Towards a faster scheduling workflow

A research on how to reduce the time taken to schedule advisors in Visitour at Geas Energiewacht

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Preface

In front of you lies the bachelor thesis that researches the scheduling process of the advisors at Geas Energiewacht. This thesis is written to complete the bachelor study Industrial Engineering and Management at the University of Twente. From February 2020 to July 2020 I have worked on this research and the writing of this report.

This research has been conducted for the company Geas Energiewacht. An advice will be given in this report about the improvement of the scheduling process of advisors. Even though I was already familiar with the company and some of the processes because of my side job at Geas, I investigated a somewhat unknown process for me. This made it extra interesting to dive into this topic.

I would like to thank Han Barink for his input and his help during our meetings. My thanks also go out to the colleagues of the department Commerce, who answered some of questions and their input during the interviews, and the department Computerization and Quality who helped me with my technical questions.

I want to specially thanks Peter Schuur, my supervisor, who checked my work thoroughly and gave tips on extra things to add to the research. I enjoyed our meetings, where even Netflix-series were discussed. Last, I want to thank Sander for his support and my roommates and family for entertaining me when I was not working on this report.

I hope you enjoy reading this report!

Dorte Rotteveel

Enschede, July 2020

Table of content

Glossary

Term	Definition	Introduced in
2Solar	Program used for the layout plans of solar panels	Section 5.1.2
Advisor	Makes quotations for solar panels, boilers and other heating and ventilating products at the customer	Section 2.5
CKC	Commercial customer contact, department of Commerce	Section 2.5
Clixz	Business process supporting application	Section 2.6.2
Dynamics Nav of Navision	Enterprise Resource Planning (ERP-) system	Section 2.6.1
EW	Energiewacht, partner of Geas, located in Assen	Section 2.2
EWG	Energiewacht Groep, partner of Geas, located in Zwolle	Section 2.2
ERP	Enterprise Resource Planning	Section 3.1
FLS Visitour	Route-planning software	Section 2.6.3
FMS	Application used by the advisors to see their planning and information about the objects at the address	Section 2.6.4
Furnace	Central heating boiler (UK-English)	Section 2.4
Lead	Possible new customer	Section 4.3.1
Service engineers	Performs maintenance and solves malfunctioning of heating systems at the customer	Section 2.5
Workflow	A series of handlings to get a certain output	Section 2.6.1

Summary

The research for this bachelor thesis has been conducted at Geas Energiewacht and is focused on the improvement of the scheduling process of advisors. Geas offers advice on heating systems and warm water objects to its customers and provides maintenance for these objects. Geas is located in Enschede and serves customers in the regions Twente and Achterhoek.

When a customer requests an advice appointment at home, where advice is given about objects and a quotation is made, an advisor is scheduled by the inside staff. This scheduling is done via Visitour, a scheduling software that is connected to the ERP-system Navision. Visitour offers a wide range of functionalities, such as dynamic scheduling and giving an appointment proposal with an optimized route. These functionalities are used for the scheduling of the service engineers, who provide maintenance for the customer, but not for the scheduling of the advisors. The advisors are scheduled manually in Visitour by the planners, but this process is not efficient. The process is not efficient because the workflow does not always work, and it takes a lot of time to put an appointment in the schedule. The schedulers have to wait on the workflow, and the transfer of data between programs does not always function well. The problem can lie with settings in Visitour or with the connection between Navision and Visitour. This research is focused on the settings of Visitour. Therefore, the research question that will be answered in this report is formulated as follows:

How can the time taken to schedule advisors in Visitour at Geas Energiewacht be reduced?

The goal of this research is to find a way on how to improve the scheduling process by reducing the time it takes for a planner to schedule an advisor, either within Visitour or by using another provider of a scheduling software. First, the process of scheduling an advisor has been mapped. A flowchart was made, based on primary information, and the settings of Visitour were investigated. Next, the performance of the process was researched. To get a clear view on the parts of the process that needed to be investigated, interviews with stakeholders were held. They gave a clear overview of the problems that were encountered. Based on these interviews, the time taken to schedule, the kilometers driven and the logfiles of scheduled appointments were researched. Solutions for the improvement of the process within Visitour were investigated as well as other providers of scheduling software.

During the interviews it became clear that the advisors were not in favor of the automatic scheduling function and the planners were. The advisors had the idea that they had to drive more kilometers with automatic scheduling than with manual scheduling. However, during the investigation of the driven kilometers and appointments since the introduction of Visitour, it became clear that this was the result of having more appointments scheduled on one day per advisor. This automatic scheduling function can thus schedule appointments more efficiently than the planner can with manual scheduling, because on average one appointment extra was scheduled per day per advisor. The planners are more in favor of automatic scheduling since this will reduce the time of scheduling an advisor. However, problems appear during the process, because of wrong settings in Visitour. The settings for the heuristic used to determine the route, is a more complex problem. The problems of the settings need to be solved before using the automatic scheduling again, which can reduce the scheduling time from 2.5 minutes to 1 minute.

To finalize this research, an answer must be given to the research on how time taken to schedule an advisor can be improved. During the analysis it became clear that the extra kilometers driven by the advisors were not because of the inefficient route, but because more appointments could be

scheduled. The advisors must be made aware of the changes that the automatic scheduling function will bring. To be able to use the automatic scheduling function again, the settings in Visitour must be updated. The skills of the advisors are not correct anymore and the notification types are inconsistent. If the advisors and planners notice that the route is not logical, the method used to determine the route must be changed. The route is determined by maximizing the yield of an appointment by minimizing the traveling costs. Not many people at Geas know how these costs influence the route and a trial-and-error approach was mostly used to determine these costs. By making a simulation, wherein requirements of the advisors are considered, these costs can be determined correctly. Also, the problem can be presented to Visitour, so they can assist with these problems, but consultation costs will be charged for this. Other providers of scheduling software were also investigated during this research, Intelly Planning came out best in the test and meets the wishes of Geas. With the i-Planning of Intelly, advisors can be scheduled in 0.5 minute and they offer a seamless transfer of data between the programs that are used. Kemkens, a partner of Geas, has shown the efficiency of using the i-Planning for the scheduling process. The costs for this scheduling software are, however, much higher than the costs of Visitour. The monthly costs are based on the number of schedulers and advisors, which makes the price high with the current organization structure. There are five advisors and six planners, which means that the price per month can decrease when less planners receive a license. Also, extra times comes available with i-Planning since scheduling only takes half a minute compared to the current 2.5 minutes in Visitour. This extra generated time created by the efficient workflow must be used for turnover yielding duties. Only then, i-Planning is attractive for Geas when looking at the costs.

When the suggested changes in Visitour are made, it cannot be guaranteed that the scheduling process works flawlessly. Some problems are currently encountered during the activation of the workflow or when the step from Navision to Visitour is made. The aim is to solve the problems with the changes mentioned before, but when these problems keep emerging, the conclusion can be drawn that the problem of this process does not lie with the settings of Visitour. The problem then might be that the link between Navision and Visitour is not functioning well or that Visitour does not fit well with the wishes of Geas. A follow-up research should be done to further investigate the problem of the activation of the workflow. This is a broad problem and is focused more on Navision and its architecture then on Visitour. For a research within Visitour, the cost structure used to determine the routes of the advisors can be investigated.

The advice given to Geas, is to first change the current settings of Visitour and then use the automatic scheduling function of Visitour again. The problems that emerge must be closely monitored, to see where the problems come from. It is best to assign one employee who knows the ins and outs of the software and can update the settings regularly. With the implementation of the automatic scheduling, the time taken to schedule an appointment should be reduced to around 1 minute per appointment. When no improvement is seen in reduction of time of the automatic scheduling, and the problem of the activation of the workflow cannot be solved, a transfer to Intelly Planning must be considered. This software has a lot to offer in terms of efficiency of the workflow and seamless data transfer and has been shown to work in a comparable environment. To make this transfer beneficial however, a change must be made to the current number of planners that need a license to schedule.

1. Introduction

For the bachelor assignment that is written to finalize the study Industrial Engineering and Management, research has been conducted at Geas Energiewacht in Enschede. The research is conducted in practice outside the university with the aim to take an ethical and professional attitude and use an academic methodology in a complex social environment (Student Manual TBK Module 11, 2018). This research has been prepared from February 2020 till April 2020 after which the research has been conducted for 11 weeks. The research has been completed in July 2020.

This report is the result of the research and is given in the form of an advice. Geas Energiewacht is a company specialized in advising customers and providing maintenance and services on heating systems and warmwater objects in Twente and parts of the Achterhoek. The advice will be about the improvement of the process of scheduling an advisor using Visitour.

Below, the design of the research is discussed, which includes the problem statement, goal of the research, research method and research questions, after which a reading guide is given.

1.1 Problem statement

In 2015, the scheduling program Visitour has been introduced at the department Commerce of Geas Energiewacht. The program had already been in use for the scheduling of the service engineers, which is why the scheduling of the advisors would also switch to Visitour. Until then, Outlook had been used to plan manually and according to the insight of the employees. However, the automatic scheduling function of Visitour resulted in inefficient routes and extra kilometers driven for the advisors. Therefore, the automatic scheduling function was disabled in 2018 and manual scheduling within Visitour was used from then. This did not mean that the problems were solved, as some problems remained or new emerged. The problems that are encountered, were not clear at the beginning of the research, but are mapped after interviews with stakeholders. After the interviews, the problems were visualized in a problem cluster, which can be found in figure 1.

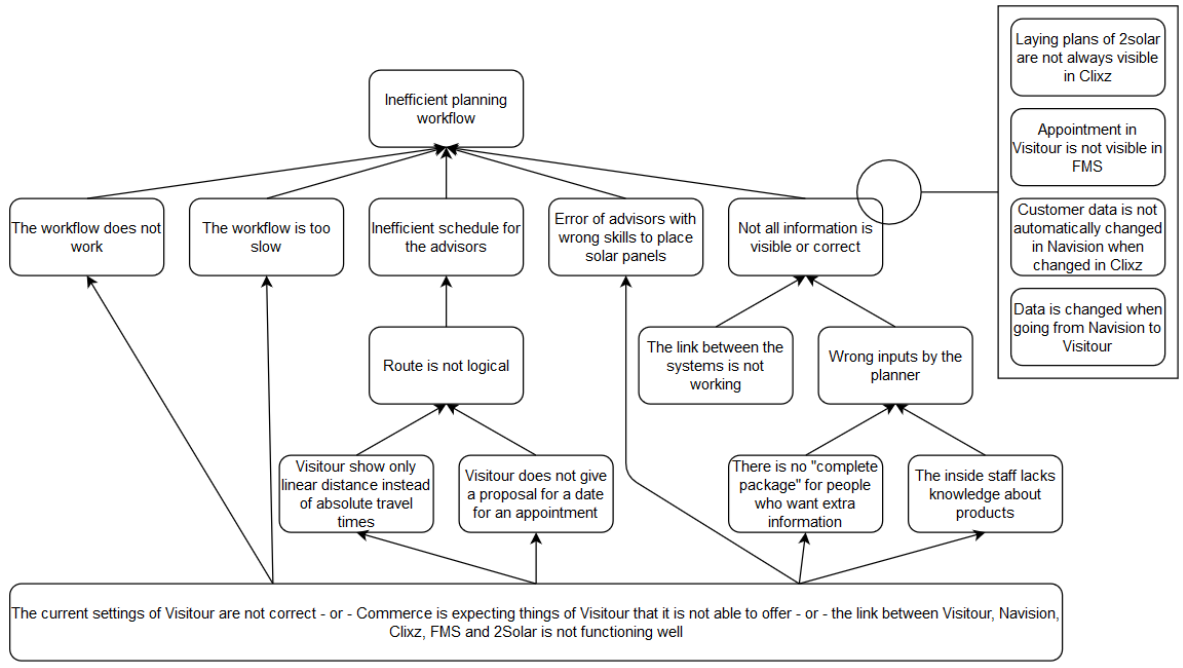

Figure 1 Problem cluster

The cause of these problems can either be that the current settings and mappings of Visitour are not correct, or that the department Commerce is expecting things of Visitour that it is not able to offer. Another cause that has been mentioned is the use of many different systems, which might also be causing some of the problems. Geas uses not just one ERP-system, but multiple modules are connected to their ERP-system Navision. The data that is transferred from the ERP to a module is sometimes lost or altered, meaning that there might be something wrong with the link between these systems.

1.2 Goal of research

The goal of this research is to improve the scheduling process of the advisors. As seen in the problem cluster in figure 1, there are three possible causes for the inefficient scheduling process of the advisors. This research will focus on the settings of Visitour with the aim to cross out Visitour as a possible cause of the inefficient planning. The goal is that changing the settings will improve the scheduling process, but if problems keep emerging, the other two possible causes should be assessed in a further research. First, a clear overview of all the problems that are encountered during the scheduling of the advisors by both planners and advisors must be made. Geas is aware of the inefficient scheduling but has no clear overview of the problems encountered and the bottlenecks in the process. Then, the performance of the process is analyzed, and the conditions under which the scheduling process can be improved are assessed. The time taken to schedule an advisor is aimed to be decreased and the goal is to automate the scheduling. The results will be presented in the form of an advisory report which will be given to the coordinator sales and the process manager of the department Commerce of Geas Energiewacht.

A solution within Visitour is preferred since not only Production works with this program, but Visitour is also one of the three programs that will be leading during the integration of EW, EWG and Geas. However, if there is no possibility to improve the process with the use of Visitour, then other providers of scheduling programs can be investigated.

1.3 Research method

In this section, the research method will be discussed. This entails the steps that are taken during the investigation, the method of gathering and analyzing data, the stakeholders and the reliability and validity.

1.3.1 Problem solving approach

At the start of the research the current process is analyzed. This means that the steps that are taken during the process of scheduling are mapped and put into flowchart. Then, a literature study is conducted to see how ERP-systems are used for service operations, how scheduling is done for service operations and finally how ERP-systems are used for the scheduling of service operations. After this literature study, the theory found will be compared to the current situation of the process. The information system will be further researched, by looking at the settings and the performance of the system. Based on this, possible solutions will be formulated by looking at the current system and at other providers of scheduling software.

To form a problem solving approach, the Kaizen problem solving method (Holland, 2013) has been used as a guide line. This means that roughly these steps will be taken, but not everything falls under the scope of this research. The eight steps that are used with this method are:

1. Clarify the problem
2. Breakdown the problem
3. Set the target

4. Analyze the root cause
5. Develop solutions
6. Implement chosen solution
7. Monitor results and process
8. Standardize and share success

This means that once the current situation has been clearly described and analyzed, the problem must be clarified. Since the problem given by Geas is rather vague, “the process is inefficient”, this is a very important step for the further development of the research. The problem will be investigated by conducting interviews with the people who are involved in the process. One employee who schedules advisors and one advisor are interviewed. They will be asked questions about the problems they encounter and what their ideal process would look like. The problems will then be put into a problem cluster, such that the problems are broken down and the relations between the problems are clear. Also, the current process will be mapped in the form of a flowchart. By doing so, it will be clear what the process is that is being investigated. With the analysis of the current process, the settings of Visitour are looked at as well.

Next, a target must be set. It must be made clear under which circumstances the problem is solved and when the stakeholders are satisfied enough with the solution. It currently takes around 2.5 minutes to schedule an appointment, but it is possible to schedule within one minute with Visitour. This is aimed to be achieved. Also, the automatic scheduling function is not used at the moment but is aimed to be used again at the end of this research. The time to plan an advisor is further analyzed in this research to investigate where the bottlenecks are in the process. Also, the performance is researched by looking at the total kilometers driven by the advisors and the log files of three documents are looked at.

When the problems have been clearly defined and the target has been set, possible solutions will be determined. First, the measures that can be taken within the current programs will be investigated. When improvement is possible within Visitour, this would be the easiest way to follow along with the programs used by the rest of the company. Therefore, the problem that are encountered will be presented to employees of Geas who are familiar with the architecture of Visitour, to see if they see possibilities to improve this process. When these solutions are not satisfactory, other providers of route scheduling software will be investigated. Their costs and benefits will be listed such that a most optimal solution can be chosen.

An advice will be given about the ideal solution. The solution will not be implemented during this research, because of the limited time and the lack of budget and priority that is given to this process during the Covid-19 pandemic. Therefore, the steps of monitoring and standardizing will also not be executed.

1.3.2 Data gathering method

Several methods will be used to gather data during this research. These include:

1. Interviews (with current stakeholders of the process);
2. Observation (of the current process) and;
3. Documentation (gathering data of the systems).

In appendix 1, the research type, data gathering method and data processing will be explained per sub question.

The interviews will be conducted at two employees who are involved in the scheduling process. One employee of CKC, who schedules the advisors, and an advisor. By interviewing these two parties, both views are taken into account when looking at the wishes and all problems are considered. The interviews will be recorded and transcribed. Next to these interviews, meetings will be planned with other stakeholder or other providers of information. These meetings are not recorded and transcribed but are considered in the research.

During the observation, the planners will be asked to schedule an advisor. During the scheduling, the times will be recorded and divided into seven groups. This will show how much time each step takes and where a possible bottleneck might lie.

For the last type of data gathering, primary data provided by Geas will be used. This method of data gathering will be used for the making of the flowchart, the analysis of the kilometers driven and the research of the log files.

1.3.3 Data analysis

During the analysis phase of the research, the gathered data will be read, interpreted, and processed, which will help to find an answer to the research question.

The interviews will be transcribed, to be able to analyze and map the opinions of the interviewees structurally. This will happen as follows:

1. The interviews will be transcribed, read through and listened to again. By doing so, the aim is to observe most of the information that is mentioned during the interviews;
2. Then, recurring topics that are mentioned during the interviews will be listed. This will be done by labeling a sentence or passage, with the topic that is discussed there. After doing this with all the interviews, the topics will be grouped per theme or keyword. The number of mentions of a certain theme are counted;
3. The last step is giving a short explanation of the theme. Important during these steps is that the opinion of all interviewees must be considered. It should capture what is said about this theme by everyone, one answer or mention should not be dominant.

During the phase of determining a target, the current situation is measured. This will be done by observing the handlings that are done by a planner and the time taken to execute a handling is timed. Also, the number of clicks and different screens that are shown to the user are counted. The current settings of Visitour will be analyzed to see if there are mistakes here before presenting the problem to Visitour.

1.3.4 Reliability and validity

During the project plan, the idea was to interview multiple people from commercial customer contact (CKC) and someone from the Front Office to see if there was a difference in approaching a problem between the departments. When contacting the Front Office however, they mentioned that every handling is done automatically and when they face a problem, they do not fix this problem themselves. Therefore, there is made no comparison between the way the Front Office and CKC solve a problem.

To guarantee reliability, multiple sources must be used. Because only one employee of CKC and one advisor have been interviewed, this reliability cannot be guaranteed completely. However, since both employees have a different perspective, but still had the same view on most points mentioned, this shows that the sources are reliable. There is only a lack of the number of sources. The problems are also confirmed during meetings with other people involved in the process.

When measuring the time that it takes to plan an advisor, multiple measurements will be done. This is done because the system is not consistent, sometimes the workflow works well and the next steps appear quite fast and other times the workflow does not appear at all or the employee has to wait on the workflow for a long time. Because the measurement of the times is difficult, reliability is difficult to ensure here. Around six measurements will be done to give a clear idea of the average time.

1.4 Research question

The research question that will be central during the research is as follows:

How can the time taken to schedule advisors in Visitour at Geas Energiewacht be reduced?

To be able to answer this question, sub-questions are formulated. These sub-questions will help to come to a good answer on the central research question.

1 What is said in literature about scheduling services using ERP?
2 How is the current information system of the scheduling process of advisors working?
    2.1 How does the literature compare to the scheduling behavior of Geas?
    2.2 What is the current architecture of the system?
3 What is the performance of the current scheduling process of advisors?
    3.1 How do employees experience the scheduling process?
    3.2 How much time does scheduling take?
    3.3 How many kilometers are driven?
    3.4 What happens in Visitour when an appointment gets scheduled?
4 How can the process of scheduling advisors be improved?
    4.1 What options are there for the improvement within Visitour?
    4.2 Which scheduling systems other than Visitour can be considered?
    4.3 What are the costs and benefits of the options?

1.5 Reading guide

This research starts with a thorough explanation of Geas Energiewacht since knowledge about the company will clarify the research. Therefore, chapter 2 investigates Geas and shows the history, mission and strategy and products and services. This chapter also discusses the people involved in this research and their interest is explained, as well as the software used throughout the company. Chapter 3 consists of a literature study and is focused on scheduling service operations, such as the advisors and service engineer and how to schedule them using ERP. In chapter 4, a comparison of literature and the scheduling behavior of Geas is made. Also, the architecture is investigated. In chapter 5, the performance of the process is investigated, by looking at the problems encountered by employees, the time it takes to schedule, and the number of kilometers driven by the advisors. Also, some logfiles are investigated here. In chapter 6, research is done to the possibilities of improving the scheduling process. First, the options within the current architecture are listed after which other providers are looked at. A cost benefit analysis will be done to determine what the best solution will be. The research will be concluded in chapter 7 and recommendations to improve the process are given. The report is closed with an appendix and a personal reflection on this thesis.

2. Company description

In this chapter a description of the company's business operations is given. The history and vision of Geas will be discussed, but also the products and services, the organization structure, stakeholders, and the software that is used. These points are discussed to clarify which process is treated and which stakeholders are involved in this process.

2.1 General information

Geas Energiewacht (hereinafter called Geas) is a company that is specialized in Energy Services in the region Twente and Achterhoek. Their goal is to let everyone live safely, comfortable, and sustainable. Therefore, they provide advice about appropriate installation of energy related products, such as heating systems, water heaters, energy saving and generating energy and provide maintenance services regarding these products. The biggest part of the business still remains the advice, maintenance and purchase of furnaces, which can be rented or bought (Over Geas Energiewacht, 2020). Heat pumps and other sustainable solutions are rising fast in attention and sales, however.

