

*Bachelor thesis of a graduation assignment at:*

# **ASSA ABLOY**

*Dynamic Service*



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## REVISION CONTROL

Version	Date	Changes
0.05	17 May 2013	Formatting document, created the index and added problem definition chapter
0.1	22 May 2013	Added and finished the general description and process specification chapters
0.15	24 May 2013	Added and finished the research model chapter
0.2	28 May 2013	Added and finished the method of working chapter
0.25	29 May 2013	Added the analysis chapter
0.3	04 June 2013	Finished sub-question 1
0.35	10 June 2013	Finished sub-question 2
0.4	14 June 2013	Finished sub-question 3
0.45	17 June 2013	Finished sub-question 4
0.5	18 June 2013	Added the fit/gap analysis chapter
0.55	20 June 2013	Added the solution/design chapter
0.6	22 June 2013	Finished sub-questions 5 & 6
0.65	23 June 2013	Added the business case and conclusion & recommendations chapters
0.7	24 June 2013	Finished incomplete chapters, created the glossary, completed bibliography & appendices
0.75	24 June 2013	Concept version 1.0 completed
0.8	10 July 2013	Concept version 1.5 completed
0.85	12 July 2013	Concept version 2.0 completed
0.9	14 July 2013	Processed feedback and applied finishing touches
1.0	14 July 2013	Final version complete

## DISTRIBUTION CONTROL

Version	Date	Recipient	Reason for distribution
0.75	24 June 2013	Frens Burgert	Concept distribution
0.75	24 June 2013	Wil Akerboom	Concept distribution
0.75	24 June 2013	Dennis van Eden	Concept distribution
0.75	24 June 2013	Claus Warmdahl	Concept distribution
0.75	24 June 2013	Huibert Duijzer	Request for feedback
0.75	24 June 2013	Wim den Boer	Request for feedback
0.8	10 July 2013	Wil Akerboom	Request for feedback
0.85	12 July 2013	Wil Akerboom	Request for feedback
1.0	15 July 2013	Jet Koot	Final version distribution (4 x hardcopy)

## PREFACE

Before you lies the result of a graduation project that was carried out for ASSA ABLOY Entrance Systems. It is the conclusion of my business engineering bachelor at the Hogeschool Utrecht. The topic of this thesis, an integration between Microsoft Dynamics AX 2012 and Field Vision, was quite interesting, especially because of my previous experience with both systems. In my opinion, I succeeded in answering the main and sub-questions of the assignment, although a few extra weeks wouldn't have hurt. An important factor in completing this graduation project have been the people who supported and guided me over the course of around four months. I will use this preface to thank them individually.

First and foremost I would like to thank both of my company supervisors: Mr. Dennis van Eden and Mr. Claus Warmdahl. I've spent a lot of time on talking with Dennis and a large part of the process descriptions and other paragraphs are only in here because of his knowledge of the company. Additionally, he was always willing to provide me with feedback and insights on the deliverables despite his busy schedule and trips to Sweden. The same goes for Claus. Although there was quite the geographical gap between us (Netherlands vs. Denmark), this has not prevented us from speaking with each other on a regular basis. These talks and his feedback have helped me getting (back) on the right track.

I am also thankful for the help and guidance of my college supervisor, Mr. Wil Akerboom. Although we didn't have many meetings at the start of this graduation project, the meetings and phone calls towards the end have been crucial in completing this thesis. His feedback and tips on how to structure my document were very welcome, as were the references to interesting models and methods. The first assessor, Mr. Frens Burgert, is hereby also thanked for his feedback and approval of the project deliverables.

Another important group of people to thank is the *Dynamic Entrance* project team; without their help and efforts, this thesis could not have been completed. I would also like to thank the employees of Besam Nederland who were willing to answer my questions during the orientation period of this project. A special thanks goes out to the service director of Besam Nederland, Mr. Gerrit Westhof, without whom I would probably never have been invited over to discuss a possible graduation assignment. I am thankful for the people who provided me with extra feedback, Huibert Duijzer in particular. And last but not least, I would like to thank my parents for their financial and motivational support throughout the entirety of my bachelor program. I hope you will enjoy reading this thesis as much as I enjoyed this graduation project.

*Nick den Boer*

## MANAGEMENT SUMMARY

This document is the result of a graduation assignment that was carried out by a student of the Hogeschool Utrecht. The main question related to the assignment was:

*"How can AAES integrate Microsoft Dynamics AX 2012 with Field Vision in such a way that it supports and improves the method of working of the ASSA ABLOY Entrance Systems group?"*

Using the Waterfall model in combination with the Sure Step methodology, the student has divided his research in two phases: the analysis phase and the design phase.

### Results of the analysis phase:

1. Review of the work stream structure and current Field Vision processes;
2. Description of the current integration method and XML message structure;
3. Entity-relationship diagrams;
4. List of frequencies at which the current XML messages are exported and imported (master data vs. transaction data);
5. Selection of requirements relevant to the Field Vision integration;

In the design phase, several integration methods were reviewed, namely: synchronous integration (cloud computing and web services), asynchronous integration (two databases that synchronize by sending over messages) and manual integration (typing over information in both systems). When looking at the current situation and its limitations, it became clear that the most suitable option is asynchronous integration.

### Key factors for choosing this option are:

- The requirement that IDDS Sweden should go live at the start of Q2 of 2014;
- The lower costs of asynchronous integration vs. synchronous & manual integration;
- The existing knowledge of Field Vision and asynchronous integration;
- The existence of the Connectivity Studio tool which makes asynchronous integration easier;

A list of the added features/data elements that were designed based on the requirements from the analysis phase can be found in paragraph 9.4. These features were prioritized using the MoSCoW method, making it easier to select which features are the most important ones.

(Continuation on the next page)

### Results of the design phase:

1. Review of several integration methods (synchronous, asynchronous and manual integration;
2. List of added features/data elements based on the requirements from the analysis phase;
3. Prioritization of the added features/data elements;

### In the business case chapter, the following cost/benefit analysis was made for the chosen solution:

A. Initial investment	€175.000,-
B. Recurring costs (annual maintenance)	€ 2.500,-
C. Recurring benefits* (prevented costs for IDDS Sweden)	€126.000,-

### The payback period for the IDDS Sweden integration is:

$$[A] / [C] - [B] = 175.000 / (126.000 - 2.500) = 1.4 \text{ years}$$

\* The benefits were difficult to estimate, but eventually the choice was made to express the benefits in costs that can potentially be prevented for the IDDS Sweden branch. Assuming that manually typing over information between the two systems would lead to an extra 1% total costs, the potentially prevented costs result in 11 million Euros annually for AAES as a whole. If you scale this down to the IDDS Sweden branch with its 85 employees, the prevented costs are ~€126.000,-.

