique company, as the approach is fully adaptable to the requirements of a specific company. The improvement of the information system can work beneficial for a company, as a sufficiently working information system can lead to many benefits. These benefits are for instance, improved the decision making, reduced cost and a higher customer satisfaction. In the end, this research supports companies in improving the overall efficiency, effectiveness, and user experience of the company by starting with the improvement of their information systems.

## 7. Discussion

The current recommendation for the interview is to interview two people per department. However, especially within a smaller company, with fewer departments, it could be helpful to interview more people per department. Interviewing two people could result in the opinion of the interviewed user being not representative for the general opinion and needs of the company. This could have a large effect on the overall recommendation that will be made for the company.

Secondly, it is recommended to add an analysis on why a specific information system was chosen and implemented at a company in the first place. This information could explain certain pain points

found in the current use of the system and could help to better understand and improve the found pain points. It could be said that the analysis approach could already bring forward the information on why a specific information system was chosen and implemented. However, without specifically asking about it, this information could also be missed.

Additionally, it is recommended to add an extra step to the toolbox. Users would like to be involved in the process and the solutions that are going to be applied. By sending the users of the system updates, they will have the feeling that they have been heard, which in the end helps to increase the motivation and acceptance for the use of the information system.

Lastly, this research currently explains how an information system can be improved. However, some solutions do not always improve the information system itself. These solutions help to improve how the information system is used. The focus of some of the solutions is, to improve the problems that users are experiencing, while using the information system. Therefore, the goal of some of the solutions is not to improve the information system, but to make the user satisfied.

## 8. Future research recommendations

It is recommended that the improved information system approach is executed and validated with an unbiased research team. The approach has currently only been executed by the developer of the approach. By executing and validating the approach with a team that had nothing to do with the design of the approach, the executability of the approach can be tested.

Secondly, it is not explained yet what specific tools are responsible for the specific increase in for example efficiency. Currently, efficiency, effectiveness, user experience and acceptance are mentioned as one. However, there is no explanation yet on what tools specifically affect one of these concepts on its own. Often, the implemented tools combined are responsible for an increase in the overall efficiency, effectiveness, user experience and acceptance of the information system. However, it could be interesting to further research what effect the tools have on the concepts on their own.

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