Geas has a working field of around 435.000 households, which equals a market share of 46% in Twente and 12% in the Achterhoek. The Front Office is always accessible for questions and more than 130 service employees and specialists are on the road daily to provide a safe, clean, and comfortable living and working environment. Next to this, they have a team for the business market, where housing associations and shops are assisted. All in all, Geas provides its services to 66.000 private customer, 1.200 companies and institutions and 19 housing corporations (99.000 residences) (Introductie presentatie Geas, 2017).

In 2013 Geas moved to a new business premises at the Spoordijkstraat in Enschede and has six (mechanic) work locations spread over the working field. In total, Geas has more than 360 employees and has an open, informal, and approachable culture. In 2012 and 2016 the company won the award of Best Operator of the Netherlands and Overijssel (Werken bij Geas Energiewacht, 2020).

2.2 History

In 1966, the company GAS (Gas Appliance Services) was founded from a partnership between several installers in Enschede and the municipal gas company Enschede, GGE (gemeentelijk gasbedrijf Enschede). When in 1969 more electrical products were added to the offer of the company, the name changed to GEAS, Gas- and Electrical Appliance Services. When in 1975 mechanics from Hengelo joined the company, its working field started to expand. Because of this accession the company converted into a private limited company. In 1996, Essent became owner of the company for 50%, the other half was distributed over other shareholders. Together with four other service partners, every part of the Netherlands can be provided with the services of Essent. The working field can be found in figure 2. In 2015, Essent became full owner of Geas. It now possesses Energiewacht (EW), Energiewacht Groep (EWG), Geas and Volta Limburg completely and is

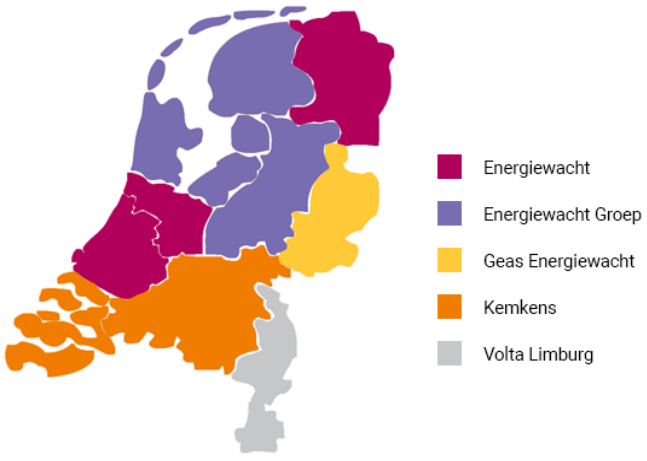

Figure 2 Working field of Geas and its partners

shareholder of 49% of Kemkens. Currently, an integration plan between EW, EWG and Geas is being developed. Because of the energy transition, the demand of furnaces is decreasing, and solar panels, isolation and heat pumps is growing. By integrating, the realization of the objectives can be met and therefore also the growth and development of the companies (V&A Integratie Energiewacht, Energiewachtgroep en GEAS, 2020).

2.3 Mission and strategy

Geas strives for comfortable and safe living for everyone in the working field against the lowest energy costs possible (Essent servicepartners in heel Nederland, 2020). This vision is summarized in the catch phrase "*betrouwbaar, betaalbaar, duurzaam"* (reliable, affordable, sustainable). This will be realized by the following points:

- Have attention for our customers;
- Translate wishes and questions into concrete working solutions;
- Being enthusiastic for its profession;
- With up-to-date knowledge from technologies and the cohesion between techniques
- By working together with customers and suppliers about knowledge and products.

By performing these points, customers and partners can trust on the best solution for a question of request (Introductie presentatie Geas, 2017).

Since a customer-oriented service and trustworthy high-quality products are important to Geas, attention is payed to the management of quality, safety, and information security in its strategy. Geas' employees must be aware of the necessity that they will have to take care of:

- The improvement of quality of products and services;
- Watching over safety, health, and wellbeing of all people involved;
- Prevent hinder on surroundings and environment;
- Prevent confidential information from being distributed, used or processed other than has been agreed to (Introductiemodule KAM, 2019).

The ambition of Geas is to be financially healthy. Meaning that it is profitable and has a good level of equity. Its market share of 46% is aimed to remain and the goal is to increase the share in the Achterhoek to 25%. The company has already received awards on being a good employer and wants to stay above average in this field. This is realized by its training center to educate technical staff. Also, since there is a growth in the demand of solar panels, meaning that a broadening of products and services and keeping up with the developments in this area. Third, the online sale of products is getting more important. Geas wants to go along with this trend and broaden the capacity. In 2015, Geas won the award of Best Website in the Netherlands in the field of Energy. (van Hunsel, Missie, visie en strategisch plan Geas Energiewacht, 2016)

Geas has a prominent position in its working field and is therefore conscious of taking care of people and nature. Geas is looking for a balance between social, ecological, and economical effects. To offer effectively and reliable energy- and living comfort related products and services to its private and business customers its policy is aimed at corporate social responsibility (CSR) (van Hunsel, Beleidsverklaring Geas Energiewacht, 2016). What is aimed for with CSR in literature (Moir, 2001, p. 19) is:

- Treating employees fairly and equitably;
- Operate ethically and with integrity;
- Respect basic human rights;

- Sustain the environment for future generations;
- Be a caring neighbor in your community.

The points mentioned here also can be found in the policy of Geas.

The managing board wants to ensure that:

- Products and services are delivered flawless and according to the expectations from the customer;
- No results of certified services are influenced;
- All foreseeable dangers that can lead to personal damage, occupational disease, fire, property damage or environmental damage will be contested;
- Chapters 3 to 6 from the BRL9500-00 are met;
- Chapters 3 to 6 from the BRL6000-00 are met.

To secure these activities a quality management system has been developed that meets the requirements of the NEN-EN-ISO9001. This certificate shows that the organization is able to consistently deliver products and services that meet the customer's requirements and applicable laws and regulations and is committed to increasing customer satisfaction by effectively implementing the systems, including processes for improving the system and ensuring compliance with customer requirements and applicable laws and regulations.

2.4 Products and services

Geas offers a broad package of both products and services, but also personalized advices. Geas can be contacted for all questions related to living comfort, safety in home, energy saving and energy generation.

Products that are offered by Geas are:

- Furnaces (buy or rent);
- Solar panels;
- Heat pumps;
- Solar water heater;
- Thermostats;
- Boilers;
- Gas heater and;
- Air conditioning.

Next to the products, Geas offers services, which are:

- Contracts for regular maintenance and service in case of malfunctioning;
- Home insulation;
- Cleaning ventilation ducts;
- "PlusJeHuis", to see which energy saving measures a customer can make;
- Determining the energy label of a house;
- Offering information about subsidy and arrangement.

On the website a "kennisbank" can be found, where information can be found about the offers of Geas, divided into categories. When more information is requested, a contact form can be filled in after which the customer is helped further.

2.5 Organization structure

The way the organization is controlled is captured in the management model (Manager K&V, 2009). This model is made to audit the management processes, fit the managing processes to the controlling processes and make it easier for future developments to be implemented. This is all part of the total organization- and quality system (Besturingsmodel Geas Energiewacht, 2009).

The organization structure of Geas can be found in appendix 2. The departments that are relevant for this research are: Commerce and Front Office.

Commerce is being led by the commercial director and is responsible for:

- Recruitment, processing and management of (new) contracts;
- External communication and marketing within the values of Essent;
- Consultancy on rent and sales (counselling interview, arranging installation, rent/sale contracts) and;
- Advice in the field of energy performance and the management of corresponding reports.

Front Office is the first point of contact for the private customer. The department is responsible for keeping contact with customers and gaining new customers. One of the tasks that comes with this contact, is the appointment planning of the field service employees. These employees visit the (potential) customers of the company at home. The field service employees consist of;

- The (technical) advisors and;
- The service engineers.

The six advisors are part of the department Commerce. The advisors visit (new) customers and give advice on furnaces, solar panels, warm water pumps, mechanical extraction, heat recovery unit and other products. Sustainability can also be included in the advice, such as insulation, but this is mostly forwarded to Nederland Isoleert. A quotation is made of the advised products or services during the appointment. The service engineers fall under the department Production. They also visit the customer at home, but they visit for maintenance or solving malfunctioning of the objects at the address.

The difference between these two types of service employees is important for the research since the planning of both types proceeds differently. Since the advisors fall under Commerce, they are planned by commercial customer contact (CKC). The service engineers fall under Production and are therefore planned by Front Office.

2.5.1 Stakeholders personalia

In this section, a sketch is given of the three most important stakeholders: the advisors, the planners, and the manager of this process. These fictional people will clearly show what kind of employees this process is dealing with and what their perspective is. Thereafter, all people involved are described briefly and are placed in a power/interest grid. In total, there are five advisors who are currently being scheduled and six planners. The names, age and status of the personalia are fictional and cannot be fully compared to reality. The interests are used to get a clear idea of how the stakeholders are looking at this process and is aimed to be comparable to reality.

Name: Hendrik
Age: 55 years old
Status: married to Ingrid (53), two children (18 and 20)
Function: advisor
Background: Hendrik has worked for almost 12 year at Geas now. He started working as a service engineer at comparable companies and got the opportunity to retrain at Geas to become an advisor. He is passionate about his job and enjoys the interaction with the customer.
Interest: Hendrik thinks it is important to spend as much time at the customer as possible, preferably physically. Every hour driving to an appointment is wasted time. It does not matter to Hendrik how he receives his information, as long as the information he needs is there and correct.

Name: Jeroen
Age: 35 years old
Status: single dad of one child (6)
Function: commercial customer services
Background: Jeroen studied commercial economy in The Hague and went back to his roots in Twente after completing his study. He enjoys the commercial chat with the customers and his co-workers and is satisfied with his current position.
Interest: Jeroen wishes that the process of planning is done mostly automatic and can be done as fast as possible, so he has time for his other duties. Because Jeroen and his co-workers have complained about the lack of speed of the process multiple times, they stopped mentioning problems.

Name: Dennis
Age: 40 years old
Status: married to Linda (35)
Function: manager
Background: Dennis has worked as a manager for a while now at different companies. He is responsible for the sales and the processes that are involved. He is ambitious and very busy.
Interest: as Dennis is a busy man, he has many people to satisfy. Since there are bigger problems than the scheduling process, this has a low priority. However, if this problem gets solved, more appointments might be planned, and costs can be reduced when the problem gets solved.

These three employees are put into a power/interest grid, together with the other stakeholders. This grid shows who are affected by this research and who have power over it or have interest in the changes that might be made.

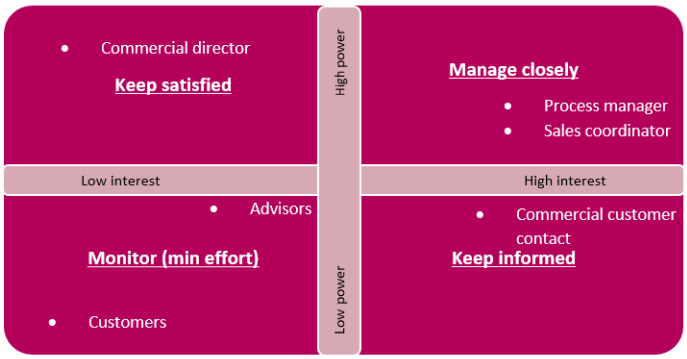

Figure 3 Power/interest grid

The interest of the advisors is low, the routes are quite good now and the speed of the workflow has no influence on them. Since they have medium power, they are placed between the quadrant "monitor" and "keep satisfied". When the advisors are not satisfied, something will change, but there are not involved in the process of looking for a solution, which is why they are placed there in the quadrant.

The planners of CKC have a high interest in the improvement of this process since they use Visitour daily. There are a lot of complaints, about the malfunctioning and speed of the workflow. They are placed in the quadrant of high interest, low power.

The process manager and sales coordinator are responsible for the optimization of this problem. Their interest is therefore high. They also have high power and will be leading the search to the solution of the problem and the implementation of a solution. Therefore, they are placed in the "manage closely" quadrant.

The commercial director will benefit from a good working workflow because of satisfaction among employees and customers but has no interest in the process of improving the scheduling. Because he does have the power to cancel an implementation, he is placed in the "keep satisfied" quadrant.

2.6 Software

Geas makes use of several systems for the operationalization of its services. This includes for example the planning, administration, and finances. Below, the systems are explained and the way they are used at the department Commerce is described. The software packages are:

- Navision
- Clixz
- Visitour
- Field Mobile Services

2.6.1 Navision

Microsoft Dynamics Nav, mostly spoken of as Navision, is the ERP-system that is used by Geas. This ERP-package is mostly used in small to medium-sized companies. By using an ERP-system such as Navision, inventory management, business administration and logistics can be processed and the information can be shared among different departments of the company (Wat is Microsoft Dynamics Navision eigenlijk?, 2020). The flexibility of this program is a great advantage for Geas, since the organization makes use of other systems that are connected to Navision. This makes it easier for the software to adapt to the processes (Wat is Microsoft Dynamics Navision, 2020).

Navision is used on the department Commerce for the registration of the customers. On a customer page, contact information, objects that are connected to the address and contracts can be found. In Navision, workflows are used. This is a combination of handlings, that lead to a certain outcome. At the start of the workflow, it is connected to a customer, after which is goes to the right department(s) where the workflow is processed.

2.6.2 Clixz

Clixz smart connections, is a company that is located in Breda and is focused on the alignment and integration of business processes by using smart ICT-solutions (Kom werken bij Clixz, 2020). Clixz is a web based, business process supporting application, that is used to generate leads. The modules Leads and Sales are used to efficiently approach possible customers and drafting quotations, after which the process can be monitored (Van complete offerte naar nieuwe deal, 2020)

The department Commerce uses Clixz to follow up on leads. Potential customers are listed in Clixz and are divided into categories. These categories are for example customers who want advice on a new object. They can receive advice by phone, or an appointment is made with an advisor. Or when a lease contract of 12.5 or 15 years ends, the customer is called to see if they are interested in a new object or a contract.

2.6.3 Visitour

FLS Visitour is a partner of Clixz and is a route planning software for technical outside staff. It can be used to make appointments on short, for emergencies, or long term, multiple weeks ahead, within seconds. The software is used in multinationals, and small medium enterprises from different branches. Throughout Europe, it controls over 35 000 field employees per day (Onze partner: FLS Visitour, 2020).

Visitour is used in two different ways in Geas. To plan the service engineers, the automatic scheduling function of Visitour is used. This means that Visitour comes with a proposal for an appointment and determines the ideal route for each service engineer based on for example skills and location. The service engineers work with a flexible planning, meaning that only one or two appointments are fixed. Because of this, the program can continuously calculate and change the optimal route. When the service engineer is at one appointment, the next will be visible in his planning. When the appointment takes longer than expected, the planning can be re-calculated and optimized when necessary. CKC however, plans the advisors in Visitour to their own insights. The automatic planning caused problems, which is why manual planning is used currently. Because of the manual scheduling, the advisors might have an inefficient route.

2.6.4 Field Mobile Services

Field Mobile Services, also known as FMS, is an application on the mobile device of the advisors and service engineers. Here they can see which appointments they have that day. When clicking on an appointment, all available information is shown. This includes the customer data, the objects that are known at that address and the possible contracts that are connected to the objects. It is a stand-alone application, meaning that it can be attached to many different programs.

At Geas, FMS is connected to Navision. Once an appointment is fixed in Visitour, it is also visible in Navision and therefore also in FMS. All connected data that shows up when clicking on an appointment comes from Navision.

2.7 Conclusion

In this chapter Geas has been thoroughly discussed. The history of Geas, but also a part of its future with the integration of EW, EWG and Geas has been mentioned. Thereafter follows the mission and vision of Geas. With the catchphrase “reliable, affordable, sustainable”, Geas wants to show that they aim for everyone in the working field to live safe and comfortable against the lowest price possible. This is also realized by offering a wide range of products and services, mentioned thereafter. The organization structure is important for the investigation, and employees from the department Commerce are the biggest stakeholders. This chapter is closed off with an explanation of the different programs that are used. An explanation is given about Navision, Clixz, Visitour, and FMS and how they are used in Geas at the department Commerce. This software is the most important part for this research. The scheduling function of Visitour will be discussed in chapter 4 and knowledge about Clixz and Navision is necessary for the scheduling workflow in chapter 4 as well.

3. What is said in literature about scheduling services using ERP?

In this chapter, literature is researched that has to do with dynamic scheduling and ERP-systems. First, the use of ERP-systems in service operations will be discussed. Then, methods for scheduling service operations is researched, after which the use of ERP-systems for scheduling is investigated.

3.1 ERP systems for service operations

Enterprise resource planning (ERP) systems are one of the largest used information systems in small, medium-sized, and large-scale organizations. An ERP system is used to link all functional modules of an enterprise together. These modules include for example production, sales, human resource, and finance (Klaus, Rosemann, & Gable, 2000). This is visualized in figure 4. All different modules are integrated into one computer information system and aim to serve all the needs of different departments of the organization. ERP-systems were mainly developed for manufacturing industries, where tangible products are produced. However, ERP systems in service sectors are becoming more common. According to Menor et al (2002), more than half of developed counties' gross domestic products is in the service sector, meaning that the competition is high in this sector. Because of the increasing competition and interest in improving process efficiency, service providers are pressured to integrate information systems for an improvement of the management of service delivery (Botta-Genoulaz & Millet, 2006). The main reasons for service companies to implement ERP-systems are strategic. This can be the advantage of having one single source where all the data is provided, or the reduction of costs the system aims to provide. Also, the effect on customer responsiveness, and the faster access to information and improvement of productivity. Several surveys have been performed in literature to identify the benefits of ERP systems at enterprises. The most mentioned benefits are: quality of information, use of a single system, accessibility of data, possible reduction of inventory, increasing productivity and better management of production and logistics (Botta-Genoulaz & Millet, 2006). Not all integrations of ERP-systems are successful, which is mostly to blame on the technical complexity and the mismatch between the technical specifications and the business requirements. The human factor also has a great influence on the adoption of ERP. ERP-systems are not just related to computers, meaning that the people who are involved need to change their practices, it requires management support and consultants. When implementing an information system, this aspect needs to be considered.

Figure 4 ERP definition

3.2 Scheduling service operations

Scheduling for service operations is in some ways quite similar to production planning. Forecasting demand, planning resources, scheduling work and reserving capacity is what can also be seen in Supply Chain Management. The extra complexity of scheduling services comes with the needed mobility of the service providers (Voudouris, Owusu, Dorne, & McCormick, 2006). Instead of scheduling within one facility, the service must be provided across the working field. Because of this, external factors,

such as traffic conditions, must be considered. Also, customers expect the service without long waiting times or even immediately in case of emergencies and no inventory levels can be built up (Pinedo, 2005, p. 48). Instead of using a Bill of Materials, the skills that a field employee has, are used to define a resource. Whereas with manufacturing operations an inventory can be kept, this is not possible with services. With services, there is an earliest starting time and completion time and a certain amount of slack. Within a given interval, a job must be completed. For this job to be completed, other resources might be needed, which means that more data is necessary. This data includes for example the characteristics of a job, such as an earliest starting time, duration, priority level, but also additional resources that may be required and a set of skills that is necessary to complete the job. Therefore, scheduling of service operations requires both the timing of activities and utilization of resources (Pinedo, 2005, pp. 37-44).

Four categories are used for flexible routing and scheduling: zone scheduling, short-turning, deadheading, and dynamic stop skipping. With zone scheduling is meant that the working field is divided into several zones and each bus is assigned a certain zone for its operations. Passenger times and the amount of required buses can be reduced. Some disadvantages however are; the reduced service frequency and increased waiting times and the possibility of having a more optimal route when assigning a job just across the border of the zone to the bus. Short-turning is used for routes where there is a peak in demand at one zone which decreases outside the zone. The short-turn trip is covered entirely by the long-turn trip, meaning that short-turn trips can be substituted by long-turn trips (Furth & Day, 1985). A part of the fleet serves the short-turn trips in the high demand zones, whereas the other part serves the lower demand zone. Deadheading uses empty vehicles at the beginning or ending of the route to save time. This way of scheduling is also used to reduce the number of vehicles needed. Dynamic stop skipping means that when there is a certain slack and is behind on schedule, the appointments with a low priority can be skipped. Dynamic stop skipping is an online, real-time strategy. Passengers have the possibility to be skipped and might have to wait for another headway, which is the disadvantage of this strategy.

3.3 Scheduling service operations using ERP

Typically, a scheduling system makes use of several modules. These modules are:

- Database, in which all necessary information is stored;
- Automatic schedule generator and;
- User interface modules.

The database must be made suitable for a scheduling system. This means that the module may need to be able to change data, perform statistical analysis and show the data to the user in a manageable way. This database may also contain the restrictions for a schedule (Pinedo, 2005, pp. 320-322). This knowledge base is mostly part of the schedule generator. In this database, there are two types of data: static and dynamic data. With static data is meant that the schedule has no influence on this data, so for example: resources and job or activity data. This data can be connected to the customer's information page in the ERP-system, which then may include the order quantity, the due date, and possible constraints. Priorities of an appointment are static data as well since the schedule does not influence this. These weights are usually inserted manually and can be based on personal judgement or a formula that uses information from the information system. The dynamic data includes for example, the starting and completion time, the idle time of a resource (driving time), the sequence of appointments and the number or late jobs.

The schedule generator must contain the following functions to be able to generate a schedule for service operations:

- Allocation of personnel, orders and equipment to specified locations;
- Determine the priority of an order and therefore the sequence of appointments and;
- Optimizing routes while keeping in mind constraints and rules and using heuristics and algorithms.

This scheduling function is affected by other modules of the company as well, since stock levels and demand forecasting can influence the scheduling of services (Metaxiotis, Psarras, & Ergazakis, 2003). Without the support of an information system it is nearly impossible for a planner to make a schedule while integrating all the points mentioned above. It would require knowledge from all data and all variables, and dynamic uncertainties must be considered, making the multi-criteria objective too complicated. When conflicts emerge, further delays and re-scheduling may be necessary, which is a time-consuming task and can affect customer satisfaction (Metaxiotis, Psarras, & Ergazakis, 2003, p. 226).