Combining these benefits with the strategic benefits of having an integration leads to the conclusion that the benefits of integrating AX with Field Vision outweigh the costs greatly.

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# 1. INTRODUCTION

This thesis is based on the graduation assignment to design a fitting integration between Microsoft Dynamics AX 2012 and Field Vision. ASSA ABLOY Entrance Systems is currently in the middle of a huge implementation project that aims to implement a new ERP system for all its subsidiary companies. Because the service activities of AAES generate approximately 40% of the total revenue, it is important that this new ERP system is integrated with the field service solution in order to create an efficient, seamless service process.

The second chapter of this thesis provides the reader with an overview of the structure and products of the Entrance Systems division. What follows is a chapter that includes the research questions, project goals, project scope and the project approach. The approach paragraph delves into the methods that were used to execute the project, followed by the research model. The third chapter ends with a summary of the project deliverables. In chapter 4, we will review the different work streams and their structure. The systems that are relevant to the assignment are briefly described and the main processes of the sales to cash and service to cash work streams are explained.

The core of this thesis starts at chapter 5 and this is where the first sub-questions will be answered. In order to answer the first question we will break the two relevant work streams down using a Work Breakdown Structure. The next sub-question is answered by dividing the Field Vision users into two groups and by describing the Field Vision processes of these two user groups. Sub-question 2 ends with an explanation of the current integration method. In paragraph 5.3 an overview is given of the different types of XML messages, followed by a summary of the data elements used in these messages. The paragraph is concluded with several entity-relationship diagrams and an evaluation of the current integration frequencies. The fourth and last sub-question in chapter 5 is an examination and selection of the requirements that are relevant to the integration.

After stating the relevant requirements, a short fit/gap analysis is done in chapter 6. Next up is the seventh chapter, which includes a review of the possible integration methods as well the advantages and disadvantages of each method. One of these methods is chosen for the design of the AX – FV integration. The actual design of the chosen solution is also included in the last paragraph of chapter 7. The business case is worked out in chapter 8, complete with the costs, benefits and payback period of the chosen solution. The last chapter is the conclusion of this thesis, followed by two sets of recommendations; one for the AX – FV integration and one for the *Dynamic Entrance* project and ASSA ABLOY Entrance Systems in general. After that, the reader is presented with a bibliography, glossary of frequently used words and the appendices.

## 2. GENERAL INFORMATION

### 2.1 COMPANY STRUCTURE

ASSA ABLOY Entrance Systems (AAES for short) is one of the five divisions of ASSA ABLOY, a large producer of door and security solutions based out of Sweden. ASSA ABLOY Entrance Systems specializes in automatic door solutions which they produce, sell and service. Besides AAES, the four other divisions of ASSA ABLOY are: the EMEA division (Europe/Middle East), the Americas division, the Asia-Pacific division and the Global Technologies division. These other divisions specialize in producing and selling locks in their respective regions. The Global Technologies division manufactures and sells products for electronic access control, secure issuance of cards and identification technology.

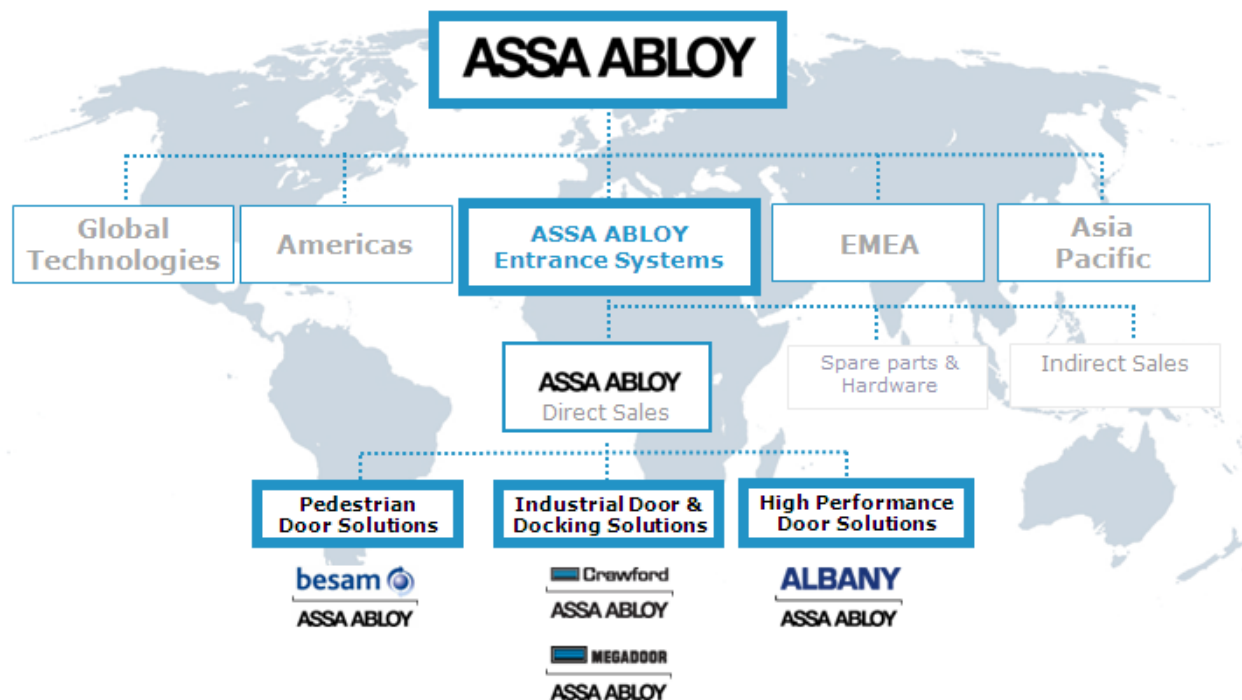


FIGURE 1: VISUAL REPRESENTATION OF AAES

AAES can be further divided into three specialized business areas, namely: Pedestrian Door Solutions (PDS), Industrial Door and Docking Solutions (IDDS) and High Performance Door Solutions (HPDS). Figure 1 shows the divisional structure of ASSA ABLOY as well as the business areas of ASSA ABLOY Entrance Systems. The four biggest brands of AAES are displayed under their respective business areas; these brand companies operate globally, but the majority of the business is done in Europe and North America. Besides the direct sales channel, AAES also has an indirect sales channel which is called Entrematic and a component supplier called FlexiForce. Entrematic

delivers entrance automation through distributors and installers to end customers in some 80 countries worldwide. FlexiForce produces and sells spare parts to both the direct channel and the indirect channel, but it also distributes its products to other companies, including competitors of ASSA ABLOY.

## **2.2 KEY FIGURES & COMPETITORS**

An overview and analysis of the key figures and competitors can be found in appendix A.

### 3. RESEARCH QUESTIONS AND APPROACH

#### 3.1 MAIN QUESTION

"How can AAES integrate Microsoft Dynamics AX 2012 with Field Vision in such a way that it supports and improves the method of working of the ASSA ABLOY Entrance Systems group?"

#### 3.2 SUB-QUESTIONS

- 1) Which processes are included in the service to cash and sales to cash work streams?
- 2) Which of these processes are currently integrated with Field Vision and how?
- 3) Which data elements are important in these processes?
- 4) What are the requirements for the processes that need to be integrated with Field Vision?
- 5) Do the requirements of the processes match the functionality of Dynamics AX 2012 and Field Vision?
- 6) How can the gap between requirements and functionality be closed?

#### 3.3 PROJECT GOALS

The main goal of this graduation project is to design an integration strategy for Microsoft Dynamics and Field Vision. Because Field Vision plays such an important role in both the service process and the sales process it is important that there aren't any hick-ups in the communication between FV and Dynamics AX. One of the major themes during the introductory IT meeting in Sweden was "seamless flow" . It is a theory which focuses on creating a process in which there are as few handover-moments as possible. By eliminating or greatly reducing the amount of information transfers in a process it will become more efficient because handing over information (physically or digitally) takes time and thus money. That is why creating an environment where there are just a few software systems instead of a lot can be cost-efficient. Because seamless flow plays such a considerable role in the *Dynamic Entrance* project and in AAES as a company, it will also influence the design of an integration strategy.

So efficiency is one of the underlying reasons for integrating the ERP system with the service solution. Efficiency is gained by creating a seamless flow in your main process since seamlessness reduces the time spent on a certain process. But seamlessness also improves the quality of the process because every time information is handed over, the chance that errors are introduced is increased. For example, manually copying customer information from a CRM system to an ERP system can easily lead to typos which in turn can lead to a mechanic driving to the wrong address. In

conclusion: integrating a service solution with an ERP system will reduce the amount of hand-over moments which will in turn improve the efficiency and quality of your processes.

SMART goal: creating a seamless integration plan which supports the relevant service and sales processes of PDS, IDDS and HPDS before the end of this graduation project (15 July 2013).

### **3.4 PROJECT SCOPE**

The terms service to cash and sales to cash have been mentioned a couple of times but it might not be clear what they mean. For a description of the main processes of both work streams, see paragraph 4.2.2 and 4.2.3. The service to cash process will be the most relevant for this graduation project. It includes all activities that are performed on existing door solutions (breakdowns, planned maintenance, repairs, upgrades and exchanges). These activities are executed by mechanics who need to receive up-to-date information from the ERP system in order to register their work. This is why Field Vision is used within AAES; it provides the mechanics with current information on customers and their installations.

The other work stream, sales to cash, includes all new door sales. The reason why this work stream is less relevant for this project is that Field Vision supports only a small part of the sales to cash work stream. When a quote has been approved, the installation of the quoted door(s) can be planned and executed. This is the part of the sales to cash work stream that is relevant to this graduation project because Field Vision is essential for these steps.

Because the main goal of this graduation project is to design an integration strategy between AX and Field Vision, the scope is limited to the analysis and design phases of the waterfall model (see paragraph 3.5.1).

As to which departments are involved in this project: all three business areas of ASSA ABLOY Entrance Systems will be within the scope of this project (PDS, IDDS & HPDS), but the main focus will be on IDDS Sweden because they are the first company to go live. Since the ERP implementation will affect all business areas of AAES, so will the integration of Field Vision with Dynamics AX. This means that the differences in work methods between the three business areas will need to be analyzed and probably redesigned to create a "one size fits all" type solution. Within each business area, the departments Equipment Sales (EqS) and Service Sales (SeS) will be the main focus.

### 3.5 PROJECT APPROACH

This paragraph will be used to describe how this graduation assignment was carried out. Here we will have a look at the theory and methods behind the approach and how they can be used for projects like this graduation assignment. We will start by reviewing the software development methodology that was selected by the student to manage the project: the waterfall model. Since AAES uses Microsoft Sure Step to manage the *Dynamic Entrance* project, this method will also be discussed and compared to the waterfall model.

#### 3.5.1 THE WATERFALL MODEL

During the initiation phase of this graduation project, the student chose the waterfall method as the leading theory behind his approach. The waterfall model is a software development model that originates from 1970 when it was first described by W.W. Royce. The name was given to the method because of its sequential, downwards flow of the different phases of software development. Those phases are: analysis/requirements gathering, design, implementation, testing/verification, delivery/maintenance (see image below).

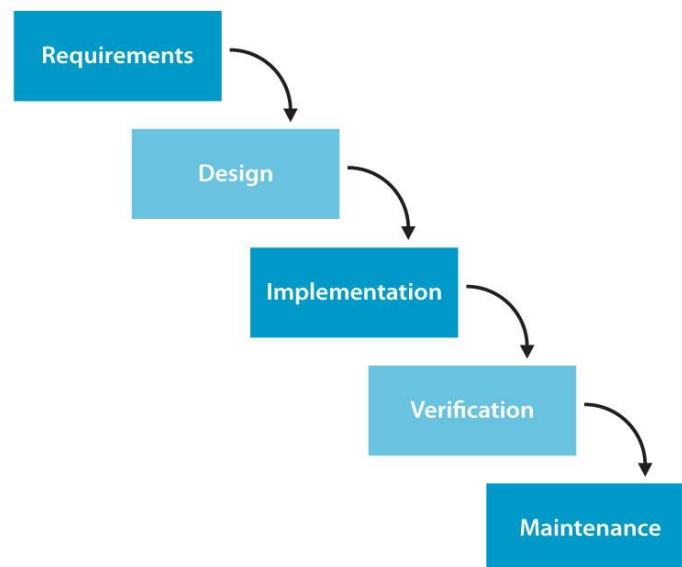


FIGURE 2: VISUAL REPRESENTATION OF THE WATERFALL MODEL

Instead of utilizing an iterative (repetitive) approach, the waterfall model passes through each phase just once. What follows is a brief review of the five phases of the waterfall model.