The user interface module is very important to make the implementation of an ERP-system a success. A system can have many capabilities and offer a wide range of possibilities, but if the user is not capable of handling the system, the added value of the module will devaluate. With the user interface, the user can edit a schedule and insert last minute appointments or changes. The impact of a change is usually made visible with a performance analysis, shown graphically (Pinedo, 2005, p. 322).

4. How is the current information system of the scheduling process of advisors working?

In this chapter, the current situation of the scheduling process is looked at. First, a literature study is conducted on how a similar process is handled in literature. This literature is compared to the situation of Geas, their use of ERP and method of scheduling is investigated. Then, a flowchart is discussed which explains the current architecture of the process. Also, the current settings are looked at.

4.1 How does the literature compare to the scheduling behavior of Geas?

During this section, the literature is compared to the situation of Geas. This means that we will compare the aforementioned points of ERP and scheduling service operations to how these points are applied to the scheduling process of the advisors.

In theory, the ERP-system is used throughout the entire company and all modules are used for different departments. Geas however, connected modules from other providers to Navision. These modules are used because they are more specialized in this field and therefore offer more options. For the sales department for example, the sales module of Clixz is used. Other departments, such as HR-management and Production do not make use of Navision, but mostly of external modules. These external modules are connected to Navision, meaning that all information that is visible in their detached module is also visible in Navision. Navision is therefore still the basis of the information system.

Geas is not merely a supplier of services, but also has products. This means that for the services no inventory level can be built, but this is possible for the products. The service engineers need to have the right equipment available in their bus, and the products that need to be installed require a certain level of availability. This makes the scheduling of service engineers more complicated since the equipment in the busses must be filled and the mobility of the services must be taken into account. This complexity does not appear for the advisors since they have no need for inventory in the busses.

The method that is used for the scheduling of the advisors and service engineers, is the zone method. First, the scheduling by Visitour for the service engineers is explained, after which the method for the advisors is discussed. Service engineers are assigned to a zone in which they are scheduled flexibly. This means that only one or two appointments are fixed and that the route is optimized whenever a service engineer finishes its appointment. In figure 5, we see an example of a possible current route. The green circles represent an appointment and the blue squares are locations of the service employees. The first appointments of the service engineers are fixed and are visible in their agenda. In figure 6 we see that two emergency appointments have been added, and the route is recalculated and optimized with the PowerOpt algorithm within seconds. The route of service engineer 3 remains the same, but service engineer 2 takes over one appointment from service engineer 1 and an emergency appointment. This is possible because only one appointment is fixed, the rest is flexible and can therefore be optimized when appointments are added. Service engineer 1 gains one emergency appointment and gives one appointment to service engineer 2.

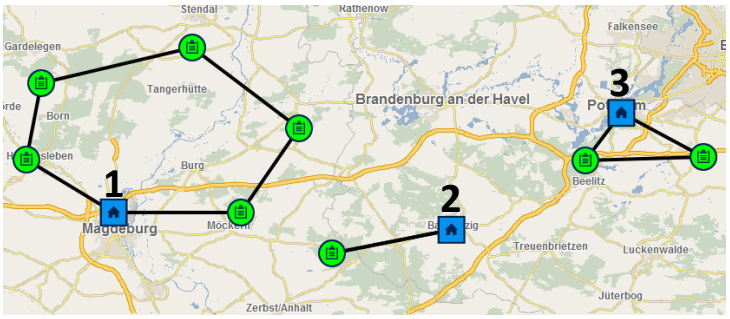

Figure 5 Route before emergencies

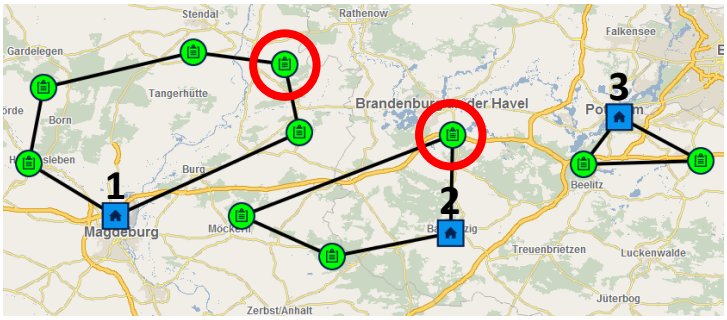

Figure 6 Route after emergencies

The same PowerOpt algorithm is used for the advisor when the planning is done automatically and the zones that are made are based on the price of the ride. The radius of the zone is determined by comparing the costs of a trip to the yield of the appointment. If the yield of an appointment is set at €4000, then the costs of the trip must not concede this. To get a logical route, costs are determined, such as:

- Fixed costs per trip;
- Fixed costs per appointment;
- Costs per kilometer;
- Costs per hour and;
- Costs per hour of overwork.

The costs per kilometer for the advisors vary between €35 and €40. The hourly rate for the advisors varies between €25 and €100. Fixed costs are not set for the advisors, but they can help to optimize the route. When a high fixed cost per trip is used, chances are that sending out one advisor for two appointments is cheaper than using two advisors for the two appointments, even if the distance is higher. The costs are based on the maximum distance and travelling time of the advisor, not on the actual price of driving one kilometer. They help to optimize the route. The disadvantage of using the zones that are determined by this price, is that when an address is only a few hundred meters outside of this zone, the appointment is appointed to another advisor. It is possible however, that driving just outside the assigned zone makes a more logical route that letting another advisor visit this address.

Since the automatic scheduling turned out to be inefficient, the scheduling is currently done based on the insight of the employees. The difference for the schedule of the advisor is that the customer does not receive a time frame of 4 hours, as with the service engineers, but has a fixed appointment in blocks of one hour. This means that an optimization such as in figure 5 and 6 is not possible. The optimization needs to take place during the call with the customer.

The database of Geas is filled with information of the customer, of objects, appointments, and constraints. These constraints will be discussed further in section 3.3.2. The level of priority that is given is based on whether it is an emergency or not. The dynamic information about the schedule can all be found in Visitour.

For the determination of the schedule, Visitour is used, which takes the constraint of the objects and employees into account. They are allocated to the locations of the appointment, which also determines the sequence of an appointment. Emergency visits have a higher priority and will be appointed an earlier timeframe.

The user interface of Visitour, shows all the information that is needed for the planner. The user interface is shown in appendix 3. It is also possible for the user to see the statistics, which include a daily analysis, service level, postal code zone, ride overview, employee overview and unavailability.

4.2 What is the current architecture of the system?

To discuss the current architecture of the system, the flowchart of the scheduling process is discussed, which shows which steps are done manually and which automatically. Then, the current settings of the system are looked at, which include the skills of the advisor and the required skills per object.

4.2.1 Flowchart

In this section the current process of scheduling an appointment for an advisor, so at the department CKC, is explained. This process is the same for furnaces, warm water systems and other objects. The process scheme is shown by using a flowchart and the steps taken are explained in more detail. The explained only include the steps which the planner must execute. The current scheduling process for the advisors can be found in appendix 4.

Outside of the scheduling process, marketing is used to generate new possible customers, called leads. By setting up campaigns and promotions, either individually or in combination with Essent or suppliers, people are drawn to Geas. In the ideal situation, this customer is interested in an advice appointment, in which the possible objects or services are discussed. When the lead has been generated, the process starts. The process can also start when for example a furnace has an age of over 15 years. In this case, there is a potential client for a new object, meaning that a lead is made automatically, and data is sent from Navision to Clixz.

Once the customer is interested, a lead will come in via Clixz. This is either done manually, in case the customer calls, or via the website, when the customer registers itself for an advice appointment. CKC is responsible for contacting the customer in case the lead comes in via the website. During the call, the postal code and house number of the customer is asked for, and with this information, data of the address is requested from Navision. A set of data, corresponding to the postal code and house number, is collected in Navision. The lead is registered in a Navision Clixz-data table, which means that is has the structure of a Navision table, and is filled with data from Clixz via XML-messages. Next to this, a workflow is prepared. The workflow is prepared here, to prevent delay further in the process. The collected data from Navision is shown in Clixz. When the customer is already registered, the right customer is connected to the lead manually. Then, the employee must manually select whether a customer has been won or not. When a customer is won, it means it turns form a potential client into an actual client, the workflow that has been prepared before is activated. In case the customer is lost, the process ends here. After the activation of the workflow, the workflow screen is shown to the user. Another Navision Clixz-data table is made, but now contains data about the product choice of the

customer, so whether the customer is interested in a furnace, solar panels, or something else. If the customer has not yet been connected to a lead, because it is a new customer, the user makes a new customer page. If the customer has already been connected, we skip this step and an advice order is made. The user now requests an appointment proposal from Visitour, and order data is sent to Visitour. With this order data, Visitour returns a proposal for a date to Navision. If this date is not accepted by the customer, a new date is suggested by the user manually. Once a date has been set, the appointment is fixed in Clixz, Navision and Visitour. The process is finished.

The appointment can now be seen in Clixz, Navision and Visitour, but also in FMS, the application used by the advisors. They now know exactly where they must be and when. All information that is visible in Navision is also visible on this application. The information that has been added by the planner, wishes and possibilities from the customer, can also be seen. During the visit, the possibilities are discussed and evaluated, and a quotation can be made. When the customer chooses to rent of buy a product of Geas, the process is picked up by the Back Office for further handling.

4.2.2 Design and current settings

In this section, it is investigated whether the design and the current settings of the process are still up to date. When Visitour wants to automatically plan an order, it makes use of the skills that are needed for the order and matches them to the skills of an employee. By doing so, it cannot be that an advisor is sent to an appointment and lacks the skills to help the customer. Each resource, which is an advisor or service employee, has a set of skills and working hours. When an appointment is planned, the working hours and skills must match the requirements of the order, otherwise the automatic scheduling function of Visitour will place the order at another advisor. The current working hours and skills of the advisors can be found in appendix 7a. Here we can see that there are no skills registered for one of the advisors, meaning that if the automatic scheduling function is activated again, there will be no appointments for this advisor.

The skills of the advisors are matched with the necessary skills of an object. So, when a customer wants an advice on a furnace, a certain set of skills is required. These skills are registered under an object template, for example MC1735 for a furnace. When opening the set of skills for the object, we see that it takes 60,00 minutes to give an advice about this object. There are two places where the skills can be found, some of the skills are registered under “bekwaamheden”, whereas others are registered under “aanpassingen”. Under “bekwaamheden”, no skills are registered, but under “aanpassingen” we can see that “ADVI CV” is a necessary skill. This skill overwrites the skills that are registered under “bekwaamheden”. This means that every advisor with the skills CV can give advice about this object. In these setting, the skills, but also the type of resource is registered. This can be an advisor, or a service engineer, or one of Geas’ partners. These is no consistency in the settings, since the code ADV, which stands for advisor, is inserted either under resource group or sometimes research group. In appendix 8a all the current skills of objects, standard times and types of resources can be found.

The skills of advisors, skills required for an object, and standard times, must be updated manually. When an advisor completes a course and therefore gains a skill, this must be added to Navision. And if it turns out that an advice does not require 60 minutes to complete, but longer or shorter, the times must be changed for the entire template. It is also possible to change the time for only one specific object, but then the next advice will take the data from the template again. It is also possible to give one advisor a percentage of the norm time. So, when an advisor takes more time than the other

advisors, the settings can be changed to 125% for example. This shows that the advisor needs 25% more time than the other advisors to finish an appointment.

4.3 Conclusion

In this chapter the answer on the question “how is the current scheduling process working?” has been sought for. This is done by an analysis on literature, where first the use of ERP systems has been analyzed. The information system has been explained together with reasons of implementing such a system and the risk that come with this. Then, the different methods of scheduling services have been explained. Scheduling services has many similarities with production scheduling, except for the lack of inventory and the complexity of geography. There are four different methods used in literature for scheduling services, zone scheduling, short-turning, deadheading, and dynamic stop skipping. To conclude the scheduling of services using ERP is discussed. The database is used to store static data, which is used for the scheduling module. The user interface is important to make a success of an ERP-system and shows the schedule and performance.

When looking at the differences and similarities between literature and the process of Geas, it can be concluded that Geas makes use of the ERP system differently. Instead of using only an ERP system, it integrated different modules for specialization. For the scheduling, the method of zone scheduling is used, based on the costs of a ride.

During the last section, the flowchart and design of the process are discussed. This includes the steps that are done manually and by the system and the setting that are used for the workflow that is used.

5. What is the performance of the current scheduling process of advisors?

During this chapter, the performance of the planning process is analyzed. This is done by conducting interviews with the people who are involved in this process and see what points they mention about Visitour and the process. Then, the time it takes for a planner to schedule an advisor is measured. Also, the number of kilometers driven during automatic scheduling is compared to manual scheduling. Finally, some logfiles are analyzed to see where in the scheduling process fault emerge.

5.1 How do employees experience the scheduling process?

Interviews were conducted with employees to see which problems they encountered and what would be the ideal situation with planning according to them. An interview was conducted with an employee from CKC (Interviewee 1) who plans the advisor and an advisor (Interviewee 2), who experiences the consequences of a planning. An interview scheme has been used for the interviews, which can be found in appendix 9. The transcripts of the interviews can be found in appendix 10.

During the interviews, six main topics where discussed: “Geas Energiewacht”, “three systems”, “Visitour”, “FMS”, “Outlook” and “planning”. These topics where mentioned by both interviewees and are therefore labelled as important. A quantitative analysis of the interview has been conducted. The results can be found in appendix 11. During the following sections, the topics mentioned by the interviewees are discussed. Everything they mentioned during the interviews was analyzed, only afterwards was checked if their statements were correct or not. This is discussed further after section 5.1.8.

5.1.1 Geas Energiewacht

Despite of the **pleasant atmosphere** on the work floor of Geas, there are some complaints about the inside staff from advisors.

- The advisors mention that there is a **lack of knowledge** of the inside staff about central heating boilers. When calling a potential client, the requests of information should be clearer and the information that is put into Visitour is limited.
- The **involvement** of the inside staff to the outside staff is limited, meaning that the outside staff feel like they are nagging, when they try to create more time at the customer by making this easier for themselves (Interviewee 2, 2020).
- Also, the advisors complain about the lack of **sustainability** that is provided by the organization. Geas is not offering enough in this field according to the advisor and should be improving more here (Interviewee 2, 2020).

5.1.2 Three systems

A recurring topic during the interviews is the use of three systems. Navision, Clixz and Visitour are meant with these three systems.

- Geas uses Navision, Clixz and Visitour, which is viewed as **inefficient** and not optimal. Next to these systems, Geas also uses FMS as an agenda with information for the advisors and 2Solar for an installation plan for solar panels.
- Because of all these programs, the **link** is not always working. Information that goes from one system to another gets lost or is not visible in all systems. As mentioned in Interview 1 (2020), it sometimes happens that an order is made correctly in Navision, but it cannot be planned in Visitour because of a fault in the link between the systems. Also, when **name and address data**

is changed in Clixz, this is not automatically changed in Navision (Interviewee 2, 2020). A comment must be made that the data is changed in Clixz and then must be updated manually in Navision.

- Both interviewees questioned why Visitour is used for the planning of the advisors, most likely because it is the **standard** in the company.

5.1.3 Visitour

When discussing Visitour in detail, multiple points where mentioned that are considered disturbing.

- When planning an appointment in Visitour, a map is shown with the route of the advisor. The planner can see if the route is logical and the travel time is shown. However, the time that is shown is not based on the route driven by the advisor, but on the **linear distance**. Therefore, the indicated time is not valid, and knowledge from the geography is still necessary. The planner must determine what the actual time of the ride will be. This **map** is however very pleasant for the planners, and Interviewee 1 mentions that this is a feature that he prefers to remain.
- Visitour should come up with a **proposal** for a date for the appointment with an advisor. This way of scheduling has been used before, but because of inefficient route, they switched to manual planning in Visitour. Employees indicate that, when changes are made in the current way of determining the route, a proposal for an appointment from Visitour would be ideal (Interviewee 1, 2020), because less mistakes in the schedule will be made and even without knowledge from geography a correct planning can be made.
- Because the **automatic planning** was inefficient, CKC has switched to **manual** planning. Because of this, the route can be inefficient, and mistakes are made more easily (Interviewee 1, 2020). The advisor is quite satisfied with the current manual planning, but is aware of the extra steps that need to be taken by the planners (Interviewee 2, 2020).
- An error occurs when planning an advisor to give advice about solar panels. It says that the advisor does not have the **correct skills** to give advice about this, even though this is not true. What happens then, is that Visitour wants to place the appointment in the planning itself, and then the whole planning is changed (Interviewee 1, 2020).
- A big issue is the **date reliability**, when planning an advisor in Visitour, the is too little certainty that the advisor sees the appointment on his agenda. Interviewee 1 want to be guaranteed that when an order is put into Visitour, it is also visible for the advisor, without a doubt. Currently, the planning is sent to the advisor because they cannot fully trust Visitour.

All in all, interviewee 2, an advisor, indicates that he sees **no advantage** of the use of Visitour. Interviewee 1, the planner, understands that Visitour has little or no benefits for the advisors, but the map shown and the possibility of automatic scheduling in Visitour does have added value for the planners.

5.1.4 FMS

FMS is an application used by the advisors and shows the agenda and the information of the contracts and objects of the address. This works well, but not perfectly.

- When opening an appointment, **all information** that is in Navision, can also be seen in the FMS application. There is a compact description of what the intention of the visit is, and which contract are on the objects. Interviewee 2 indicated that this is enough information in 8 out of 10 visits.

- A problem that emerges, is the link between Visitour and FMS. Sometimes, when information is put into Visitour, it is **not visible** in FMS. Interviewee 2 indicated however, that is some cases, this can also be caused by the **planners** putting the information in the wrong place.

A problem that is caused by this not functioning link, is that an appointment is not visible in FMS, but it is in Visitour. This means that the advisor is unaware of an appointment and the customer is not visited.

5.1.5 Outlook

Outlook was used before the implementation of Visitour. Therefore, the advantages and disadvantages of Visitour compared to Outlook were discussed.

- An advantage of Visitour compared to Outlook that has been mentioned before is the **map** that is shown to the planners. A comparable visualization of the route is not possible in Outlook (Interviewee 1, 2020).
- Everything that is put into the agenda by the planners is immediately **visible** in the agenda of the advisors. Therefore, it is **trustworthy** and can be used without sending an agenda at the end of the day. If the advisor discussed an extra appointment with the customer, it can be added to the agenda by the advisor, which worked really well (Interviewee 2, 2020). Data from the customer must be pasted into the agenda **manually** however, which is extra work for the planners.

As Interviewee 1 concluded: “Outlook is not favorable for the planners, but it is for the advisors”.

5.1.6 Schedule

The advisors are currently quite satisfied with the planning, but there are a few points that need to be considered for the advisor to be fully satisfied with the planning.

- When Visitour was implemented and the planning was done automatically, the **route** was not logical. On a yearly basis, 5000 **kilometers** per advisor were driven more than the years before (Interviewee 2, 2020). Interviewee 2 indicates that driving is wasted time and that a logical route must be made to spend as much time at the customer as possible. Therefore, the ideal situation for Interviewee 2, is an appointment near his home and a logical route for the rest of the day.
- The advisors are currently planned by **blocks**. This means that they plan from 8 to 9, or 9 to 10 instead of 8:15 to 9:15. Both interviewees talk positively about these blocks. It is therefore important that this method of planning remains.

5.1.7 Other findings

The results from the interviews have been discussed with the process manager, who mentioned some points that were different from what has been mentioned in the interviews or are an addition to what has been said.

During the interviews it has been mentioned multiple times that the distance that is shown in Visitour, is only the linear distance, which still makes it difficult to estimate the actual time traveled from address A to address B. However, the process manager had the idea that the distances were accurate to the hundred meters. This has been checked with the manager of continuous improvement who confirmed that the distance is indeed the actual distance and not the linear distance. The distance shown in Visitour can be compared with a route in Google Maps and the difference will be neglectable.

Because of the confusing way of showing the route, as seen on the left of figure 7, this misconception can be understood. There is an option to show the route as seen on the right of the figure.

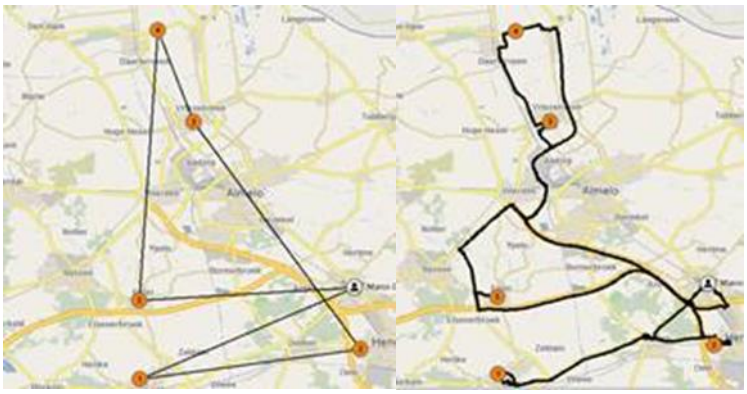

Figure 7 Routes as seen in Visitour

Also, the advisor mentioned that there is no advantage in using Visitour and the employee of CKC said that mostly the map shown is useful for the planning. An advantage that has not been mentioned is the exchange of data. Because of the connection between Navision and Visitour, the information about the customer and the objects on the address are shared. When a customer calls and is connected with the Front Office, they have insight in the appointment and appointment date. The information is visible for all departments, which gives the use of Visitour a higher value.

Also, there are two problems that emerge that were not mentioned during the interviews. These problems do, however, have a big impact on the functioning of the workflow and the scheduling process. When the workflow has been called up (section 3.3.1), there are several tasks that have to be executed. The first step is to activate the workflow. It occurs that the activation of the workflow does not function. It that case, the next step cannot be executed, which is the making of the advice order where the connection to Visitour is made. In case of one of these steps is not functioning correctly, the planner starts the process again. This year, 62 failures in the workflow were measured. Last year, this was a total of 155 notifications. This amounts to around 6% failure in both years when you compare it to the 2500 contracts. The failures emerge, because a file or request is sent, but does not receive an answer, meaning that it is stuck in the system and no further steps can be taken.