1. Requirements: the first phase ensures that all possible requirements of the system(s) are gathered and stated. Requirements include functions and limitations that the end user

expects from the system. The requirements are compiled in what the Microsoft Sure Step method calls functional requirement documents or FRDs. At the end of the requirements phase, a fit/gap analysis is conducted to determine which requirements are already supported by the standard version of the system and which functions will need to be developed.

2. Design: the second phase happens before the actual coding phase and it includes the design of all features that are not supported by the standard version of the system. These design specifications are the core for the implementation and verification phases and they are gathered in functional design documents or FDDs.
3. Implementation: the third phase includes the development and coding of all necessary functionality. The system is split up into a large amount of smaller programs called units and these units are developed and tested individually. The reason why this is done on an individual basis, is that this makes it easy to verify if a unit meets the requirement that was stated in the first phase.
4. Verification: the fourth phase consists of a system integration test. The previous phase resulted in a large amount of units that were tested individually and this phase verifies whether or not these individual units also function correctly as a whole. In other words; where the previous phase tested parts of a certain business process, the verification phase tests the complete business process.
5. Maintenance: the fifth and final phase incorporates the delivery of the product to the customer (or the go live moment) and the maintenance that is needed over its lifetime. When the system integration check has been completed, the customer can start to use the system. Of course there will still be some bugs or hindrances that need to be repaired, but the majority of the process is done.

In the project initiation document, the student composed a list of possible pros and cons of using the waterfall model for this graduation project. These are summarized in table 1.

The waterfall method	Advantages	Disadvantages
Clear outline of the different phases	It is relatively easy to manage the project because the start and end points of the phases are well defined.	When a phase is completed there is no going back, meaning that any mistakes made in the analysis phase will recur in the design phase.



Elaborate documentation of each phase	An elaborate documentation of the requirements for example will result in an end-product that is in line with the expectations of the customer. Another advantage is the fact that this documentation can be used as a source for this graduation assignment.	Documenting each phase will consume a lot of time that could be spent in other ways like testing or developing. It is not always necessary to document each phase extensively.
Apparent project structure	This feature is aligned with the first two features and ensures that the project is easy to manage.	The rigid structure of the waterfall method comes with decreased flexibility, meaning that it is not always possible to make changes at a later point in the project.

TABLE 1: ADVANTAGES AND DISADVANTAGES OF THE WATERFALL MODEL

The project initiation document also stated that the waterfall method could not be fully used because of the limited scope of this graduation project and the limited technical expertise of the student. The scope of this graduation projects limits itself to the analysis and design of an integration between AX 2012 and Field Vision. Developing, testing, implementation and maintenance are deemed out of scope and will thus not be executed by the student using the waterfall model. Recommendations can of course still be made for these phases.

### 3.5.2 MICROSOFT SURE STEP

The *Dynamic Entrance* project makes use of a specialized project management methodology called Microsoft Dynamics Sure Step 2010. This method comes with an application that was customized for implementation projects of Microsoft Dynamics products. The project team does not follow the methodology in its entirety, but rather holds on to the structure and documentation that it offers. Sure Step is very gravitated towards the relationship between the supplier of the solution and the customer. In the case of the Dynamic Entrance project, the project team is both the supplier and the customer which makes some processes of the Sure Step methodology unnecessary. According to their own description of the methodology, Sure Step is (see appendix B for more on this):

*"[Microsoft Dynamics Sure Step is] a full customer lifecycle methodology for all Microsoft Dynamics® solutions, providing the Microsoft ecosystem with comprehensive sales through delivery guidance, project management discipline alignment and field-driven best practices. Sure Step is designed to enable the solution provider to better serve their customers by helping reduce their Microsoft Dynamics total cost of ownership. Sure Step content covers the Microsoft Dynamics ERP*

and CRM solution suite of solutions, including Microsoft Dynamics AX, Microsoft Dynamics CRM, Microsoft Dynamics GP, Microsoft Dynamics NAV, and Microsoft Dynamics SL. The guidance, tools, templates and best practices provided in the methodology can help increase the consistency, timeframes, quality and success of the Microsoft Dynamics engagements.

*Sure Step has six phases: Diagnostic, Analysis, Design, Development, Deployment and Operation. The Diagnostic phase encompasses Solution Envisioning, and provides guidance on product capabilities, including content on focus industries for a corresponding product. The Decision Accelerator Offering is an important part of the Diagnostic phase, designed to reduce the risks and concerns for the customers in their decision making process for new/upgrade ERP/CRM solutions."*

It is not difficult to see the similarities between Sure Step and the waterfall model. With the exception of the diagnostic phase at the start of the Sure Step methodology, the phases are exactly the same. Both methods cover the full lifecycle of the solution, from planning the project to maintenance of the solution. Sure Step has some agile characteristics which makes it a bit easier to adapt to changes during the process, but overall the two methods are very much alike. Since the project team is Sure Step to manage the project, all documents will have Sure Step names and formats. That is why the documents that were produced during this graduation project will also make use the Sure Step format; it creates a sense of uniformity with the *Dynamic Entrance* project.

### 3.5.2.1 ANALYSIS PHASE

In order to give the reader an insight in how comparable Sure Step and the waterfall model are, we will review the first two phases of the Sure Step methodology: analysis and design. The Microsoft Dynamics Sure Step 2010 application describes each phase in detail and also offers flowcharts that list every general step that needs to be taken during this phase. Figure 3 shows a slightly compressed version of the analysis flow (steps that involve data migration and infrastructure were intentionally left out).

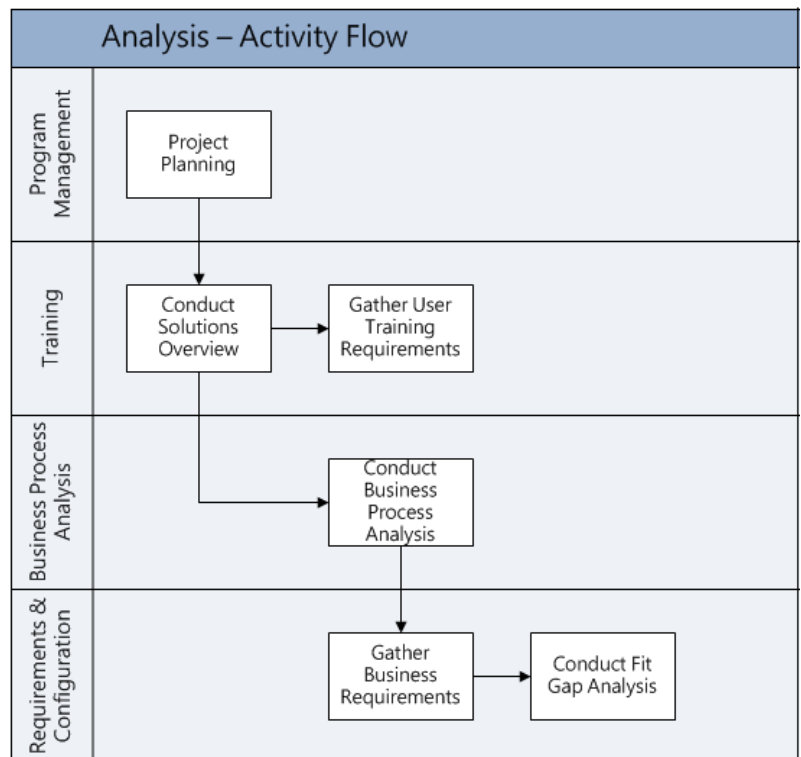


FIGURE 3: FLOWCHART OF THE ANALYSIS PHASE

The starting point is project planning, which makes sense, seeing that this is usually the first step in projects like these. Who will be working on which work stream? When do the business requirements need to be finished? When do we start with the fit/gap analysis? The next step, "conduct solutions overview", aims to help the (customer) implementation team, key users and other stakeholders to understand the standard, out-of-the-box functionality of the solution. This step is executed before the gathering of requirements to demonstrate that existing processes can be executed in a slightly different sequence or manner while achieving the same or better results.

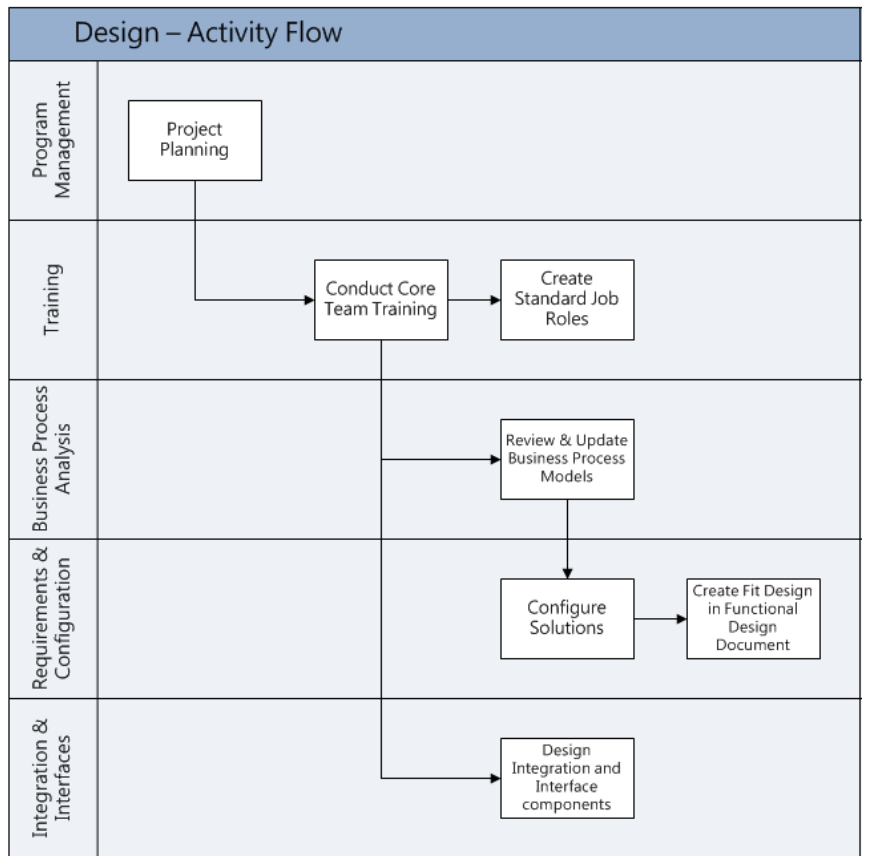
After this step is completed, the requirements for user training are gathered. These requirements usually consist of expectations from the end-users with different roles (business process owners, IT personnel and support functions) which are planned in parallel with the implementation plan. The other step that flows from the "conduct solutions overview" is called "conduct business process analysis". The purpose of this step is to define and align processes and to identify common objectives for future processes. Following that step is the gathering of business requirements. This is done by conducting requirements workshops whereby the supplier of the solution interviews the business process owners with the goal of finding out the requirements for a certain process.

In the case of the *Dynamics Entrance* project, the project team has conducted the workshops at Crawford (IDDS) in Sweden. This company was chosen as the first company to go live on Microsoft Dynamics AX 2012. The last step of the analysis phase is the fit/gap analysis. Now that the requirements are documented in functional requirement documents and the project team is aware of the standard functionality of the solution, the fits and gaps can be identified. Each business requirement is reviewed and confirmed as either a fit or a gap. For each gap, an initial recommendation is made on whether the gap should be resolved by a customization of the solution, implementation of a workaround, or adjustment of the business process.

#### **3.5.2.2 DESIGN PHASE**

The goal of the design phase is to define how the business requirements will be implemented. Another slimmed-down flowchart was made of the design phase (see figure 4 on the next page). The project planning is reviewed and edited based on the results of the analysis phase. The core team of the customer (business process owners) will be trained on the features and functions of the solution following the business requirements and fit gap analysis. Job roles are also defined in the design phase, based on the newly defined business processes.

During the previous phase, newly discovered requirements can lead to changes in the desired business processes. These changes are documented by updating the process flows for each business area. This is a continuous process (agile) that should be iterated throughout the project life cycle. The next step, "configure solutions", includes the configuration and set-up of application settings that are needed to meet the business requirements. Gaps that emerged from the fit gap analysis can be resolved by adjusting settings or by setting up independent software solutions.



**FIGURE 4: FLOWCHART OF THE DESIGN PHASE**

Of course some requirements were confirmed as a fit during the fit gap analysis. These fits might need some configuration and/or specific parameter settings which are documented in the next step: creating functional design documents. Functional design documents or FDDs are a key deliverable in the design phase since they contain all the settings and configurations of the desired solution.

The last step that is shown in the design phase flowchart is called "design integration and interface components" and this step is particularly interesting for this graduation project. The purpose of this step is to create a design for integration and interface components including data mapping, security and operational requirements.

The Sure Step methodology offers several templates for documentation of the project and it also has one for the requirements of the interface. This template can be found in appendix C. To summarize this chapter a flowchart was created that represents the simplified flow of the analysis and design phase combined (see figure 5 on the next page).