5.1.8 Conclusion of interviews

All in all, there is dissatisfaction about the current way of planning. The process of scheduling an advisor takes a lot of time and sometimes there is a fault in the connection between Navision, Visitour, Clixz and/or FMS. This results in a loss or faulty exchange of data. The route is, because of the manual planning, quite good. The route seems logic in the eyes of the advisors and they don't have the feeling that they drive around too much. If automatic scheduling will be used again, big changes must be made to the previous method of automatic scheduling, because the advisors had the idea that a lot of extra kilometers had to be driven when automatic scheduling was used before. The use of another program has been mentioned multiple times, which shows that the employees are willing to change the current method of scheduling under some conditions. These conditions come from some characteristics of Visitour that are quite useful and are preferred to be remained. This is for example the automatic scheduling function. The planners want this function to be used again, since it can make a better schedule and reduces the scheduling time. The summary of the interviews can be found in table 1.

Table 1 Summary of the findings

Theme	Explanation
Geas Energiewacht	The atmosphere of Geas is good, but there are complaints from the advisors about the lack of involvement and knowledge of the inside staff. Also, more attention should be paid to sustainability.
Three systems	Navision, Clixz and Visitour are not efficient to work with. The data transfer is not consistent, meaning that data is lost or wrong. The interviewees think Visitour is only used because it is the norm, not because it currently adds to the process.
Visitour	An advantage of Visitour is the map that is shown, also the possibility of automatic scheduling is an advantage, but this is not used right now. A disadvantage is that automatic scheduling is not used since extra kilometers were driven when this was used. The planner mentioned that manual planning takes around 3-4 minutes. Error messages are shown when the skills of the advisors are not correct and information is not always transferred, making the system uncertain.
FMS	FMS shows all the necessary information to the advisor, however not all information is always visible. This has to do with the system or the planners putting information in the wrong place.
Outlook	Outlook was used before Visitour, this was trustworthy and worked well. However, there is no option for automatic scheduling.
Schedule	The advisors are satisfied with the current planning. The routes are good, because they don't pass each other along the way. With automatic scheduling of Visitour, more kilometers were driven than with manual scheduling.
Other finding	The route shown on the map is the absolute distance not the linear distance. And an advantage not mentioned during the interviews is the connection of Visitour with Navision. Also, there are two steps where problems emerge, step one is the activation of the workflow, at the second step Visitour is involved.

5.2 How much time does scheduling take?

During this section, the time taken to schedule an advisor is measured. This is done by observing a planner and timing the steps that are taken. In the flowchart in appendix 4 is shown what the steps are. The CKC employee (Interviewee 1, 2020) already mentioned that the scheduling takes around 3 to 4 minutes. During this section, it will be measured how much time it actually takes and where the bottlenecks lie. This can be either the manual handlings or lack of speed of the system. In total, there are six planners. Two of them are students who work around eight hours per week, these eight hours are mostly filled with contacting customers for an advice appointment. Of the other four planners, two are mostly concerned with online quotations and schedule advisors occasionally. The two employees who are concerned with customer contact have scheduling advisors as one of their main tasks.

To start the measurement, the number of clicks and screens were counted. The clicks of refreshing, which can be one with some patience, are not counted since the planner clicks multiple times when they do not have the patience to wait. In this case, the number of clicks is around 30. In total 8 screens are shown.

In appendix 5 can be seen how much time the scheduling takes per step. The whole process is divided into 7 parts. The first part is not measured, this is step that is already done in most cases and is executed so fast, that the time is almost nil. The second step is about connecting the customer to the

lead. This only takes a few seconds. Once the customer is won, Navision activated the workflow and the workflow screens are shown to the user. This is all done automatically and takes 17.13 seconds. The longest time of waiting is when the advice order must be made. The advice order exists of two parts; the first is the automatic activation of the order and the second is the finalizing of the order by adding information manually for the advisor. This first part is slow and takes more than one minute. The information that is added for the advisor takes around 40 seconds. Then, a proposal is given in case of automatic scheduling, or the appointment is filled in manually, this takes around 20 seconds. To fix the appointment, the data must be dragged to the right advisor in Visitour and is fixed automatically in the other systems. This takes almost 7 seconds.

What can be concluded from the flowchart is that the automatic steps take in most of the time. Waiting on the workflow to be activated and the making of the advice order takes in more than half of the total time. The 40 seconds that are used to fill in the information for the advisor is difficult to reduce, since this information is necessary for the appointment and must be clear. There is a lot of room for improvement of the automatic parts of the flowchart.

During the measurements, some problems were faced. When there were 18 leads in Clixz that had to be called to plan a meeting with an advisor, only 4 were scheduled. This had to do with the fact that people did not answer their phone or in the end were interested in an online quotation or another service. Also, determining when to stop and where to start measuring turned out to be quite difficult, as only the manual step becomes clearly visible.

5.3 How many kilometers are driven?

During the interviews, the routes and the number of kilometers driven were discussed. Interviewee 2 mentioned that around 5000 kilometers per year were driven more than the annual amount in the years before. The automatic scheduling function of Visitour was blamed for this. However, it is interesting to see if the scheduling of Visitour caused the extra kilometers and if there is a significant difference between the automatic scheduling and manual scheduling.

Therefore, an analysis has been performed on the number of kilometers driven. In October of 2015, Visitour has been implemented. Since then, data has been collected about for example the number of appointments, number of trips and kilometers driven per day. The data will be divided into two groups, automatic scheduling, and manual scheduling. An independent t-test will be performed to see if there is a significant difference between the two ways of scheduling. It is not only useful to look at the kilometers driven, but also at the kilometers driven per appointment. This is done to check if the reduction of kilometers might have to do with for example a reduction in appointments.

The data has been collected per half year, so in total 4.5 years of data has been collected in nine batches. The data can be seen in table 2. The numbers with an * are not included in the calculation of the averages because the data is not collected of six months and this influences the results.

Table 2 Kilometers driven

Date	Method of scheduling	Number of appointments	Trips	Appointments per trip	Kilometers (total)	Kilometers per appointment	Kilometers per trip
10-2015 to 4-2016	Automatic	556,0	113,3	4,9	11856,2	23,8	105,2
4-2016 to 10-2016	Automatic	511,7	113,3	4,5	12217,7	26,3	109,3
10-2016 to 4-2017	Automatic	620,3	118,3	5,2	13709,5	23,5	117,3
4-2017 to 10-2017	Automatic	476,0	94,0	5,1	11378,8	24,3	119,8
10-2017 to 4-2018	Automatic	542,0	113,0	4,8	12320,0	23,6	109,0
4-2018 to 10-2018	Manually	311,4	75,0	4,0	7295,4	23,4	93,8
10-2018 to 4-2019	Manually	421,0	98,0	4,2	9026,7	21,5	88,7
4-2019 to 10-2019	Manually	308,3	84,8	3,6	6615,9	22,3	80,6
10-2019 to 4-2020	Manually	302,0	82,3	3,6	6508,9	22,4	80,4
4-2020 to 6-2020	Manually	104,2*	25,5*	3,9	2385,0*	26,0	95,2
Average		**417,4**	**95,2**	**4,4**	**9319,1**	**23,7**	**99,9**

Around two years ago, the automatic scheduling function was turned off and manual scheduling was used from then on. Looking at the data, it can clearly be seen that this switch is made between the fifth and sixth half year. There is a sudden drop in number of appointments and the total kilometers driven. This might have to do with the fact that Visitour was able to schedule more appointments in the same amount of days. The data also explains why the advisors were driving around 5000 km extra per year (Interviewee 2, 2020), this had to do with the higher number of appointments that were scheduled. There is no information about a possible change in demand.

From the t-tests in appendix 6, it can be concluded that there are significant differences between the automatic scheduling and manual scheduling, except for the kilometers per trip. This shows that during the period of automatic scheduling, Visitour was able to schedule more appointments per trip. However, there is also a significant difference between the number of trips, which means that there were more advisors on the road during the automatic scheduling time. This can also explain the significant difference between the total number of appointments. There is no significant difference between the kilometers driven per appointment. This shows that the planners can schedule the advisor as efficient as Visitour when looking at the route.

5.4 What happens when an appointment gets scheduled?

When an appointment gets scheduled, it is possible to see which steps are taken before the appointment gets fixed in Clixz, Navision and Visitour. These steps can show if there are things that go wrong and whether this is a mistake from the planner of the program. Three logfiles were analyzed to see what goes wrong. These documents are all of appointments where the scheduling went wrong.

5.4.1 Document 1

The first step in the logfile is sending the requirements for the appointment to Visitour. The information is:

- Period: 2020-06-22 – 2020-07-17
- Duration: 60
- Region: Haaksbergen 1
- Discipline: Geas Energiewacht
- Team: Team Adviseurs

- Geostatus: 9
- Priority: 2
- Skills:
- Appointment type: ADVI

This information shows between which dates the appointment must be scheduled, which is must be scheduled in and if it is an emergency or not (priority 1 or 2). The region is not looked at by Visitour since the route is based on the cost zones. Interesting is the lack of skills. However, at the front office, where the automatic scheduling in Visitour works flawlessly, no skills appear in the information here as well, meaning that this is not causing any problems.

With this information, proposals are done for an appointment. They can be seen in figure 8.

Figure 8 Proposals for appointment 1

These proposals are completely ignored and a date for an appointment is inserted manually.

- Period: 2020-06-24 – 2020-06-24
- Time: 13:00 – 13:59

The appointment is placed on the agenda of Marco Slag, after which an error message is shown that the skills (Advies CV) are not adequate. This can be explained by the lack of skills that are connected to the profile of Marco Slag as can be seen in appendix 7a.

This error is ignored by the planner, because the planner know he does have the correct skills and the appointment is fixed.

5.4.2 Document 2

The information with the requirements for the second appointment can be compared to the requirements in document 1. Based on these requirements, proposals are given for the appointment, as can be seen in figure 9.

Figure 9 Proposals for appointment 2

A change is made for the date manually and the appointment information is:

- Period: 2020-06-26 – 2020-06-26
- Time: 10:00 – 11:59

We see that the time of the requirements is different than the time that is scheduled. 60 minutes were requested, and 119 minutes were scheduled. This has to do with the wrong times in the settings, as can be seen in appendix 8. In this table, the last column shows what the standard times are for an appointment, but in reality, not all types of appointments are 60 minutes.

Again, an error message appears, since the appointment is planned for Marco Slag, but according to the settings in Visitour, he does not have the skills for this appointment (Advies CV(1)). The error is ignored because the planner is aware that he does have the correct skills, and the appointment is fixed.

Then, the fixation is lifted manually by one of the planners and the appointment is scheduled at another advisor. Here, the skills are accurate, so no error message appears. Then, the appointment is changed manually again, back to Marco Slag, where the error message appears again. The appointment is once again changed manually to an advisor with the right skills and then changed back to Marco Slag again. The skills are not accurate and now the maximum trip duration of 1:16 hours is exceeded.

The errors are ignored, and the appointment is fixed.

5.4.3 Document 3

Again, with information comparable to the information of document 1, the requirements of an appointment are set. Based on these requirements, proposals are given for the appointment, which can be found in figure 10.

Figure 10 Proposals for appointment 3

A change is made for the date manually and the appointment information is:

- Period: 2020-06-25 – 2020-06-25
- Time: 13:00 – 13:59

The appointment is fixed.

Nothing appears to be out of the ordinary, except for the time between the request and the fixation of the appointment. 24 hours are between the start of the scheduling and the fixation. With the other documents there is a time of a few minutes between these two handlings. This might have to do with the appointment that does not appear in Visitour. An appointment should appear above the schedule as seen in appendix 3 and is then dragged to the right advisor. The only known possible cause of an appointment not appearing, is of new addresses that are not yet known in Visitour. In this case however, the construction year is 1980, meaning that this is not the cause here. The real cause is unknown.

5.5 Conclusion

During the interviews, a lot of data has been gathered about the opinions of the advisors and planners about the current way of scheduling. Even though the advisors are quite satisfied with the current route, they are not about the inconsistency of the system. Not all information is transferred seamlessly between Navision, Clixz and Visitour and not all appointments appear in FMS. The planners are now used to the way of planning, but it is not efficient. It takes 2.5 minutes to schedule one appointment, but it is possible to schedule within one minute with Visitour. Also, no use is made of the automatic scheduling function. There are also some complaints outside the information, such as the lack of involvement and knowledge of the inside staff. This problem is not addressed in this research but will be considered during the recommendations.

To see exactly how long scheduling takes, measurement have been done and the results are added to the flowchart. This shows where the bottlenecks are. The bottlenecks are mostly at the handlings of the system, when workflows are activated, and orders are made. This time can be reduced by activating the automatic scheduling again.

To first see whether automatic scheduling is feasible and will not mean extra driven kilometers for the advisors, data of automatic scheduling has been compared to manual scheduling. This data shows that in the time of automatic scheduling, the planning was more efficient and more appointments per trip were planned. The number of kilometers driven per appointment remained the same. This explains the extra total kilometers driven in times of automatic planning. However, there were also more trips made during the automatic scheduling, which can also cause the increase of total kilometers driven.

Then, we look at what goes wrong currently during the scheduling of the advisors. Logfiles are analyzed to see which steps are made and where possible faults lie. In two of the three cases, the fault lies at the registered skills of the advisor. An error message appears, which says that the advisor is not qualified for an appointment. Also, according to Visitour, the appointment was out of reach for the advisor. The last error cannot be explained. Every step seems to go well, but there is 24 hours between the start and finish of the planning. The only known possible cause, does not apply here. In document 2 we also see human interaction, messing with the appointment. The appointment is changed five times in a row from one advisor to another.

6. How can the process of scheduling advisors be improved?

In this chapter, research is done on how the scheduling time can be reduced. First, the options for improvement within Visitour are listed, for when the settings of Visitour are causing the inefficiency. Thereafter, other scheduling systems are researched, for when this process does not suit the methods of Visitour. To search for ways to improve the process of scheduling advisors within Visitour and outside Visitour, appointments have been made with Kemkens, a partner of Geas, the head of IT and quality and the manager of continuous improvement. Also, other providers of scheduling modules have been investigated. A cost benefit analysis is conducted to compare the options.

6.1 What options are there for improvement within Visitour?

When looking at the current performance and settings of Visitour, it can be concluded that there are some easy steps that can be taken for improvement of the scheduling process. However, there are also some bigger options that are more difficult to change and extra research must be done for this improvement. To reduce the time for scheduling, the following things can be done:

- Implement the automatic scheduling function of Visitour
    - Update the skills of advisors and objects
    - Update the working hours
    - Investigate the cost structure for the route scheduling function
- Research the link between Navision and Visitour

To reduce the time to schedule, the automatic scheduling function can be used again to make the schedule. To be able to use this function again, there are two settings that need to be adjusted and one that can be investigated further. During the investigation of the current settings in Visitour and the analysis of the logfiles, it was concluded that the necessary skills for an object, skills of the advisors and the working hours of the advisors are not updated and consistent. The skills of an advisor must be set up correctly for Visitour to come with a proposal for an appointment. On my request, the new skills were provided by Han Barink and can be found in appendix 7b. These skills are also used by the planners during manual scheduling. CVKEUR and ISO are removed from the list of skills, since these services are not offered by the advisors anymore but are outsourced. Also, some skills were added, like AIRCO and skills that are not up to date yet. These skills can be updated easily and will remove some of the error messages that appeared in the logfiles (section 4.4). Next to the skills of the advisor, their working hours must be updated. Also, the skills for an object must be changed. They are installed correctly in Visitour, but there is no consistency in their settings. When all the needed skills are inserted either all under “bekwaamheden” or all under “aanpassingen”, the setting are well-ordered and easier to change later. An example of what these settings can look like can be found in appendix 8b.

When these settings are changed, the automatic scheduling function of Geas can be used again. The program will give proposals with the correct object skills and match them to the skills of the advisor. In the logfiles (section 4.4) it can be seen that Visitour already comes up with multiple proposals for an appointment, so this part of the automatic scheduling works well. Next to the fact that the scheduling must work well for the inside staff, the route must be ideal for the outside staff. During the interview with the advisor (Interviewee 2, 2020), it became clear that they were not satisfied about the extra kilometers that they had to drive when the automatic scheduling was used. However, during the analysis on the kilometers driven (section 4.3), it became clear that the extra kilometers came from the extra appointments that were scheduled. With the automatic scheduling function, Visitour can

make a more efficient planning that the planners can. Therefore, more appointments can be scheduled on one day and thus more kilometers are driven.

Even though the automatic scheduling function will work with the new settings, the cost structure in Visitour must be thoroughly investigated. Based on meetings with people familiar with Visitour, the conclusion was drawn that the costs for determining the route of the advisors, was based on trial and error. No one spoken to, really knew how the costs were determined and where they were based on. The manager of continuous improvement mentioned that a simulation can be made to determine the settings of the costs mentioned in section 4.2. To do so, the requirements for the route must be clearly analyzed. There can be, for example, a preference for two advisors to both have one appointment on a day or one advisor to have two appointments. This can all be influenced by the cost structure. Also, the contact of Visitour can be approached to help to determine these costs, but again the requirements of the route must be clearly defined first. At the department of Smart Measurers, a comparable way of scheduling is used in Visitour. Their costs structure can be looked at, which may help to determine the settings for the scheduling of the advisors.

When these steps are implemented, the process of scheduling will not be flawless yet. As mentioned in section 5.1.7, there are two points during the process where problems occur. The second task, where Visitour is called, will cause fewer problems. When automatic scheduling was used before, there were no frequent complaints about the appointment not appearing in Visitour like there are now. Also, because the skills and notifications types are filled in correctly, this is likely to not be causing anymore problems. The first task however, where the workflow does not get activated in some cases, might not be solved yet. This is a problem which also occurred during the automatic scheduling and is more difficult to trace back. When Visitours settings are as desired and this problem still occurs, the conclusion can be drawn that the mistake lies somewhere in Navision or its connection to Visitour and not with the way Visitour is set. This problem is more complex and might need another research to investigate this problem.

6.2 Which scheduling systems other than Visitour can be considered?

In this section, the options for improving the process by other scheduling systems are listed. The systems Intelly Planning, Service Planner and Agiliq are discussed, after which an overview is given of the advantages and disadvantages of the available options. The manual and automatic scheduling in Visitour are also listed in this section (section 6.2.4).

6.2.1 Intelly planning

During the research of looking at other providers of a planning module, an appointment has been made with Kemkens, a partner of Geas located in Oss. Since they schedule advisors in the same way as Geas does, this can set a clear view on the advantages and disadvantages of another scheduling program. The information was provided by Gregory Resubun, who works on the sales department.

At Kemkens, there are a lot of similarities with Geas. They use Navision as an ERP-system and use the sales module of Clixz. Also, FMS is used for the advisors to see their schedule for the day and information about the customer and objects on an address. However, instead of using Visitour for the scheduling of advisors and service engineers, they use the “planbord” from Intelly, also called “i-Planning”. To offer a faster and better service, the customer receives a block of two hours for an appointment and will be informed an hour ahead of the appointment when the advisor or service engineer will arrive. This can be done by email or by text. I-Planning is an online platform and is focused

on innovation, efficiency and user-friendliness (Afspraken plannen, beheren en inzichtelijk maken, 2020).

The scheduling module was mostly designed for service engineers, just like Visitour, meaning that its functions of flexible planning were the most attractive features for Kemkens. However, it can also easily be used for advisors. Kemkens uses Clixz the same as Geas, meaning that when you call a customer for an appointment, the same steps must be executed. However, when the workflow screens have been shown, you go to the i-Planning directly. This differs from Geas, where Navision is used as an intermediate step before moving to Visitour. In the i-Planning, you must select which skills are needed for this appointment. So, if the customer wants to receive an advice on solar panels, the advisor must have these competencies. In a section under the skills, the planner can add instructions for the advisor, so he knows what has been discussed on the phone with the customer. Then, there is an option to select the preferences of the customer. If the customer is never available on Monday and/or prefers the afternoon, this can be set here, with a simple tick box. The program comes up with five suggestions for an appointment, based on the necessary skills, location, and preferred time. Behind these appointments, you can see the advisor that will handle this appointment, the linear distance, and the travel times. These times and distances are not the same as the actual distance and time, but it usually differs for a maximum of 10 minutes. Because of the text to the customer, this is not seen as a problem as Kemkens. Once a suggestion has been chosen, it is immediately visible in the scheduling module and FMS. When an emergency appointment has been added, the “refresh” option might have to be selected before appearing in FMS. All in all, this scheduling takes around half a minute, meaning that it can all be completed during the call with the customer. It might be a little bit longer when the customer does not agree with the first option(s) or when a lot of information must be added to the comment section. A maximum of eight clicks is used to schedule an appointment.

Kemkens mentioned lots of advantages of i-Planning, which are listed briefly.

- Kemkens used to work with Outlook until a year ago, and the planning of Intelly reduced the manual handlings drastically.
- When entering the skills that are needed for the appointment, it is also possible to split them up. Two advisors will be appointed in case the customer has questions about two objects and the advisor only has skills for one of those objects.
- Because the Intelly Planning is a partner of Clixz, the connection between these two programs works well. The exchange of data is fast and there is no problem to go from one program to the other.
- The appointments are always visible in FMS, it has not happened that an appointment was visible in i-Planning and not in FMS.
- There is a connection with Navision, so all information is visible in Clixz, Navision and i-Planning.
- When an object has been sold, the object “adviseurs object” is changed in the correct object with the matching information automatically. The information does not have to be inserted manually.
- The appointments are color-coded in the schedule. It shows when the advisor is on the road, just started the appointment and when it is finished. When a customer calls why the advisor is not on the address yet, this can be checked easily.

- Blocks between appointments show the travel times of the advisor, if this block is small, the appointments are close to each other. Therefore, you can easily see when an appointment is scheduled inefficiently, because this block is too large.
- It is possible to move an appointment manually. This can be an advantage when a gap opens, or another time or advisor seems more efficient.

Of course, Kemkens also has some disadvantages of the i-Planning, but they are also to blame on the recent implementation of the software.

- It is sometimes necessary to check the locations of the planning. The software sometimes comes up with a suggestion from east to west to east again. In this case another suggestion must be chosen. This happens sporadically.

6.2.2 ServicePlanner

ServicePlanner is an online system for scheduling appointments, route scheduling and reservation system. It has been developed by a service engineer who was tired of keeping up with his administration to schedule all his customers and the unnecessary extra kilometers driven. With ServicePlanner the service engineer has to spent almost no time on the planning (Het systeem - wat kun je met ServicePlanner?, 2020). The advantages are briefly listed below.

- Automatic scheduling with the customer. If the customer is not available, a new suggestion is sent immediately.
- A reminder is sent to the customer. This prevents standing in front of a closed door.
- The system makes sure that the appointments are close to each other. Also, when the customer changes the date.
- The system can be connected to an accounting package or it can make quotation and invoices.
- The system takes travel time into account.
- The service engineer first reviews the schedule before the appointments are send to the customer.
- The employee can use navigation from Google Maps to go to the next appointment.

There are also some disadvantages for this route scheduling system.

- It is unknown if a connection with Navision can be made. Without this connection, all data of the customer must be inserted manually.
- This planner is mostly used for small enterprises.

6.2.3 Agiliq

Agiliq is designed as a service scheduling function within Navision. Planning is not one of the standard functionalities in Navision but is made possible with the add-in from Agiliq. They work together with Netronic, which offers a graphical planning for Navision. Within the add-in, there are three types of planning: project scheduler, production scheduler and service scheduler. The virtual service scheduler (VSS) is a graphical visualization of the service plan board and its advantages are:

- Jobs can be added to the desired resource with a clear Gantt-chart. A simple drag and drop method is used.
- VSS is an add-in of Navision, meaning that there will be a seamless transfer of data.

Some disadvantages that appear during the research of this option are:

- The tool does not offer a suggestion for an appointment, but only helps with the allocation of resources. This means that the scheduling is still done based on the insight of the employees.

Agiliq is mostly used for other branches than Geas is in. The most common branches are machine construction, yacht building, paint branch, technical wholesale, lightning industry, and rental industry.

6.2.4 Overview of the providers of scheduling software

In table 3, an overview is made of the features of the providers. In case information is unknown, the box is kept empty.

Table 3 Overview of providers

	Visitour now	Visitour with completely functioning automation	Intelly i-Planning	Service Planner	Agiliq
Connectivity with Navision	✓	✓	✓	✗	✓
Connectivity with Clixz	✓*	✓*	✓	✗	✗
Time taken for scheduling	2.5-3 minutes	1 minute**	0.5 minutes		
Clicks to schedule appointment	± 30 clicks		Max 8 clicks		
Suggestions for appointments	✗	✓	✓	✓	✗
Customer can reschedule	✗	✗	✓	✓	✗
Map with travel times	✓	✓	✓	✗	✗
Split appointment for two advisors	✗	✗	✓		
Travel times are shown (linear/absolute)	✓ absolute	✓ absolute	✓ linear	✗	✗

*there is a connection with Clixz, but Navision is used as an intermediate step

**the head of IT and quality mentioned that scheduling in Visitour can be done in one minute. Because of large flows of information, this is quite ideal.

6.3 What are the costs and benefits of the options?

To see what the costs and benefits of the options are, the real costs of purchasing the software and its maintenance, and the extra costs that come with the burden of the system are researched. First the actual costs of the systems are listed, after which the extra costs of the burdens are looked at. Since the Service Planner and Agiliq showed to have many shortcomings, as can be seen in the overview of the providers, only the costs and benefits of Visitour and Intelly i-Planning are considered.

6.3.1 Visitour

The costs of Visitour are determined per license. For each advisor that needs to be scheduled via Visitour, a license has been purchased. There is a one-time-only cost, for the purchasing of a license and a yearly cost per advisor for the maintenance of Visitour. Since there currently are five advisors that need to be scheduled, the costs are as follows:

Table 4 Costs of Visitour

	Price	Total
Visitour license per advisor	€600	€3,000
Visitour maintenance yearly	€144	€720

Next to these costs, there are costs of the server environment that needs to be set-up, but these costs are shared with all advisors and service engineers that need to be scheduled. Because these costs are already accounted for and cannot be taken back, they are not taken into account.

6.3.2 i-Planning

To determine the costs of i-Planning, contact has been made with Clixz, the partner of Intelly Planning. They made an implementation plan and showed which steps are implemented during phase 1 and phase 2 and how much time this would costs. The costs associated with this are also given.

For the implementation of the system, an estimation of 11 days is given. This includes the installation of the system, tests, training, and aftercare. For this consultancy, an hourly tariff of €100 is used.

Table 5 Investment costs of i-Planning

Consultancy	Price excl btw	Total price incl btw
Functional and technical consultancy	€100 p/h	€10,648
Travel expenses	€0.27 p/km	€1,466
Total		€12,114

These expenses are charged only once. The use of the system must also be considered and should be compared to the costs of Visitour. The costs for the use of the i-Planning are €20 per employee per month. With the employees, the schedulers and the advisors are meant. There currently are five advisors and six planners.

Table 6 Yearly costs of i-Planning

Software	Costs per employee	Price per year
Web based plan board	€20	€2640
Total per year		€2640

6.3.3 Comparison of the costs

To be able to compare these costs, the benefits of the system must be considered as well. A comparison is made between the current way of scheduling in Visitour, automatic scheduling in Visitour, and scheduling using i-Planning. The extra time that comes free when automatic scheduling and i-Planning are used, and the extra appointments that can be scheduled are considered.

On average, 541 appointments have been scheduled with automatic scheduling in half a year, and 336 with manual scheduling. This is based on the data from the past five years (appendix 6a). The number of appointments scheduled with i-Planning is assumed to be equal to the number of appointments scheduled with automatic scheduling of Visitour. With manual scheduling in Visitour, 6% of the workflows must be re-started (section 4.1.7), the extra time spent on this is considered as well. A part

of the workflow failure will not disappear for automatic scheduling, since the problems of Navision are not researched in this thesis. Therefore, a 3% failure rate is assumed for automatic scheduling in Visitour. For the i-Planning, 0% failure rate is used in the calculations.

Table 7 Comparison of scheduling costs

	Manual scheduling Visitour	Automatic scheduling Visitour	i-Planning
Appointments per year	672	1082	1082
Workflow failure	712	1114	1082
Time taken to schedule one appointment	161 seconds (appendix 5)	60 seconds	30 seconds
Total time spend on scheduling per year	31.8 hours 0.80 working weeks	18.6 hours 0.47 working weeks	9.0 hours 0.225 working weeks
Cost of scheduling*	€685	€402	€193

*For the personnel costs, a salary of €2741 per month, so €685 per week is assumed (Salarissen voor Planner (m/v) in Nederland, 2020) and 25% extra costs for the employer (Dit zijn de kosten van personeel, 2020).

As can be seen in table 7, more appointments can be scheduled using automatic scheduling. Since no information is known about the yield of an appointment and the chance of selling a product, no further can be drawn based upon this information. However, the chance is likely that more appointments will result in more sales.

To determine which scheduling program is more beneficial to use for the scheduling of the advisors, the yearly costs are compared. The costs of the license per advisor for Visitour are left out since they are sunk costs.

Table 8 Total yearly costs

	Visitour manual	Visitour automatic	i-Planning
Software costs	€720	€720	€2640
Scheduling costs	€685	€402	€193
Total	€1405	€1122	€2833

6.3.4 What is the best solution of the given options?

When looking at the total yearly costs of both Visitour and i-Planning, it can be concluded that Visitours costs are a lot lower than the costs of i-Planning. Even when considering the benefits of the faster method of scheduling, these benefits will not make up for the extra costs. What must be considered as well is the extra yield of the extra appointments and the extra time that the planners can spend on other duties. Since no further research is done about the extra possible benefits of these duties, no conclusions can be drawn about this.

To make the i-Planning more attractive for Geas, the number of planners must be revised. Scheduling five advisors with six planners might be a bit too much, especially when the costs are €240 per year per employee. The personnel costs of the i-Planning are a lot lower than the costs of Visitour because

of the efficient workflow. The costs of the software are however too high to transfer with the current circumstances.

During the interviewees became clear that the planners are willing to transfer to another program if this can reduce the time to schedule and malfunctioning of the workflow. Interviewee 1 mentioned that if a scheduling program can be used without an intermediate step of Navision, that this would be ideal, since the step with Navision causes the most delays. By making a transfer to i-Planning, there is no workflow in Navision and Navision is only used for customer data and for fixing the order. This is an advantage of i-Planning and will increase employee satisfaction. This satisfaction will also increase, because the scheduling process will become easier. Instead of the current 30 clicks, only 8 are needed with i-Planning.

6.4 Conclusion

In this chapter, the options for improvement are listed. First, the changes that can be made in Visitour to improve the process of scheduling are investigated. The changes that can be made in the settings are listed and some further research that must be done is explained. Next to the options within Visitour, other providers of scheduling software have been researched. After talking to Kemkens and looking at the other scheduling software, the conclusion was drawn that Intelly Planning offers the best functionalities for Geas. They don't need Navision as an intermediate step for scheduling, which is convenient for the speed of the process and the scheduling becomes easier. Because the process can be compared to the process at Kemkens, the assurance is given that implementation is possible and will function.

After a cost benefit analysis has been made, the conclusion is drawn that the software costs of i-Planning are much higher than the costs of Visitour. Besides the investment of installing the software, the costs per year are also considered. Since there are five advisors and six planners, the yearly costs are more than 2.5 times as high as using Visitour. When less planners need a license to schedule and the extra time that arises can result in extra turnover, then the transfer to i-Planning can be considered. As long as the same number of employees need the license, Visitour is the better alternative, especially when the automatic scheduling function is implemented successfully and the workflow functions well.

7. Conclusion and recommendations

This research was focused on the improvement of the scheduling process of the advisors at Geas Energiewacht. The problems that emerge during the process are researched and mapped to get a clear overview of the bottlenecks of the process. Then, the current process of fixing an appointment was fully mapped, and the design and settings of Visitour have been researched, after which the possibilities for improvement have been investigated. In this chapter the research is concluded, and recommendations are given about the improvement of the process.

7.1 Conclusion

During the research to the problems that are encountered by the employees involved in the process, it became clear that they are not satisfied about the efficiency of the scheduling process. It takes 2.5 minutes to schedule an advisor, whereas under one minute is possible for this, and the workflow does not always get activated or an appointment does not appear in Visitour (section 5.1.7). The planners wish to use the automatic scheduling function again, but the advisors had the idea that they had to drive extra kilometers and an inefficient route was made during the time this automatic scheduling was used before.

During the mapping of the current settings in Visitour became clear that this was not updated regularly, and that the notification types were inconsistently set. Because the automatic scheduling function will reduce the time it takes to schedule an advisor and the problem of an appointment not appearing in Visitour is likely to be solved, the aim of this research was to implement this function again once the problems became clear. Before researching how this automatic scheduling could be implemented, the kilometers driven by the advisors have been investigated (section 5.3) and the logfiles of orders (section 5.4) to see where mistakes emerged. Based on the analysis of these two factors can be concluded that the automatic scheduling function can be used again. There are, however, some adjustments that need to be made for a successful implementation.

First, during the analysis of the kilometers driven by the advisors became clear that they indeed had to ride more kilometers on a day. This was caused however, by the extra appointments that could be scheduled because of the efficient planning made by Visitour. The advisors must be made aware of the extra appointments that are scheduled to understand where the extra kilometers come from. Also, when the routes are not logical according to the advisors, the settings of the costs might be adjusted to meet their wishes.

To adjust these costs according to the wishes of the advisor, one employee must be assigned to control the architecture of the scheduling process completely. There is not one employee who has read Visitours manual and fully understands the settings and ins and outs. When there is one employee responsible for this process, the design can be worked out fully and the correct method of scheduling will be determined. Once this is done, the basis of the settings will be correct and only small interference is needed every now and then. The skills and working hours should also be updated regularly by this person.

During the investigation of the second logfile in section 5.4, could be seen that human errors were made. The inside staff must be made aware of the changes that are made in the scheduling process and the ways to handle information. When they all use the same steps during the scheduling, mistakes in the system can be detected easier. Currently, the system is sometimes blamed in cases where a human error may have been made.

Even with all the changes in the program, the process will not work flawlessly yet. When the settings of Visitour are updated correctly, the functioning of the process must be closely monitored. When the same problems keep emerging, the conclusion can be drawn that the settings of Visitour are not the cause of these problems. The causes that then remain are the link between the three systems Clixz, Navision and Visitour or that something is asked of Visitour that it cannot offer.

In that case, Geas should look for other providers. The most beneficial scheduling software that has been investigated is Intelly Planning. Because this software has already been implemented at Kemkens, this scheduling module is assured to function well. The i-Planning works via Clixz, and Navision does not have to be used as an intermediate step. Therefore, an appointment can be scheduled within half a minute and uses a maximum of eight clicks. The software comes with suggestions for an appointment and is then immediately visible in i-Planning, FMS, and Navision. The cost of this scheduling software is, however, much higher than the costs of Visitour. The high yearly costs can be reduced by reducing the number of employees that need a license, but as long as Visitour functions good enough, i-Planning will not be beneficial.

7.2 Recommendations

A recommendation that is given to the department Commerce is to make sure that the settings of Visitour are correct and updated. This is not too much work and will make it possible for the automatic scheduling function to be used again. The advisors and planners must be made aware of the consequences this will have for their way of working and how to deal with this new method. After implementation, the performance of the process must be monitored closely by looking critically at the problems that will emerge. These problems must be tried to trace back to either Navision or Visitour. When problems keep emerging that involve Visitour, the problems need to be presented to Visitour or a switch to Intelly Planning must be considered seriously. The program has the same offer as Visitour but works faster and has been shown to function well in the setting of scheduling advisors.

Because of the current integration between EW, EWG and Geas, any optimization in software has been put on hold, a so called “freeze” has been introduced. They have chosen to first look at the implementation before looking at improvement. It will therefore be only for the longer term to start the further investigation on how this process can be improved. Since other departments are able to successfully schedule with Visitour, my recommendation for Geas is to first assign someone to fully investigate the workflow of Navision, the cost structure in Visitour and other settings that are used in this process. When after thorough investigation, no improvements can be made, the transfer to i-Planning can be made. However, the number of licenses needed must be decreased to make this process somewhat beneficial. The higher costs of i-Planning must be compensated for with turnover yielding duties during the time that is won with the new method of scheduling.

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8. Reflection on thesis

In this chapter, a personal reflection will be given on the research and writing of this thesis. This includes both the preparation of the thesis and the execution of the project.

During the preparation of the thesis, I had the feeling that everything went quite well. Even though I was not able to work from the office due to Covid-19, I still had a clear idea on what I had to write and what the research was about. It was therefore quite easy to write down what the idea was of the research. The most difficult part was to fit everything into the guidelines of the university. Since my research also involved the determining of the problems, it was difficult to fit my research in the MPSM-cycle (Heerkens & van Winden, 2017). This cycle assumes that the problem is already clear. I therefore went looking for another problem-solving approach, which was more focused on investigating the problem. This really helped to write down the steps I would be executing during the research. Looking back at this, I would start by looking at which problem-solving approach is really fitting with a problem during a next research, to prevent having to re-write this part.

When the preparation of the thesis was finalized and approved, the research could start. To discus the project plan and see what the next steps were, the document had been shared with the supervisors from Geas. When the document was shared, it took another 2.5 weeks before this could be discussed. During this time, some steps were made like the preparation of the interviews and making a start on the literature study. This was however a long time in which the research came to a halt. After the meeting, the interviews were planned, and more information was gathered for the next steps of the research. After the processing of the information, another meeting was scheduled to discuss the information and look at the next steps again. This, however, took another three weeks before an appointment could be scheduled. Because there was a lot of time between the appointments, a lot of conclusions were drawn by me and not really in consultation with Geas. When these conclusions were discussed during the meeting, it did not seem to be a problem, so this worked out well. It would have been better however, if more details could have been discussed. Even though the initiative for the meetings and questions all came from my side, pushing the meetings more might have led to sooner responses. However, I believe I am not fully to blame for this, since I constantly tried to keep in contact. The supervisors of Geas were only available together on Tuesday, which made the options for the planning of a meeting limited. When a meeting was finally scheduled and accepted, one of the supervisors could not attend or the document that I had send had not been reviewed yet. It was therefore difficult to get the right information because they were not aware of what I needed.

When contact had been made with Visitour, they mentioned that a consultancy meeting with them would cost some money. Because of a limited budget and lack of priority of this process, the idea came up to combine the meeting with the head of IT and quality. He is investigating a similar problem. Before setting up a meeting with Visitour, a meeting had been planned with the head of IT and quality to discuss the problem at hand. During the meeting he gave information that had not been given by the supervisors and mentioned things about the analysis that were helpful. He steered me to a certain direction that gave a lot of information about the current way of scheduling. If I knew sooner that this information would have been useful, a broader analysis of the performance could have been done. This means that during the preparation of the thesis, I should have looked more on how the analysis could be performed instead of focusing on investigating what the problem is. This was, however, quite difficult, because a plan for an analysis without knowing what the problem is, is nearly impossible. This made the research unpredictable. If the research of the problem had been completed earlier in the research, the performance analysis could have been extended more.

Because the analysis phase had not yet been determined because the problems were not clear yet, these steps sort of evolved throughout the research phase. It was therefore difficult to determine what the next steps of the research would be. During a meeting we could only discuss the direct next steps and not really a long-term plan was discussed. The progress of the research therefore depended a lot on meetings with people involved, but it was not always easy to schedule an appointment.

During the start of the research, the integration of EW, EWG and Geas started to develop and more decisions became public. In one the mails was announced that Visitour was one of the programs used as a starting point for the integration. This meant that this research was really conducted for the long term, for when the integration had been finalized and priority was given to the optimization of software again. My motivation kind of dropped after this announcement, because I knew I would not see the results of this research in practice. However, in recent discussions of the integrated company, the i-Planning software has been discussed, a proposal will be made to use i-Planning as a scheduling software. It is great to see how this research can add something to the further development of this process.

Appendix

Appendix 1: research designs

Table 9 An overview of the research designs

		Research question	Research type	Data gathering method	Data processing
1.		**How is the current scheduling process of advisors working?**			
	1.1	**What is said in literature about dynamic scheduling using ERP?**	Exploratory	Secondary data, literature study	Qualitative
	1.2	**How does the literature compare to the scheduling behavior of Geas?**	Explanatory	Primary data, observation	Qualitative
	1.3	**What is the current architecture of the system?**	Exploratory	Primary data, observation	Qualitative
2.		**What is the performance of the current scheduling process of advisors?**			
	2.1	**How do employees experience the scheduling process?**	Descriptive, exploratory	Interview	Qualitative
	2.2	**How much time does scheduling take?**	Descriptive	Observation	Quantitative
	2.3	**How many kilometers are driven?**	Descriptive	Primary data	Quantitative
	2.4	**What happens in Visitour when an appointment gets scheduled?**	Descriptive	Primary data	Qualitative
3.		**How can the process of scheduling advisors be improved?**			
	3.1	**What options are there for the improvement within Visitour?**	Descriptive	Analysis, primary data, secondary data, interview	Qualitative
	3.2	**Which scheduling systems other than Visitour can be considered?**	Descriptive	Secondary data	Qualitative
	3.3	**What are the costs and benefits of the options?**	Descriptive	Primary data, secondary data	Qualitative, quantitative
	3.4	**What is the best solution of the given options?**	Descriptive	Comparative research	Qualitative

Appendix 2: organization scheme

In the scheme below, the current organization structure (June 2020) can be found.