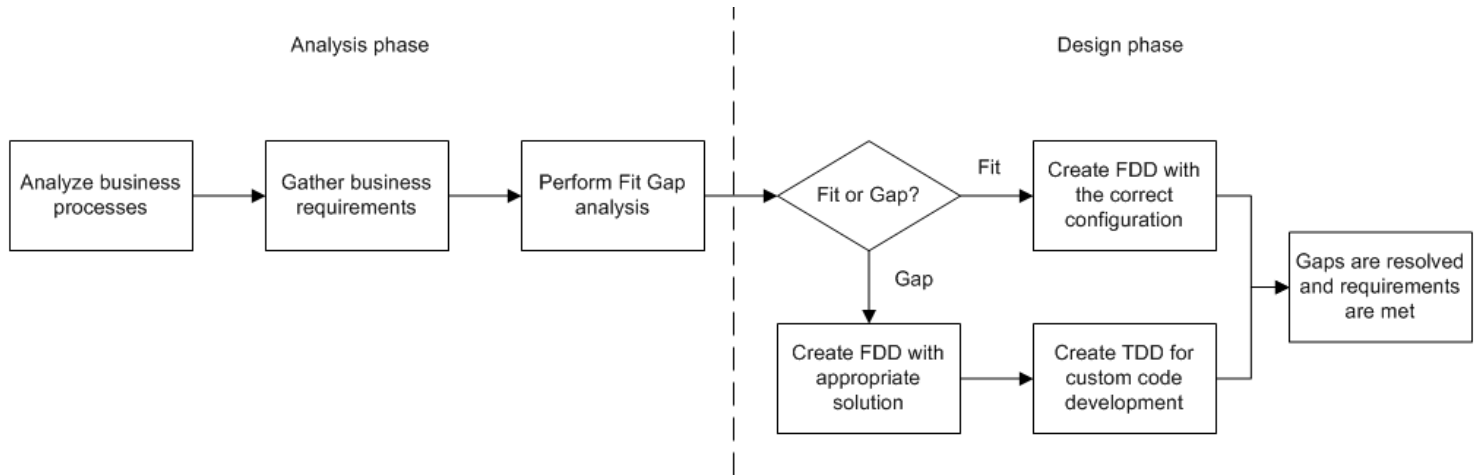


FIGURE 5: FLOWCHART OF THE ANALYSIS & DESIGN PHASE

### 3.6 RESEARCH MODEL

In this paragraph, a research model of the graduation project will be visualized (see figure 6). The research model can be seen as the summary of this chapter because it includes the goals, limitations and methods that are discussed in the previous paragraphs. The best way to "read" the research model is from right to left, that way the strategic goals of the project will be the starting point. From there, the research model states the performance that needs to be reached to accomplish the goals. The next step is a list of the methods and tools that can be used to reach the desired performance (i.e.: a seamless integration between AX and Field Vision). The desired performance can be further specified by stating the scope of the project ("where should the performance be applied?").

The limitations are linked to the scope of the project because the scope can be seen as a limitation itself. What follows are the actual steps that need to be executed to accomplish a seamless integration and the necessary input for these steps.

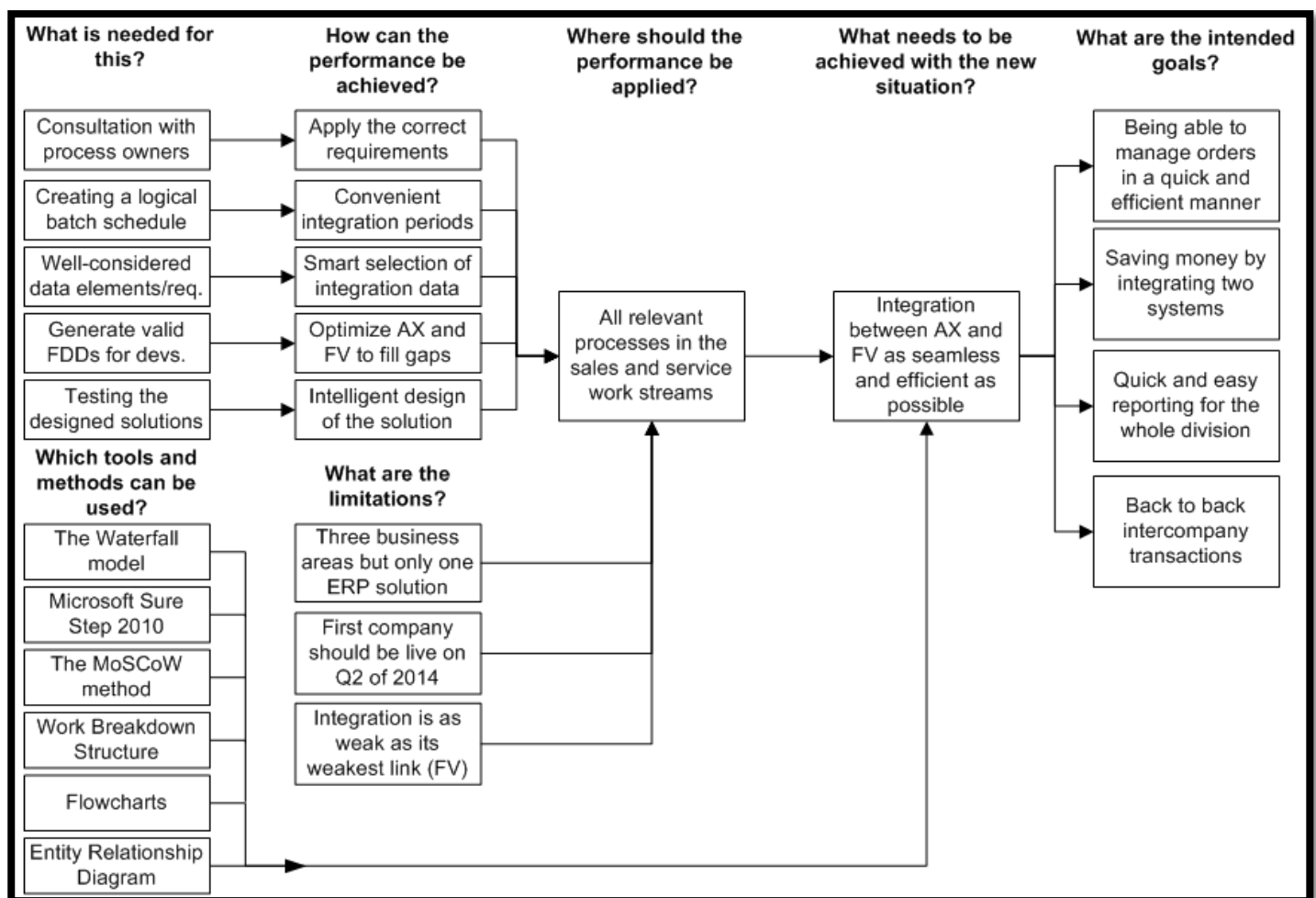


FIGURE 6: RESEARCH MODEL

### 3.7 PROJECT DELIVERABLES

Now that the different phases and documents of an implementation project have been explained, the deliverables of this graduation project can be listed. Note that some deliverables were added to provide the reader with a better understanding of the current integration.