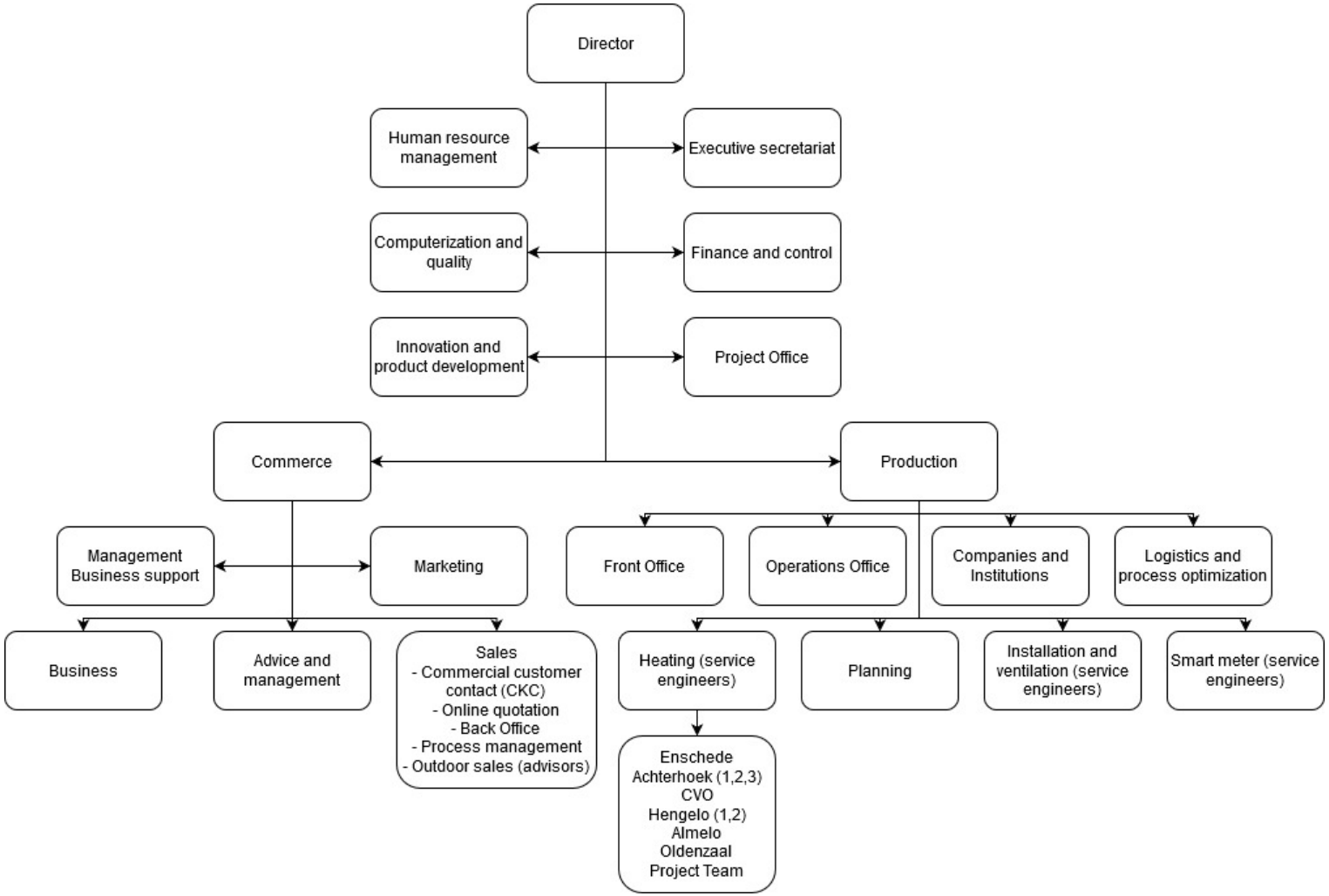


Figure 11 Organization scheme of Geas

Appendix 3: user interface Visitour

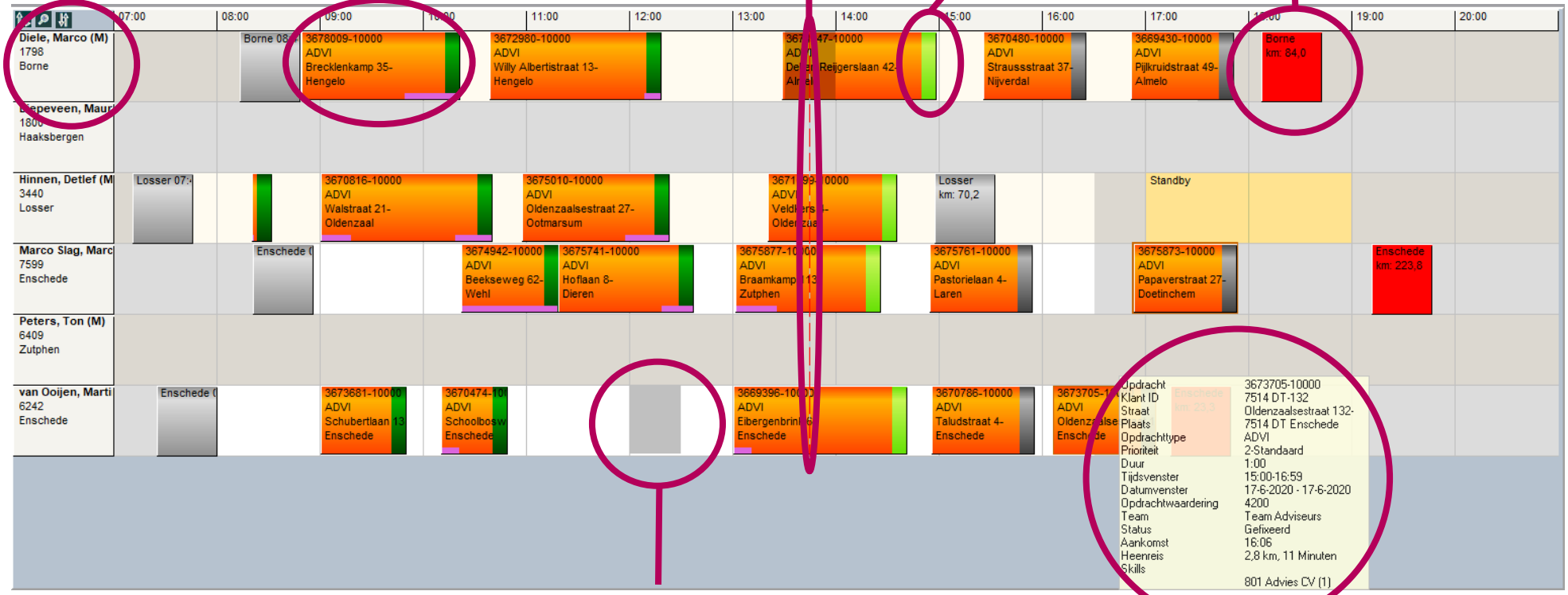
Explanation 5 Name, personnel nr. and location of advisor

Explanation 4 Appointment, with type of appointment and address

Explanation 3 Current time

Explanation 2 Status of appointment (dark green: realized, light green: arrival, grey: fixed)

Explanation 1 Ending location and amount of km



Explanation 7 Break

Figure 12 User interface Visitour

Explanation 6 Specific information about the appointment (becomes visible with cursor)

Appendix 4: flowchart plan process

In the figure below, the scheduling process of the advisor is visualized. Activities with a hand in the upper left corner are manual steps.

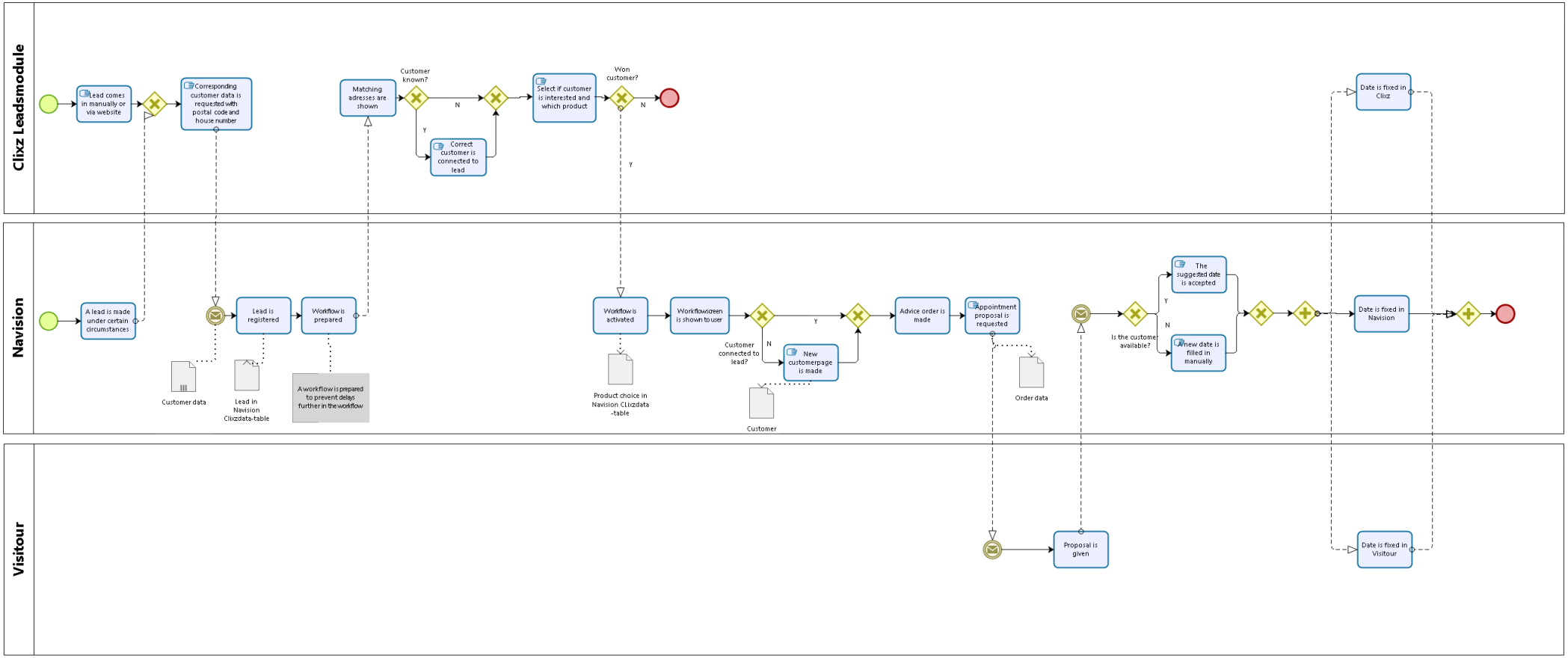
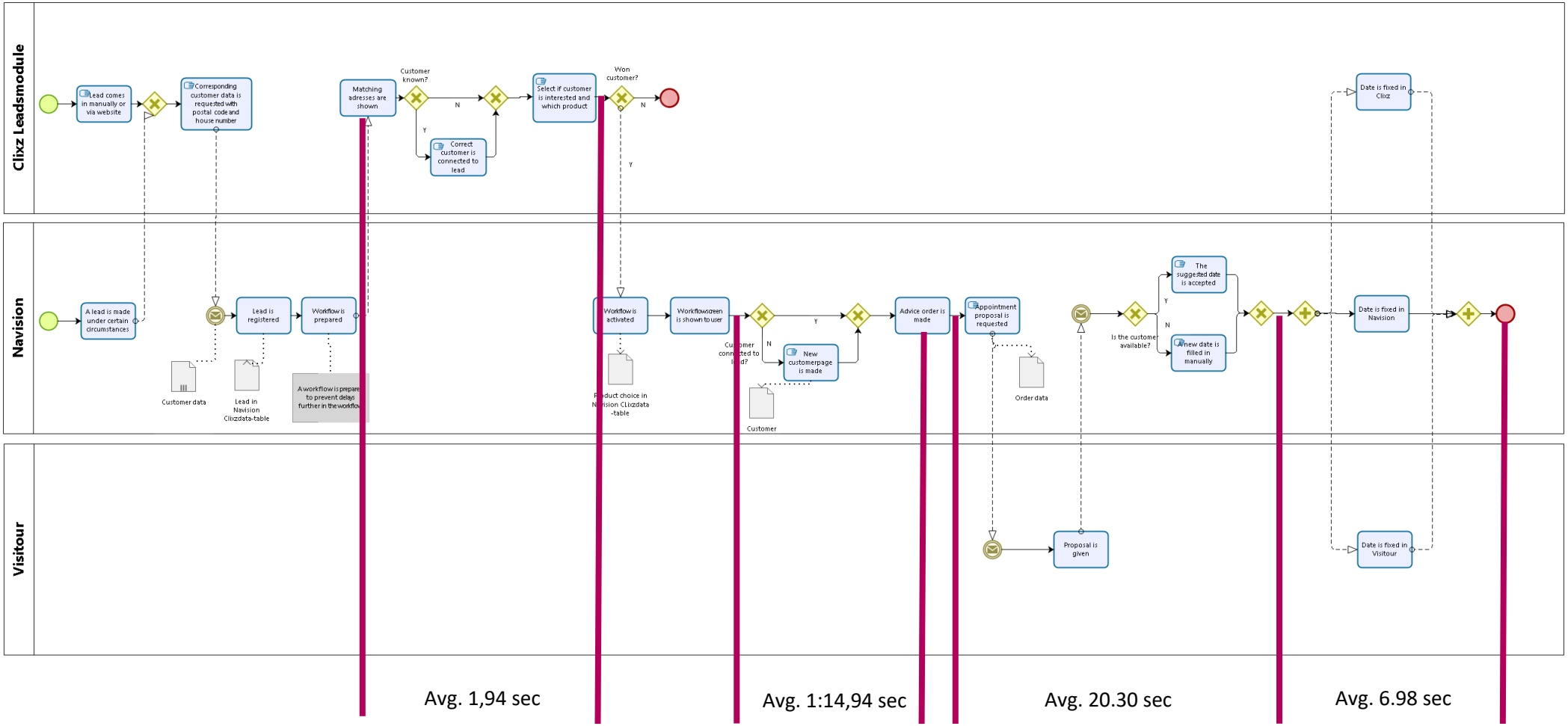


Figure 13 Flowchart of scheduling process

Appendix 5: flowchart with times



Appendix 6: significance of kilometers driven

In this table the significance of the appointments and kilometers driven are displayed.

	Number of appointments	**Trips**	**Appointments per trip**	**Kilometers per appointment**
H_0:	$\mu_{automatic} > \mu_{manual}$	$\mu_{automatic} > \mu_{manual}$	$\mu_{automatic} > \mu_{manual}$	$\mu_{automatic} > \mu_{manual}$
$\mu_{automatic}$	541.2	110.4	4.9	24.3
μ_{manual}	335.7	85.0	3.9	23.1
$\sigma_{automatic}$	53.8	9.4	0.3	1.2
σ_{manual}	57.0	9.6	0.3	1.7
$N_{automatic}$	5	5	5	5
N_{manual}	4	4	5	5
T-test	5.5	4.0	6.0	1.3
P-value	<0.001	<0.01	<0.001	>0.10
Significant yes/no	Yes	Yes	Yes	No

Appendix 7: skills and working hours

Appendix 7a: current skills and working hours

In these tables the skills and working hours of the advisors, as registered in Visitour and Navision are displayed.

	CV	ISO	LV	VENT	ZON	ZONCV	WP	CVKEUR
Marco Diele	X		X	X	X	X		
Maurice Diepeveen	X			X	X	X		
Detlef Hinnen	X		X	X	X	X		X
Martin van Ooijen	X	X		X	X	X		X
Ton Peters	X	X	X	X	X	X	X	X
Marco Slag								

Advisor	Working hours
Marco Diele	Mon: 9:04-14:30 Tue: 8:30-17:30 Wed: 8:30-17:30 Thu: 8:30-20:00 Fr: 8:30-17:30
Maurice Diepeveen	Mon: 8:00-17:30 Tue: 8:00-17:30 Wed: - Thu: 8:00-17:30 Fr: 8:00-17:30
Detlef Hinnen	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30
Martin van Ooijen	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30
Ton Peters	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30
Marco Slag	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30

Appendix 7b: new skills and working hours

The skills and working hours as registered in Navision are not accurate anymore. Therefore, the new skills and working hours are listed in the tables below. The columns of ISO and CVKEUR are red, because Geas does not offer these services anymore.

	CV	ISO	LV	VENT	ZON	ZONCV	WP	CVKEUR	AIRCO
Marco Diele	X		X	X	X	X	X		X
Maurice Diepeveen	X		X	X	X	X	X		
Detlef Hinnen	X		X	X	X	X	X		X
Martin van Ooijen	X		X	X	X	X	X		X
Ton Peters	X		X	X	X	X	X		X
Marco Slag	X		X	X	X	X			X

Advisor	Working hours
Marco Diele	Mon: 9:04-14:30 Tue: 8:30-17:30 Wed: 8:30-17:30 Thu: 8:30-20:00 Fr: 8:30-17:30
Maurice Diepeveen	Mon: 8:00-17:30 Tue: 8:00-17:30 Wed: - Thu: - Fr: -
Detlef Hinnen	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30
Martin van Ooijen	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30
Ton Peters	-
Marco Slag	Mon: 8:00-16:30 Tue: 8:00-16:30 Wed: 8:00-16:30 Thu: 8:00-16:30 Fr: 8:00-16:30

Appendix 8: notification types

Appendix 8a: current notification types

Code	Object template	Object type	Skills (service code) "Bekwaamheden"	Skills (Type) "Aanpassingen"	Standard times ADVI
03A CV-KETEL	MC1735	CVHC	-	ADVI-CV (resource group ADV)	60,00 minutes
03B ISOLATIE	MC2558	DNST	ADVI-EPA (E-CHECK)	ADVI-ISO (resource group ADV)	60,00 minutes
03C KOELING	-	MK1	-	-	-
03D GEISER	MC1127	GVEN	LL ONDERHOUD (FILT, GROH, KLOH, MDOH) LL STORING (STOR)	- (resource group MRO)	60,00 minutes
03E WARMTEPOMP	MC2063	WPOM	WARMTEPOMP LUCHT (AANM, GROH, SCHOUW, STOR)	- (research group ADV)	60,00 minutes
03F WTW	MC2656	WTWU	INSTALLATIE (IWRK) STORING (STOR)	-	60,00 minutes
03G ZONNEBOILER	MC2662	BZON	ONDERHOUD (GROH, KLOH)	ADVI-CV (resource group ADV)	60,00 minutes
03H STADVERWARMING	-	WWSV	-	-	-
03I LUCHTVERWARMING	MC1128	CVLU	-	-	60,00 minutes
03J BOILER	MC2261	BEN1	-	- (resource group MRO)	60,00 minutes
03K ZON	MC2683		-	ADVI-ZON (research group ADV)	
03L ZON+CV	MC1735	CVHC	-	ADVI-CV (resource group ADV)	60,00 minutes
03M GASHAARD	MC0767	GHRD	LL ONDERHOUD (FILT, GROH, KLOH, MDOH) LL STORING (STOR)	- (resource group MRO)	60,00 minutes
03N AIRCO	MC2695	AIRS	AIRCO (AANM, ADVI, GROH, INSTAL, REGIE, SCHOUW, STOR)	ADVI-CV (research group ADV)	60,00 minutes

Appendix 8b: new notification types

Only the relevant advice notification types are shown in this table.

Code	Object template	Object type	Skills (service code) "Bekwaamheden"	Skills (Type) "Aanpassingen"	Standard times ADVI
03A CV-KETEL	MC1735	CVHC	-	ADVI-CV (resource group ADV)	60,00 minutes
03E WARMTEPOMP	MC2063	WPOM	WARMTEPOMP LUCHT (AANM, GROH, SCHOUW, STOR)	- (resource group ADV)	60,00 minutes
03G ZONNEBOILER	MC2662	BZON	ONDERHOUD (GROH, KLOH)	ADVI-CV (resource group ADV)	60,00 minutes
03K ZON	MC2683		-	ADVI-ZON (resource group ADV)	75,00 minutes
03L ZON+CV	MC1735	CVHC	-	ADVI-CV (resource group ADV)	90,00 minutes
03N AIRCO	MC2695	AIRS	AIRCO (AANM, ADVI, GROH, INSTAL, REGIE, SCHOUW, STOR)	ADVI-CV (resource group ADV)	60,00 minutes

Appendix 9: interview schemes

For the interviews, a semi-structured interview is used. This means that the questions are determined beforehand, but the order is not pre-determined and there is room for follow-up questions (Baarda & van der Hulst, 2017). This form of an interview is used to make sure that the all the topics are discussed, and extra information can be asked in an order that feels logical and natural during the interview. There are multiple starting questions, after which the specific information will be discussed in a free order. If during the interview a certain order of starting questions is more logical than how they are sorted on the interview scheme, it is possible to deviate from this scheme. By using follow-up questions, the information that the interviewee gives is relevant for the central question, valid, clear, and complete.

When doing research in the form of an interview, am interview scheme is drafted. The components of an interview scheme are globally as follows (Baarda & van der Hulst, 2017):

- The introduction: during this section is explained who you are and why the interview is conducted. What will also be mentioned is how the confidentiality is treated, what will happen with the results and the duration of the interview. Always ask if there are any questions about the interview before you start.
- The starting question: you want to start with a starting question to get a lot of information about one topic from the interviewee. Always ask an open question, which can be answered broadly (e.g. what do you think of…, can you tell something about…, how do you experience…).
- A topic list: make a list of all the (sub)topics you want to discuss during the interview. By doing so, no topic will be forgotten. A good division should be made here to divide the main topics from the subtopics, so the interviewer knows which questions need to be answered and which will help to do so. A new topic should be introduced with a starting question. Before starting with the substantive question, neutral structured questions can be asked about personal data.
- The closing: thank the interviewee for its contribution to the research and ask if there are any questions left. Explain once again what will happen to the gathered data and make an agreement about when the results will be shared with the interviewee.

The employees who will be interviewed during the research have different functions; an employee of the Front and Back Office and an advisor will be interviewed. Interview schemes were drafted for the interviews. The interviews will be conducted in Dutch.

Introduction

Ik ben Dorte Rotteveel en zit op dit moment in mijn derde jaar van de studie Technische Bedrijfskunde aan de Universiteit van Twente. Om de bachelor af te kunnen ronden, voeren wij een onderzoek uit bij een bedrijf om hier een proces te verbeteren. Dat doe ik hier bij Geas Energiewacht en onderzoek het inplannen van adviseurs met Visitour. Het doel van dit interview is om erachter te komen hoe medewerkers werken met het programma en wat de voor- en nadelen zijn die zij hiermee ervaren. Het interview zal ongeveer een uur duren. Met de interviews kan een duidelijk overzicht gemaakt worden van de dingen die verbeterd kunnen worden en welke voordelen we juist moeten behouden.

I am Dorte Rotteveel and am currently in my third year of the study Industrial Engineering and Management at the University of Twente. To finish a bachelor, we must conduct research at a company to improve a certain process. I am doing this research at Geas Energiewacht and am investigating the planning of advisors in Visitour. The goal of this interview is to research how employees are working with the program and which advantages and disadvantages are experience by them. The interview will take around an hour. An overview of the things that can be improved will be made with the information gathered from the interviews and which advantages should be remained.

Ik neem graag het gesprek wat wij hebben op, zodat ik achteraf gebruik kan maken van de opnames en transcripties voor het onderzoek. De namen zullen niet bij de opnames worden vermeld en de opnames zelf worden verwijderd naar de transcriptie. Met de informatie wordt vertrouwelijk omgegaan en zal niet herleidbaar zijn naar jou. Heb je hier bezwaar tegen?

I would like to record the conversation we will have, so I use the recordings and transcripts for the research. Names will be not be mentioned and the recording itself will be removed after transcription. The data will be handled confidential. Do you have any objections to this?

Heb je hier nog vragen over of is er iets onduidelijk?

Do you have any questions beforehand or is something unclear?

Personal questions:

1. Kan je wat vertellen over werken bij Geas? (beginvraag)
   Can you tell something about working at Geas? (starting question)
2. Wat is je functie binnen Geas?
   What is your function at Geas?
3. Hoe ervaar je het werken bij Geas qua werkzaamheden en sfeer?
   What are your experiences of working at Geas with regard to duties and atmosphere?
   a. Wat vind je het leukste aan je werk?
      What do you enjoy most about your job?

CKC

Huidige planproces

4. Kan je wat vertellen over je werkzaamheden met Visitour? (beginvraag)
   Can you tell something about working with Visitour? (starting question)
5. Wat zijn de voordelen van werken met Visitour?
   What are the advantages of working with Visitour?
   a. En wat de nadelen?
      And what are the disadvantages?
6. Wat vind je van het gebruik van Visitour ten opzichte van Outlook, wat voorheen werd gebruikt?
   What do you think of the use of Visitour instead of Outlook, which was used previously?
   a. Kom je nu stappen tegen die je handmatig uit moet voeren die automatisch gedaan zouden moeten of kunnen worden?
      Do you encounter steps that you have to do manually, which could be or should be automated?
7. Welke problemen kom je tegen tijdens het inplannen?
   Which problem do you encounter during the planning?
   a. Tijdens welke stappen kom je deze problemen tegen?
      During which steps do you encounter these problems?
   b. Worden jouw andere werkzaamheden hierdoor belemmerd?
      Are your other duties disturbed because of this?
   c. Mis je informatie of mogelijkheden voor een handeling?
      Do you miss information or possibilities for certain actions?

Optimale planproces

8. Wanneer zou je volledig tevreden zijn met inplannen? (beginvraag)
   When would you be completely satisfied with planning? (starting question)
9. Aan welke voorwaarden moet Visitour voldoen om je werk optimaal uit te kunnen voeren?
   Which requirements should Visitour meet for you to perform your job optimally?
10. Hoe sta je tegenover het invoeren van een ander planprogramma?
    How do you feel about implementing another planning program?
    a. Aan welke voorwaarden moet dit programma dan voldoen?
       Which requirements should this program meet?
    b. Welke toevoegingen zou een ander programma kunnen bieden volgens jou?
       Which additions could another plan program offer according to you?

Advisors

Huidige planproces

1. Wat zijn de voordelen van werken met Visitour? (beginvraag)
   What are the advantages of working with Visitour? (starting question)
2. Ben je tevreden met de manier waarop je ingepland wordt?
   Are you satisfied with the way you are currently planned?
3. Wat vind je van het gebruik van Visitour ten opzichte van Outlook, wat voorheen werd gebruikt?
   What do you think of the use of Visitour instead of Outlook, which was used previously?
   a. Kom je nu stappen tegen die je handmatig uit moet voeren die automatisch gedaan zouden moeten of kunnen worden?
      Do you encounter steps that you have to do manually, which could be or should be automated?
4. Wat zijn de zwakste punten van de huidige manier van plannen?
   What are the weakest points of the current method of planning?

Optimale planproces

5. Wanneer zou je volledig tevreden zijn met inplannen? (beginvraag)
   When would you be completely satisfied with planning? (starting question)
6. Je noemde X als zwak punt, heb je zelf ideeën hoe dit verbeterd zou kunnen worden?
   You mentioned X as a weak point, do you have an idea on how to improve this?
7. Aan welke voorwaarden moet Visitour voldoen om je werk optimaal uit te kunnen voeren?
   Which requirements should Visitour meet for you to perform your job optimally?
8. Hoe sta je tegenover het invoeren van een ander planprogramma?
   How do you feel about implementing another planning program?
   a. Aan welke voorwaarden moet dit programma dan voldoen?
      Which requirements should this program meet?

Closing

Zijn er verder nog punten die je wilt benadrukken of benoemen wat betreft het interview?

Is there anything else you want to emphasize or appoint as regards to the interview?

Ik wil je heel erg bedanken voor je bijdrage aan mijn onderzoek. Dankzij de antwoorden die je mij hebt gegeven kan ik de problemen en mogelijkheden van Visitour in kaart brengen. Mocht ik nog verdere vragen hebben achteraf, zou ik dan contact met je op mogen nemen?

I want to thank you for your contribution to my research. Thanks to the answers you have given me I can map the problems and possibilities of Visitour. If I encounter any questions afterwards, could I contact you?

Als laatste wil ik nog even benadrukken dat er vertrouwelijk wordt omgegaan met de informatie en dat dit volledig anoniem verwerkt zal worden. Zou je het interessant vinden om achteraf de resultaten te ontvangen?

Last, I want to emphasize that the information will be handled confidential and that it will be processed anonymously. Would you find it interesting if the results will be shared with you afterwards?

Appendix 10: transcripts

The form of transcription that is used is an intelligent verbatim transcription. This means that the transcripts are error-free and easy-to-read because grammatical errors, fillers (ums, uhs etc.), non-verbal communication and ambient sounds are not included. The transcript might have some minor paraphrasing or detailed editing to make a ready-to-print transcript (4 Rules of Verbatim Transcription, 2018).

Since the interview was conducted in Dutch, the transcripts will also be in Dutch. By doing so, the interviewee could speak more freely without a language barrier and the transcripts will be without mistranslation of the interview. Not relevant topics were removed from the transcript and are noted as […].

Appendix 10a: transcript 1

Interview 1	
Interviewee	Employee CKC, I1 in the transcript
Interviewer	Dorte Rotteveel, DR in the transcript
Date and time	12-5-2020 10:00
Duration of the interview	32:59
Location	Microsoft Teams

Time	Who	What
03:00	DR	Kan je me wat vertellen over hoe je het ervaart om op dit moment te werken bij Geas? Of nou ja, misschien niet op dit moment, maar meer tijdens de normale omstandigheden.
03:29	I1	Voor de Corona-tijd bedoel je. Ik zit hier al een tijdje natuurlijk, alleen ik moet wel zeggen nadat we het nieuwe systeem hebben gekregen zoals Clixz, Navision, Visitour toen dat allemaal vernieuwd is, dat was in 2019, begin januari dat alles vernieuwd is, toen is het wel allemaal minder efficiënt gaan werken allemaal. Eerst hadden we twee systemen waarmee we moesten plannen, dat zijn er nou drie, Clixz zit er nu tussen. Alleen het werkt niet efficiënt. We doen ons werk prima en dat kan ook allemaal wel, maar het werkt niet optimaal. En verder is de werksfeer wel allemaal goed, ik zit nu wel weer op kantoor, dat is wel weer leuk een keer.
04:32	DR	Want kan je me precies vertellen wat je functie is? Wat zijn de werkzaamheden waar je je mee bezig houdt?
04:40	I1	Ik houd me natuurlijk met van alles bezig, maar CKC is het meeste advies uitbellen, dus leads bellen om een adviseur in te plannen, advies geven over een ketel en adviseurs inschakelen of iets in die richting. En verder bellen wij klanten na aan het einde van een leasecontract van 12,5 of 15 jaar. Oude ketels na 15 jaar bellen wij na, met de vraag van: “u heeft een oude ketel, moet u die niet eens vervangen?”. Daarnaast doe ik nog contractbeheer, daar weet je zelf ook alles vanaf natuurlijk, dat is chaos op dit moment met de invullijsten en het verwerken van contracten en de mailbox loopt vol. En dan doe ik ook nog verhuur, afkoopsommen berekenen, afkoopfacturen, overnames dat zit er ook nog bij in. Dus dat is nog wel wat. De functie is eigenlijk verkoop en alles wat met verkoop te maken heeft.
05:50	DR	Kom je daar dan ook allemaal aan toe met de huidige omstandigheden?
06:00	I1	Op dit moment doe ik CKC, prioriteit is vooral CKC. Maar ja, contractbeheer loopt ook weer op. Kijk, met CKC verdienen we geld, maar met de invullijsten van contractbeheer voer ik nieuwe contracten in, daarmee verdienen we ook geld.

[…]

06:53	DR	Want alle werkzaamheden die je doet wat betreft CKC, daarbij gebruik je altijd Visitour?
07:05	I1	Ja, eigenlijk alles wat betreft de planning van de adviseurs is allemaal met Visitour. Als ze ergens een afspraak hebben, of achteraf nog een keertje langs moeten komen, dat gaat eigenlijk allemaal via Visitour.
07:20	DR	Dus dat is dan wel een van de voornaamste programma's waar je mee werkt?
07:28	I1	Je hebt natuurlijk Clixz, Navision en Visitour. Nu is Navision gewoon een tussenstap. Ik verwerk het in Clixz, dan komt het via Navision in Visitour terecht. En Visitour is natuurlijk wel leidend voor waar de adviseur dan heen gaat. Kijk, als daar iets niet goed in staat dan is de adviseur ook niet op de goede plek.
08:04	DR	Hiervoor werd volgens mij gebruik gemaakt van Outlook om de adviseurs in te plannen. Wat vind jij echt een voordeel van het gebruik van Visitour ten opzichte van Outlook?
08:13	I1	Nou, met Visitour kun je als je op een bon klikt ook zien waar de adviseur een beetje heen moet. Dus als je bon 1, 2, 3, 4, 5 hebt kan je zien waar hij eerst heen gaat en waar hij daarna naartoe moet. Dus je krijgt een soort Google Maps kaartje, dus dan kan je ook nog zien of de route een beetje logisch is. En in Outlook heb je dat niet. In outlook zet je alleen wat adresgegevens van de klant en dat is het eigenlijk.
08:50	DR	Dus zelfs als je geen kennis hebt van Enschede en omstreken kan je nog bepalen of de route optimaal is of niet.
09:02	I1	Ja, precies. Alleen het enige wat dan een beetje dom is aan Visitour is dat als je naar een adres moet hij de tijd rechttoe rechtaan aangeeft. Dus alleen de hemelsbreedte. Dan zegt hij dat het 10 minuten duurt, terwijl je er met de auto eigenlijk wel 20 minuten over doet.

[…]

09:50	DR	Kom je op dit moment stappen tegen in je werkzaamheden die je handmatig moet doen terwijl dat automatisch zou moeten kunnen?
10:00	I1	Wat Visitour eerst wel deed, was dat je een voorstel kreeg en daarmee kon je plannen. Dus in Navision kreeg je een voorstel van Visitour. Dus deze adviseur is op maandag beschikbaar tussen 12:45 en 13:45 bijvoorbeeld. Alleen we hebben nu weer vaste tijden, dus wel moeten tussen 13 en 14 plannen. En wat bij mist bij Visitour, is dat als ik een adviseur wil inplannen, hij niet meer weet bij welke adviseur hij dat moet inplannen. Het zou handiger zijn dat als ik een afspraak in moet plannen in de Achterhoek, en de agenda is helemaal leeg, dat hij iemand pakt die al in de Achterhoek is. En dat doet hij nu niet automatisch. Je moet alles handmatig slepen. Het enige wat Navision wel kan doen is dat je hem op een adviseur zet en dan komt hij ook wel bij die adviseur te staan. Maar het is allemaal handmatig, en wat er dan wel eens kan gebeuren is dat je een planning maakt waarbij je van Enschede naar Hengelo en weer naar Enschede gaat en daarna weer naar Almelo. En omdat je dat allemaal handmatig doet gaat dat nooit helemaal op de manier waarop je dat zou willen. Dus je kan niet zeggen we doen het toch in de middag als dat beter uitkomt, want je hebt 's ochtends al afgesproken met de klant. Het zou mooi zijn als hij gewoon met een voorstel komt, zonder dat ik tegen de klant hoeft te zeggen "morgen kan, maar eigenlijk is overmorgen handiger". Visitour moet gewoon met een voorstel komen dat overmorgen de best optie is.
11:48	DR	Want heb je daardoor het gevoel dat je vertraging oploopt tijdens het gesprek met de klant? Omdat je eerst moet kijken wat de mogelijkheden zijn?

11:57	I1	Ja, het hele systeem werkt sowieso niet efficiënt, Clixz, Navision, Visitour, drie systemen om een ding in te plannen werkt gewoon niet optimaal. In principe plan ik het in Navision en ondertussen moet ik tijdens het gesprek met de klant ook kijken in Visitour wat de beste plek is. En er is gewoon veel plek, maar de vraag is wat is de juiste planning. Dus het is dan wel handig als Visitour zegt, je kunt beter dit doen, want hier is hij al in de buurt. En dan is die route goed, En soms geeft hij die route al niet goed aan. Ook toen we het nog wel automatisch doen, daarom zijn we overgestapt op handmatig plannen. Kijk en ik ben er inmiddels aan gewend, maar als een nieuwe hier komt werken dan moet hij al die plekken meteen goed kennen. Wat waar dichtblij ligt en wat waar. En met Visitour wordt dat veel makkelijk omdat Visitour dan een voorstel doet wat de beste planning is.
13:24	DR	Krijg je tijdens het inplannen ook foutmeldingen? Of is het vooral dat er geen voorstellen worden gedaan?
13:34	I1	Als wij iets van zonnepanelen gaan inplannen, dan zet hij hem sowieso niet bij een adviseur en als we dat wel doen dan krijgen we de melding dat een adviseur hier geen skills voor heeft. En soms dan wil hij hem zelf gaan om plannen en dat is echt niet verstandig, want dan gooit hij de hele planning om terwijl je dat zelf niet hebt gedaan. En dan krijgen we natuurlijk op de kop op de zaak en van de adviseurs. Daarin werkt Visitour ook niet optimaal, maar Visitour wordt gewoon overal gebruikt voor de planning, dus dat is gewoon leidend voor de adviseurs. Dus als daar iets niet in klopt, dan is dat niet goed. En het gaat ook wel eens mis als een klant twee woningen heeft. Dus dan maak je in Navision een bon aan op het hoofdadres, maar dan pas je het adres aan naar het andere adres, dan weet hij in Visitour niet meer wat hij moet doen, en dan gaat dat helemaal mis. Dan neemt hij de straatnaam over van de nieuwe woning en het huisnummer van de oude woning.
15:05	DR	Heb je het idee dat je hierdoor ook belemmerd wordt in andere werkzaamheden? Dus als hier iets fout gaat, zitten er dan op een andere plek blokkades ofzo? Dat als er in stap 1 iets verkeerd gaat dat je dan stap 3 niet meer kunt uitvoeren bijvoorbeeld?
15:22	I1	Niet per se, want voordat je hem naar Visitour stuurt, zet je alles al goed en zorg je dat het klopt allemaal in Navision. Het enige wat hij dan niet goed pakt is in Visitour zelf. Maar het probleem is soms dat ik hem niet kan inplannen en dat ik dan een mailtje moet sturen naar Han of I&K dat ik deze bon niet plannen en hem niet handmatig kan invoeren. En waar gaat dat dan mis, in Visitour of Navision? Ergens in die koppeling daartussen denk ik. Maar de vraag is dan of de koppeling van Navision naar Visitour niet goed is of andersom. Maar goed, dat weten we zelf ook niet. […]
16:30	DR	Dan wilde ik even kijken naar het optimale planproces, je hebt hier al wel een paar punten van genoemd, maar wanneer zou je echt volledig tevreden met het planproces, wat is voor jou de ideale situatie?
16:58	I1	De voorstellen, dus dat hij zelf een voorstel doet voor dit is de beste route voor de adviseurs en dat dat niet meer handmatig hoeft. Als tweede, want dat doet hij ook nog wel vaak, dat als wij een bon aanmaken, dat deze dan niet zichtbaar is bij de adviseur, daar zorgt Visitour voor. Dus als ik hem erin zet moet hij daar gewoon zichtbaar worden, zonder dat we daar over twijfelen. Want op dit moment sturen we aan het eind van de dag de planning door omdat we het systeem niet vertrouwen, Visitour dus. We moeten gewoon het volle vertrouwen hebben dat als ik hem erin zet dat hij er dan ook bij de adviseur in staat. Verder geeft hij aan als een adviseur onderweg is naar een adres, in

		Visitour geeft het lijntje aan dat hij nog wel eventjes onderweg is, terwijl hij er binnen 5 minuten is. Dus stel je wilt een advies inplannen, dan denk je dat hij nog wel even bezig is terwijl dat niet zo is. Dus de reistijden zouden handig zijn als we weten hoeveel dat precies is. Dat als hij van een adres in Almelo naar Wierden moet, dat ik precies weet hoelang dat duurt. Het is natuurlijk geen Google Maps, maar dat zou wel handig zijn.
18:56	DR	Dus je bedoelt echt de route tijden zelf en niet de afstand hemelsbreed?
19:01	I1	Ja, aan hemelsbreed heb ik niks, ik ga niet met het vliegtuig. En verder heb je dus de foutmelding van de skills, dat bepaalde adviseurs bepaalde dingen niet kunnen of iets niet mogen doen van Geas. Soms gaat hij de planning omgooien, wat niet nodig is. Het is ook gewoon betrouwbaarheid, als ik een bon maak moet ik gewoon zeker weten dat hij er bij de adviseur ook goed instaat.
19:45	DR	Is er op dit moment een real-time verbinding tussen jullie planning en de adviseurs? Dus als jullie iets aanpassen is dat ook direct veranderd op de telefoons van de adviseurs?
19:56	I1	Ja, daar krijgen ze dan een melding van, maar als wij een bon eruit halen, dan krijgen ze dat niet, dan geeft hij dat niet aan, en dan moeten ze bellen om te checken of er iets uitgevallen is. Het is ook heel onduidelijk op de telefoon van de adviseurs. Want zij hebben FMS op de telefoon staan, dat is een soort Visitour. Dan geeft hij in Visitour aan eerst Enschede, dan Hengelo dan Almelo en dan geeft hij op de telefoon aan eerst Hengelo, dan Enschede en dan Almelo, en dat klopt niet. En dan moeten ze handmatig klikken om te zien hoe laat het is, en daarom moeten wij ook de planning sturen zodat ze zien wat de juiste route is. En soms draait hij die planning gewoon helemaal om omdat hij iets niet snapt van de tijden of van de planning. Het zou wel mooi zijn als dat werkt.
20:59	DR	Dus ook de verbinding tussen Visitour en FMS op de telefoon van de adviseurs gaat iets mis.
21:08	I1	Ja, dat is ook iets waar we eigenlijk helemaal gek van worden.
21:19	DR	Want hoe sta je ertegenover om een ander programma te gaan gebruiken? Dus dat we Visitour voor het inplannen van de adviseurs gewoon niet meer gaan gebruiken.
21:19	I1	Ja, het zou wel kunnen, er werd bijvoorbeeld gezegd dat we terug moeten naar Outlook. Ik vind persoonlijk Visitour best handig op sommige momenten. En in Outlook zet je gewoon een afspraak en dat staat in de agenda van de adviseurs. En dat werkt dan allemaal gewoon. Alleen kunnen wij dan niet zien wat de optimale route zou zijn, dus dan moet je echt goed kijken als je een adres hebt in Hengelo of dat voorin of achterin Hengelo ligt. Dat moet je dan echt uit je hoofd weten. In Visitour kan je dat wel echt handig bekijken. Outlook is denk ik voor ons niet echt gunstig, maar wel handiger voor de adviseurs.
22:35	DR	Nu heeft Clixz ook een planmodule geloof ik, dus dan zouden we naast de Lead module ook de planmodule kunnen gebruiken. Hoe sta je daar tegenover?
22:50	I1	Als dat zo is zou dat de beste optie zijn, want dan zit Navision er ook niet meer tussen. Dan voer je de ketels in via Navision en gaat verder alles via Clixz. Want in Clixz staat in principe alle informatie, in Navision en Visitour verdraait hij alle informatie.
23:06	DR	Ik heb me daar verder nog niet in verdiept hoor! […]
24:40	I1	In 2019 zijn we dan overgestapt op een nieuw systeem, maar het is er allemaal niet efficiënter door geworden.

25:00	DR	Want hoe lang ben je nu bezig met het inplannen van een afspraak? Dus vanaf de lead tot het moment dat de afspraak in Visitour staat?
25:10	I1	Ik begin soms een gesprek met de klant om die tijd maar te overbruggen, maar het verschilt natuurlijk wel per situatie. Some moet je een nieuw adres invoeren, of is het een nieuwe klant. En kijk, bij mij duurt het dan wat korter dan bij [collega], maar als ik alleen inplan, dus alles opschrijf en daarna invoer, ben ik wel zo'n 3 tot 4 minuten bezig. Soms iets langer, soms iets korter.
26:05	DR	Want zou voor jou dan optimaal zijn? Dat je tijdens het gesprek al kan plannen?
26:15	I1	Ja, zeker! Als je via Clixz direct naar de planmodule zou kunnen, dan zou dat super efficiënt zijn. Dan ben je binnen een minuut klaar. Maar je moet natuurlijk wel informatie uitvragen, maar dat zou in die korte tijd wel kunnen. […]
30:01	I1	Dat was het eigenlijk allemaal wel over Visitour.
30:05	DR	Ja, ik heb wel een duidelijk beeld gekregen van alle problemen en voor- en nadelen. Het is fijn om duidelijker te krijgen wat de stappen zijn en waar het fout gaat. […]
31:35	I1	Als ik iets bedenk wat ik vergeten ben te zeggen, dan zal ik nog wel even een mailtje sturen.
31:41	DR	Ja, heel graag. En als ik nog vragen heb achteraf, zou ik dan een mailtje kunnen sturen?
31:45	I1	Natuurlijk, geen probleem.

Appendix 10b: transcript 2

Interview 2	
Interviewee	Advisor, I2 in the transcript
Interviewer	Dorte Rotteveel, DR in the transcript
Date and time	13-5-2020 8:00
Duration of the interview	39:19
Location	Geas Energiewacht, Spoordijkstraat 60

Time	Who	What
00:43	DR	Zou je misschien wat kunnen vertellen over hoe je het ervaart om bij Geas te werken?
00:48	I2	Nou, daar kan ik heel duidelijk over zijn, ik werk vanaf 1983 bij Geas, dus mijn hart ligt wel een beetje bij de organisatie. Ik ben als leerling monteur begonnen hier binnen de organisatie en heb meerder functies gehad. Ik denk dat dit wel een van de laatste is die ik ga hebben. Maar dat doe ik met alle liefde en alle plezier. Dus dat is een beetje mijn verhaal.
01:20	DR	Want je bent op dit moment adviseur, maar wat doe je dan precies bij de klant?
01:25	I2	Wij geven dus adviezen bij de klanten thuis. Advies over cv-ketels, stukje duurzaamheid, isolatie, dat is wel heel beperkt wat wij doen, dat sturen wij vooral door naar Nederland Isoleert. En verder geven we veel adviezen over mechanische afzuiging, WTW-units, warmtepompen, noem maar op. Dus eigenlijk het complete plaatje. En die verduurzaming daar mag nog wel wat gebeuren binnen de organisatie, het samenstellen van pakketten, wat kun je allemaal aanbieden. Dat is nu nog een beetje hapsnap, links en rechts een beetje weghalen.