#### Analysis phase deliverables:

- Review of the work stream structure
- Specification of the main processes of the sales to cash and service to cash work streams
- Selection and description of the relevant sub-processes within the two work streams
- Explanation of the current integration method
- Description of the current XML message structure
- Entity-relationship diagrams
- Review of the current integration frequencies
- Selection of requirements relevant to the AX – FV integration
- Functional Requirement Documents

#### Design phase deliverables:

- Overview of possible integration methods
- Selection of a suitable integration method
- Design of the chosen solution
- Functional Design Documents

#### Graduation project deliverables:

- Business case
- Conclusion and recommendations
- Finalized version of the bachelor thesis

## 4. WORK STREAM STRUCTURE AND MAIN PROCESS SPECIFICATION

### 4.1 WORK STREAM STRUCTURE

The *Dynamic Entrance* project consists of nine work streams which are designed to incorporate the complete business process of ASSA ABLOY Entrance Systems. Each work stream is numbered for organizational purposes, but more on this later. Overlap exists between the different work streams, but that is normal seeing that this is also the case for business processes. An elaborate overview of the different work streams and their corresponding main processes can be found in appendix D. What follows is a list of the nine work streams and the scope of each work stream:

- |                           |  |
|---------------------------|--|
| 1. Finance                | Includes all financial and accounting processes (budgeting, bookkeeping, managing assets etc.)                 |
| 2. <u>Sales to cash</u>   | Includes the complete new sales process, from the creation of a prospect to receiving payment.                 |
| 3. Purchase to pay        | Includes the complete purchasing process, from the issuance of a purchase order to payment.                    |
| 4. <u>Service to cash</u> | Includes the complete service process, from creating a service contract to receiving payment.                  |
| 5. Logistics              | Includes all logistic processes (transportation, warehouse management, order transfers etc.)                   |
| 6. Manufacturing          | Includes the complete production process, from receiving production orders to delivering complete products.    |
| 7. Product management     | Includes all product management related processes (price management, local & global products, PDM system etc.) |
| 8. HR support             | Includes all HR processes that can be supported by AX (this work stream has not been started yet).             |



9. IT support

Includes all IT processes that can be supported by AX  
(this work stream has not been started yet).

As can be seen on the image on the below, the *Dynamic Entrance* project is decomposed into smaller components with the use of a work breakdown structure (WBS). The *Dynamic Entrance* project is located at the top of the work breakdown structure and it can be seen as the header for the nine work streams. The next level contains the main processes of each work stream. If we follow the example of the image, one of the main processes in the service to cash work stream is called order management which is in turn a header for a set of sub-processes. A sub-process is already quite specified, but there is one more level beneath it: use cases. Use cases can be compared to work instructions because they usually consist of a list of steps describing interactions between an actor (employee) and a system. A numeration was devised because of the amount of levels in this work breakdown structure. Work streams are signified with a single digit, main processes have two digits, sub-processes have three digits and use cases have four digits.