02:20	DR	Je noemt het geven van adviezen, bij klanten thuis, wat vind je daarvan je leukste werkzaamheden?
02:25	I2	Wat ik leuk vind is elke keer dat klantencontact. Ik ben echt iemand die moet communiceren met de klant en dat is mijn sterkste punt. En omdat ik een technische achtergrond heb, kan mijn verhaal heel duidelijk zijn naar de klant. […] Als ik binnenkom, zie ik direct dingen die niet goed zijn of wat we kunnen veranderen.
03:10	DR	Ben je hierdoor ook langer of juist korter bezig bij de klant?
03:15	I2	Veel langer, ik heb gewoon veel meer tijd nodig. Dat komt omdat als mensen advies van mij willen om vervanging van een cv-ketel, dan is die cv-ketel niet zo doodnormaal als voor andere mensen. Ik kijk ook naar de installatie, gasverbruik of we dat minder kunnen doen, dus ik ga daar gewoon een stapje verder in. Ik kijk wel altijd of mijn agenda dat toelaat. Kom ik hele gekke dingen tegen, die je niet zo kunt laten voor in de toekomst, dan maak ik gewoon een nieuwe afspraak. En dan kom je automatisch weer bij Visitour terecht.
04:00	DR	Daar komen we dan zo wel op terug. Want hoe vind je het hier op de werkvloer zelf, qua sfeer en werkzaamheden?
04:07	I2	Sfeer is wel goed, maar de kennis en kunnen is wel een beetje matig, dat kan wel echt beter. En dat bedoel ik niet negatief, maar als je vraagt naar de verbeterpunten, dan vind ik wel dat kennis en kunnen wel wat verder omhoog kan.
04:30	DR	En zie je dat dan vooral op bepaalde afdelingen of door de hele organisatie?
04:34	I2	Sowieso de advies en productinformatie, daar mag de kennis wel wat hoger. Het uitvragen moet gewoon duidelijker, de informatie die in Visitour wordt gezet is vaak beperkt of niet aanwezig. Daar stoor ik me echt mateloos aan. Maar dat is gewoon zoals je met mensen te maken hebt, die maken fouten. […]
05:36	I2	[Voor Visitour] werkten wij gewoon in Outlook, dat werkte harstikke mooi. Was heel makkelijk, je kon zelf dingen toevoegen, dus als je een afspraak had met de klant, dan kon je dat er gewoon inzetten. Met Visitour is dat gewoon allemaal weg en dat heeft voor ons best wel wat beperkingen. En in het begin ging Visitour gewoon automatisch inplannen, daar zat niemand achter. Dat werd in een bak gegooid en aan het eind kwam daar een route uit, en dat was gewoon een drama. Met de planmodule kan je 100 monteurs perfect inplannen, maar als je 5 mensen moet plannen, dan werkt dat niet. En het duurde wel een tijdje voordat ze doorhadden dat de rijtijden van ons gigantisch omhoog gingen. Want wat Visitour doet, is hij laat me beginnen in Enschede en stuurt me ’s middags gewoon naar Zutphen. [Korte onderbreking]
07:40	I2	Maar die hele planning, was dus een groot drama. We hebben gekeken naar het aantal kilometers, dat hebben gewoon uit de module gehaald en vergeleken met voordat Visitour kwam. Per adviseur 6000 km per jaar verschil. En dat dan vijf keer is gewoon een extra auto laten rijden. En toen is Visitour wel in stand gebleven, maar toen werd alles handmatig ingepland.
08:24	DR	Want ben je door het handmatig plannen wel tevreden met de planning?
08:25	I2	In het begin ook niet. Iemand die hier een beetje bekend is, weet dat als je van Enschede naar Hengelo moet, dat dat 10 minuten rijden is. Maar dat als ik van Wierden naar Hardenberg moet, dat dat gewoon drie kwartier is. En omdat die routeplanning uit Visitour was gehaald, kon je dat niet meer zien. Maar later werd dat ook wel weer bijgesteld en ik moet eerlijk zeggen, dat ze nou die blokken er weer in kunnen zetten. Dus de eerste afspraak tussen 8 en 9 en

		tussen 9 en 10 en dat gaat best wel goed. Maar voor mij voegt Visitour helemaal niks toe.
09:20	DR	Want ik begreep dat jullie de planning binnen krijgen via een app op de telefoon. Werkt dat prima, krijg je alles te zien wat je nodig hebt?
09:31	I2	Nou, dat heeft een beetje met automatisering te maken, dat soms het ene niet naar het andere wordt overgezet. En nu werken we natuurlijk met Clixz, dat is wel een deel gekoppeld aan Navision, maar alles wat wij aanpassen in Clixz wordt niet per se direct overgezet in Navision. Dus dan moet ik een melding zetten in Clixz dat ik de NAW-gegevens heb veranderd en dan moet iemand anders dat weer in Navision aanpassen. Bij het uitbellen moeten ze de gegevens checken van de klant, maar dat gebeurt gewoon vaak niet. En dan kom ik bij de klant en dan is het mailadres weer niet goed en dan moet ik dat weer invoeren. Ik wil gewoon dat als ik Clixz open dat ik daar mee verder kan, dat moet gewoon kloppen. En dan moet ik dat gaan aanpassen en ik vind dat dat mijn werk niet is. En als het mailadres niet goed is, heb ik daar zelf last van. Als ik die klant een offerte stuur naar dat mailadres, dan krijg ik natuurlijk nooit wat terug.
11:15	DR	Want je vertelde net dat je geen voordelen ervaart van het werken met Visitour. Heb je het idee dat toen jullie van Outlook zijn overgestapt op Visitour je bepaalde informatie wel had in Outlook en nu niet in Visitour?
11:28	I2	Laat ik het zo zeggen, als je Outlook goed behandelt en je hebt de goede mensen erop zitten die alles goed in Outlook invullen, dan kun je daar meer informatie uithalen dan uit Visitour. […]
12:10	I2	Als er met Visitour handmatig wordt ingepland, maar je wel achter de schermen kunt zien hoe die routes dan komen te liggen, dat werkt op zich wel mooi. Je kunt zelfs het aantal kilometer eruit halen. Dus op zich heb ik er nu geen last van. Dus zoals het nu werkt, met die blokken erin, dat werkt prima. […]
14:35	I2	Met Visitour was het natuurlijk het idee dat de rijtijden omlaag konden, maar dat was dan natuurlijk niet zo. Dat hebben ze er dan ook snel uitgehaald, dat stukje planning. En waarom verder Visitour nog steeds wordt gebruikt achter de schermen, ik heb geen idee.
15:30	DR	Visitour biedt natuurlijk wel veel mogelijkheden voor ook de automatisering van het hele proces, maar misschien past het gewoon niet bij het proces van het inplannen van de adviseurs.
15:38	I2	Dat mag je zeker meenemen in het hele verhaal, dat ik het voordeel er niet van zie. En achter te schermen zal het in Outlook wel weer veel meer plakken en knippen zijn en meer handmatig werk.
16:22	DR	Kom jij zelf ook stappen tegen in je werk die je handmatig moet doen die automatisch gedaan zouden kunnen worden of moeten worden?
16:28	I2	Wij krijgen eigenlijk alles op een presenteerblaadje. Dus nee, eigenlijk niet. Ken je FMS, hoe wij alles binnenkrijgen?
16:40	DR	Nee, eigenlijk niet. [Laat FMS zien]
16:58	I2	M'n hele dagplanning staat daar gewoon in. En als ik dan een afspraak open dan staan daar alle gegevens in die jij ook gewoon in Navision hebt staan. En daar staat heel beknopt in wat de bedoeling is en welk contract erachter zit. En 8 van de 10 keer heb ik daar voldoende aan. Soms worden er dingen op plekken neergezet waardoor het niet zichtbaar is
17:50	DR	Deze informatie, kon je die ook zien toen jullie met Outlook werkten? Of werd dat dan handmatig ingevoerd?
17:59	I2	Toen hadden we geen FMS.

18:01	DR	Dus dan was alleen de informatie zichtbaar die erin was gezet door de planner?
18:05	I2	Ja, dus toen hadden we geen begin- en eindtijd, niet aanmelden. We hadden gewoon een a4'tje in de auto en het voordeel was dat je daar alles gewoon bij kon zetten en dat is er nu ook niet meer. Maar goed, ik heb nu nog steeds alles gewoon op een a4'tje, neem alles mee in m'n map en schrijf alles gewoon op want dat is gewoon heel makkelijk. Dus papier gaat nooit helemaal weg. Maar het is wel gewoon een voordeel dat je de basisgegevens hebt van welke contractsoorten erachter zit. Dus ik denk dat FMS gewoon moet blijven draaien. Maar ik weet niet in hoeverre dat verbonden is aan Visitour.
19:00	DR	Als FMS, of iets vergelijkbaars, mogelijk is met een ander programma erachter, dan wil je dat dus wel behouden?
19:19	I2	Ja, ik vind dit heel prettig. Alles, ook reistijden, wordt hierin bijgehouden. En ik heb het idee dat dat ook is gekoppeld aan Visitour, want daarmee kunnen ze zien waar ik ben. Maar of dat ook allemaal nodig is, zeg het maar, dat laat ik aan jou over. Maar ik vind wel dat er nu te veel systemen naast elkaar draaien, Clixz, Visitour, FMS, Navision. Gisteren hadden we ook een videocall en dan zit je met z'n achten in zo'n ding en de helft van je tijd krijg je wat mee, want die schreeuwt dit en die schreeuwt dat. Ik vind het allemaal niks. En had aangegeven dat het weer toenam dat de gegevens weer niet klopte. "Soms is het ook zoals het is", kreeg ik toen te horen. Ik zeg, dat gaan we dus niet doen he? En ik snap ook wel het ook wel eens klaar is met het gezeur van ons, maar wij zijn wel afhankelijk van de gegevens die we binnenkrijgen. Maar we moeten dus een notitie maken in Clixz als we de NAW-gegevens hebben aangepast. Want dat moet blijkbaar, terwijl tegen mij is gezegd dat Navision gekoppeld is aan Clixz. En dan ga ik ervanuit dat als ik de NAX-gegevens in Clixz verander, dat dat ook ergens in Navision terecht komt. Maar dat schijnt dus niet zo te zijn. […] Maar dat stukje informatie dat ik dus hier heb [in FMS], dat zou wel heel fijn zijn als ik dat kan behouden. Maar of dat nou via FMS moet… dat mag ook wel wat anders zijn. En er is ook een tijd geweest dat het niet klopte wat wij doorkregen, dat we een uitdraai kregen aan het eind van de dag moesten krijgen zodat we de adressen wisten waar we heen moesten de volgende dag.
22:14	DR	Zoiets hoorde ik inderdaad al, bedoel je dan dat de volgorde van de adressen niet klopte in FMS?
22:24	I2	Nou, dat vond ik nog niet eens zo erg, want dat kan ik zelf wel zien. Ik kijk dan wel naar de tijdsblokken en dan kijk ik zelf wel waar ik als eerste of als laatste heen moet. Dat vind ik nog niet zo heel erg. Maar ik bedoelde dat er dingen niet in staan, dus dan stond het wel in Visitour, maar niet in FMS. En dat is heel lastig. Want dan bellen ze je op om 11 uur, "ben je geen klant vergeten?". Ik zeg; "dat kan, maar niet bij mij". En dan staat hij wel in Visitour, en daar moeten ze mee ophouden, met dat "staat hier", want hij staat niet bij mij. En toen hebben ze volgens mij wel twee jaar aparte lijsten nog uitgedraaid om te kijken of dat wel klopte. Maar dat gat de laatste tijd wel goed hoor, alleen laatst in de achterhoek, dat een adres er niet tussen stond. Maar dat is meer een stukje automatisering.
23:35	DR	We hebben al een paar dingen hiervan besproken, maar wanneer zou je nou echt helemaal tevreden zijn met de planning? Wat is voor jou de ideale situatie?
23:45	I2	De ideale situatie voor mij is als ik 's ochtends in de buurt van waar ik woon om 8 uur kan beginnen en dat de volgende ook gewoon binnen een bepaalde afstand is en dat de rest van de dag de route ook netjes is en klopt. En dat ik de informatie krijg die ik nodig heb.

24:08	DR	En die informatie die je dus nodig hebt zijn de contracten die lopen, de adresgegevens, waarin mensen geïnteresseerd zijn?
24:12	I2	Ja, dat is voor ons gewoon heel belangrijk. Ook de toestellen die allemaal in onderhoud zijn, ook bedrijven waar soms 5 of 6 verschillende toestellen hangen en dat weet ik welk toestel moet worden afgevoerd. Dus dat is voor ons het belangrijkste en voor de rest maakt het me niet zoveel uit, als die route maar klopt. Of ik dat nou in FMS heb of op een A4'tje.
23:43	DR	Want als ik je zo goed begrijp sta je wel open voor het invoeren van een nieuw programma of een ander proces, zolang de informatie maar zichtbaar blijft. Klopt dat?
23:55	I2	Ja, precies. Dus als iemand zegt, we doen FMS en Visitour weg en het zou in Outlook kunnen bijvoorbeeld, als ik daar gewoon een overzichtje van krijg, perfect.
25:10	DR	Want zou het programma dan nog meer moeten kunnen? Heb je het idee dat je nu nog bepaalde informatie mist?
25:20	I2	Nou, soms mis ik dus nog wel informatie wat blijft hangen in het systeem. Wat zij wel hebben staan, maar wat ik dus niet zie.
25:25	DR	Ja, maar het is dus niet zo dat je meer informatie wilt dan je nu ziet?
25:30	I2	Nou, nogmaals, als iemand die daar zit gewoon invult wat ik nodig heb, dan heb ik niet meer nodig. Als dat klopt, dan klopt dat. Dus er blijft altijd een stukje handwerk over. Maar diegene dat niet doet, of er verzaakt wat, dan heb ik een probleem. Want gisteren ook weer, 2Solar, 2Solar hebben we ook nog! Ken je dat, is voor de zonnepanelen. Daar kunnen wij ook niks mee. Dus als mensen advies willen voor zonnepanelen, dan krijgen wij al een legplan mee in Clixz, dat is de afspraak. Dan hebben we al voorbereiding, weten we hoe het dak eruitziet en of dat kan bij de klant is aan ons om dat te bekijken. Maar dan staat er dus niet bij of dat dak plan al gemaakt is of niet. Dus dan moet ik weer in Clixz kijken, dan is er niks gemaakt en moet ik naar binnen bellen. Dat zijn allemaal handeling die allemaal tijd kosten waar ik niks aan heb. Of de gegevens van de klant staan er niet op, hoeveel stroom ze gebruiken, wat het gasverbruik is. Maar daar kan je een planmodule op loslaten wat je wilt, maar als degene die daar achter zit het niet goed bediend.
27:10	DR	Dus als er een nieuw programma geïmplementeerd zou worden, moet de training van zo'n programma ook echt voldoende zijn.
27:21	I2	Dat is soms al vierhonderd duizend keer geprobeerd. Maar om nog even terug te komen, als ik alle informatie heb en de route klopt, dan ben ik harstikke tevreden. Gewoon zoveel mogelijk informatie van de klant, en soms wordt dat wel ingevoerd maar komt dat niet binnen in FMS. En dan is Outlook weer harstikke makkelijk, want daarin kan je alle teksten er gewoon bijzetten en is allemaal zichtbaar. Het is misschien handmatig, maar voor mij werkt het gewoon perfect. En de NAW-gegevens kan je volgens mij gewoon zo overzetten. Maar gewoon even kort samengevat, ik wil gewoon een goeie route, ik wil zoveel mogelijk informatie van de klant, ook wat er met de klant besproken is.
29:04	DR	Ja, dan kom je natuurlijk op een hele andere manier binnen bij de klant. […]
30:30	DR	Je moet op een gegeven moment wel die afweging maken, Outlook werkt voor jullie prettig en Visitour is handig vanwege bijvoorbeeld een routekaartje.
30:40	I2	Ik weet dat ik niet terug moet in de tijd hoor, maar er was eerst gewoon een kaart met ons gebied, gewoon een plattegrond met alle plaatsen er gewoon op. En dan met een paar grote lijnen het aantal kilometers erop en dat werkte

		gewoon perfect. En dan kan je zeggen dat het ouderwets is, maar het werkte wel! Weet je, wat ik mis in de organisatie is de betrokkenheid van de binnendienst medewerkers naar de buitendienst medewerkers. Wij hebben het gevoel dat we zitten te zeuren naar de binnendienst, maar dat is absoluut niet zo. We willen gewoon ons werk makkelijker maken, om zoveel mogelijk tijd bij de klant te creëren, want daar gaat het uiteindelijk om.
31:55	DR	Want je hebt nu voor je gevoel taken die eigenlijk door de binnendienst gedaan moeten worden? Zoals het checken van de NAW-gegevens.
32:00	I2	Ja, of, nou, daar ga ik weer. Er wordt een tijd ingepland voor de cv-ketel, en dan geeft de klant aan dat ze ook nog wat advies wil over een warmtepomp, “weet de adviseur daar ook wat van?”. Dan is het “ja, daar weet de adviseur ook alles van”. Maar ik zit met dan tijdblok van dat uur. Maar als ik een warmtepomp moet uitleggen, ben ik een uur, anderhalf uur verder. En bel ik de binnendienst of de klant dat heeft doorgegeven en dan zeggen ze dat ik daar wel over kan vertellen. Maar zij moeten aan de klant vragen of ze voor de cv-ketel advies willen of voor een uitgebreid pakken om het maar even zo te noemen. Als de klant maar een of twee vragen heeft, dan kunnen ze het zo laten, maar wilt die klant meer, dan moeten ze daar wel rekening mee houden. En dat gevoel mis ik een beetje. Hier is het gevoel een beetje van; klant komt binnen, contractje tekenen en weer door. Maar zo is het hier niet. Dus die adhesie van binnen naar buiten dat mis ik wel.
33:35	DR	En heb je zelf een gevoel hoe dat verbeterd zou kunnen worden?
33:38	I2	Ze hebben wel gezegd dat ze iemand van de binnendienst met de buitendienst mee moeten laten gaan, maar dan heb je het over een halve dag. Dan kom je precies bij mensen waar het allemaal standaard is, dus daar heb je niet zoveel aan. Dan heb je het echt over een hele week of een hele maand, we hebben niet elke dag gekke dingen. Er zitten ook normale dagen in zo’n week. Maar het wordt natuurlijk wel steeds gekker, mensen gaan veel meer dingen vragen. Als iemand een vraag heeft over een warmtepomp, dan zit ik een uur later nog op de praatstoel. En daar halen we dan niet direct een klant uit, maar dan is Geas wel een beetje in beeld. Dus ik ben gewoon tevreden als ik ’s ochtends wegrijd met een goede route, en wat er achter de schermen gebeurt dat maakt me eigenlijk geen reet uit. En ik wil wel meedenken daarover. En ik denk gewoon dat we nu met te veel systemen naast elkaar werken. […]
37:35	I2	Heb je er wat aan gehad zo?
37:40	DR	Ja, absoluut, het is heel grappig om het verschil te horen tussen de binnendienst en de buitendienst. Maar het is ook wel heel waardevol, want dan is het wel duidelijk dat je niet alleen de belangen van de ene groep moet meenemen, maar het gaat wel echt om het vinden van een tussenweg, om beide partijen tevreden te houden. Dus ik ben er heel erg blij mee, mocht ik achteraf nog tegen vragen aanlopen, zou ik dan nog contact met je op kunnen nemen?
38:50	I2	Ja natuurlijk, zet het dan maar in een mailtje.
39:15	DR	Heel erg bedankt voor je bijdrage.

Appendix 11: results of interviews

In the table below the results of the interviews are shown schematically.

Theme	Subtheme	Times mentioned	Explanation
Geas		**3**	
	Atmosphere	2	The atmosphere on the office is pleasant
	Sustainability	1	Geas is lacking in the field of sustainability
	Knowledge and skills	2	Inside staff must develop more knowledge about the products and services
	Involvement	2	There is no involvement between the inside- and outside staff
Three systems		**5**	
	Inefficient	5	Three systems are used to schedule one appointment which is not efficient. This makes the process slow
	Standard	2	Visitour is only used because these three systems are used throughout the whole organization
	Link	5	The link between the three systems is not always working, which means that information gets lost, is changed or is not visible everywhere
	Name and address data	3	When changing name and address data in Clixz, this does not get changed in Navision automatically
Visitour		**60**	
	Linear distance	2	The map in Visitour only shows the linear distance instead of the absolute time travelled by the advisors
	Map	3	A map is shown, people who are not familiar with city names and places around Enschede are still able to make a good route
	Manually	12	Too many steps in the process are done manually, more should be automated
	Appointment proposal	8	Visitour should come up with a suggestion for an appointment date
	Missing skills	2	When an appointment is planned for solar panels, Visitour says the advisors do not have the correct skills to do so
	Certainty	3	There is lack of certainty that if an appointment gets scheduled, the appointment is visible in the agenda of the advisor
	Automatic scheduling	3	When automatic scheduling was used, it was not efficient
	No added value	1	Visitour offers nothing extra for the advisors
FMS		**10**	
	Not visible	5	An appointment that is put in Visitour is not guaranteed to be visual in FMS

	All information	6	All information about the objects and contracts is shown, which is important for the advisor
	Planners	2	Sometimes information is missing in FMS, but the planner might also be to blame because of putting information on the wrong place
Outlook		**11**	
	Lack of map	3	Planning in Outlook means that there is no map and knowledge about the geography is necessary
	Visibility	2	An appointment is immediately visible in the agenda of the advisor
	Manually	1	Everything is done manually in Outlook
	Trustworthy	1	Planners and advisors know for sure that it works
Schedule		**15**	
	Logical route	8	Having a logical route is important for the advisor and the goal of the planner
	Blocks	3	Planning is done in blocks of one hours, which both planners and advisors are satisfied about
	Extra kilometers	1	A lot of extra kilometers were driven because of the automatic planning, this must remain low