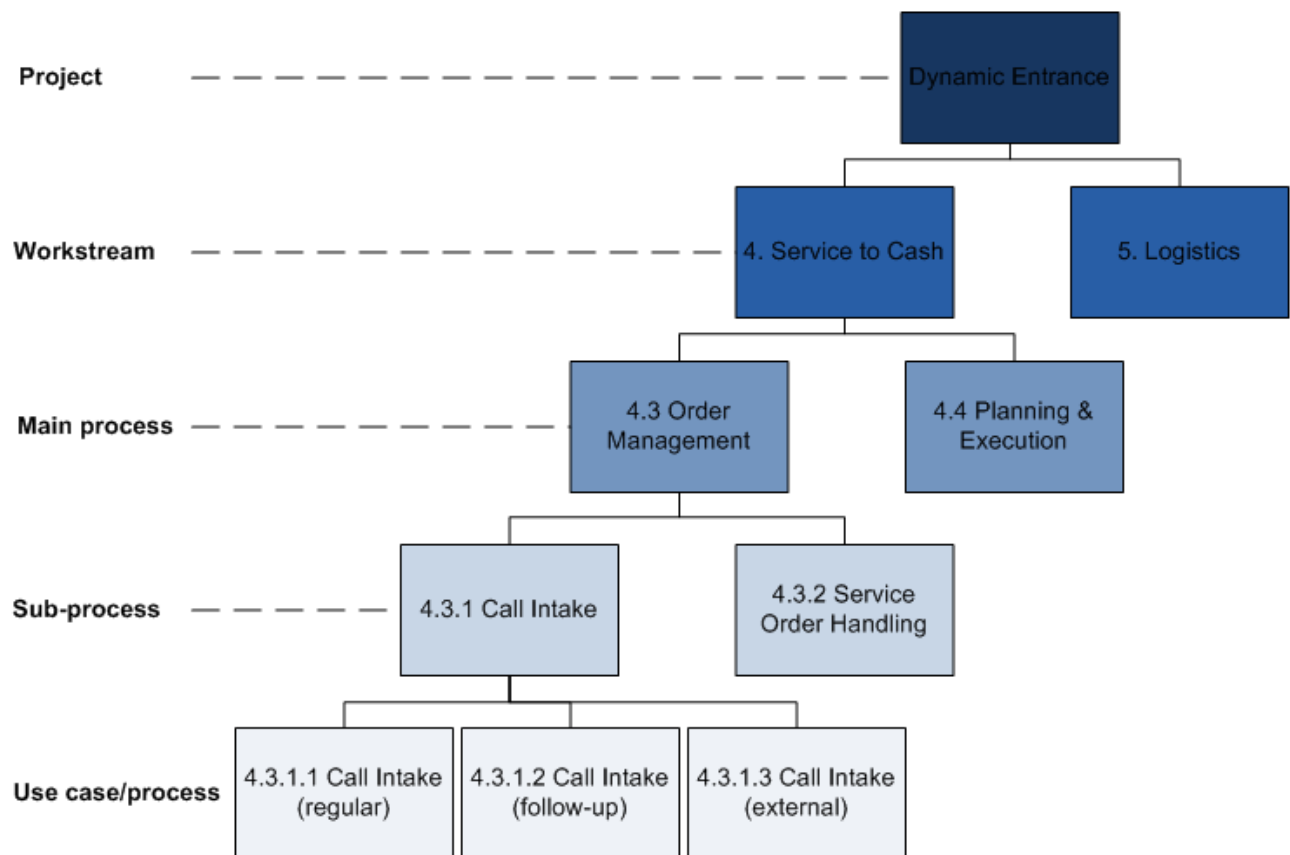


FIGURE 7: WORK BREAKDOWN STRUCTURE OF THE DYNAMIC ENTRANCE PROJECT

## **4.2 PROCESS SPECIFICATION OF THE TWO RELEVANT WORK STREAMS**

In this paragraph we will review the main processes that are represented by the two relevant work streams, namely sales to cash and service to cash. Because both work streams make use of several types of software, we will start with an overview of the relevant systems and their functions. After that, the main process of both work streams are visualized into simplified flowcharts to show what is and isn't included in these work streams (see paragraphs 4.2.2 & 4.2.3). Simplified, because trying to fit all steps from start to end in one image would result in an extremely large flowchart. That is why a more elaborate description of the different processes and sub-processes will be given later on (see chapter 5).

### **4.2.1 RELEVANT SOFTWARE**

#### **4.2.1.1 CRM SYSTEM**

As can be seen in the aforementioned flowcharts, information passes through three different types of software before the processes are finished. The first type of software is a CRM program called iSAC. CRM is an abbreviation for Customer Relationship Management and that is exactly what it does; it lets companies manage their current and future customers. AAES uses a custom-made CRM system to store its prospects, customer & contract information and to create quotes for customers. This system is used in both the sales to cash and service to cash work streams and consists of three different kinds of software: Microsoft CRM (CRM part), Tacton (product configurator) & GPC (global product catalog). In the sales process, it is used to create and manage prospects, customers and quotes. The service process makes use of iSAC when a customer does not yet exist in either the CRM or ERP system. iSAC is also used in the service process when the customer requests a quote for the replacement of (part of) an installation.

#### **4.2.1.2 ERP SYSTEM**

Next up is the ERP system which is the biggest of the three. ERP stands for Enterprise Resource Planning and is widely considered as the backbone of an organization. It is a software program that supports (nearly) all processes and their corresponding information flows within a company. From sales to invoicing and from manufacturing to distribution; ERP systems are able to automate it all. Besides supporting business processes, it also allows companies to quickly generate real-time reports which is useful for managers and executives. Other actions, like document management, workflow management, access to web services and searching specific information can also be carried out with an ERP system.

Currently, the ERP system that is mainly used within the Entrance Systems division is Baan 4.0, a program created by a Dutch company called The Baan Corporation. This company does not exist

anymore, but its products are still used throughout the world. Other ERP systems that are employed within AAES include M3, iScala, SAP and Crawmator. Now, the decision has been made to replace all current ERP systems with one ERP solution; Microsoft Dynamics AX 2012. In the sales to cash and service to cash work streams, Baan and the other ERP systems are used to:

- Create sales and service orders;
- Purchase materials;
- Manage inventories;
- Verify worksheets;
- Generate invoices;
- Perform accounting tasks;

#### 4.2.1.3 FIELD SERVICE SOLUTION

The third and final system that is relevant to the two work streams is the Field Service Solution (FSS for short). ASSA ABLOY Entrance Systems uses one Field Service Solution for all its subsidiary companies and that system is called Field Vision. This program was developed by Tensing, a Dutch company that is located in Zaltbommel and distributes its products to customers in Europe and the United States. Field Vision is used for the planning and registration of all service activities and some of the sales activities. Basically, it is the link between the office and the engineers. Sales orders that are created in Baan or one of the other ERP systems can include multiple tasks and for each task a service order is created and sent to Field Vision.

The table below summarizes the three relevant systems, their functions and integrations:

Type of software	CRM software	ERP software	Field service software
Application name(s)	iSAC	Baan/M3/iScala/Sap/Crawmator	Field Vision
<b>Main functions</b>	<ul style="list-style-type: none"> <li>• Creating prospects</li> <li>• Configuring installations</li> <li>• Creating quotes</li> <li>• Managing new customers</li> </ul>	<ul style="list-style-type: none"> <li>• Creating service orders</li> <li>• Purchase materials</li> <li>• Manage inventories</li> <li>• Verify worksheets</li> <li>• Generate invoices</li> <li>• Performing accounting and financial actions</li> <li>• Source system (master data)</li> </ul>	<ul style="list-style-type: none"> <li>• Planning service activities</li> <li>• Managing and monitoring mechanics</li> <li>• Registering work and materials</li> <li>• Link between the office and the field</li> <li>• Back-up source of historical data</li> </ul>
<b>Integrated with</b>	ERP software	CRM & Field service software	ERP software

TABLE 2: SUMMARY OF THE RELEVANT SYSTEMS

#### 4.2.2 SALES TO CASH MAIN PROCESS

For a flowchart of the sales to cash main process, see figure 8 on the next page. The sales to cash work stream starts with the acquisition of new prospects or customers. These customers, their visiting and invoicing addresses and other relevant information are entered in iSAC. This is also where the initial quote will be generated; the item configurator is used to configure installations and their specific values/features. The configurator of iSAC works in such a way that it recognizes whether or not a certain part should be added to the bill of materials based on the specification filled in by the salesman. When the customer has accepted the quote it is "released", meaning that it is transferred to the ERP system. If the quote was made for a new customer, the customer information needs to be entered in the ERP system before the quote can be sent over.

So the result from iSAC is that the ERP system is fed with a list of materials that either need to be produced by an AAES factory or purchased from another supplier. Once the correct materials have arrived, all items are gathered and sent to the right technician or customer location. The service order is sent to Field Vision where it is planned for the right technician. The technician receives this service order on his PDA and already has the materials needed so he can execute the installation. While sales projects always have a fixed price that was agreed upon by accepting the quote, it is still important for the engineers to register his or her hours and materials used. The main reasons for this are the ability to gather information about the execution of sales projects and the ability to check the hours worked of the mechanic. An invoice is generated based on the accepted quote and sent to the customer.

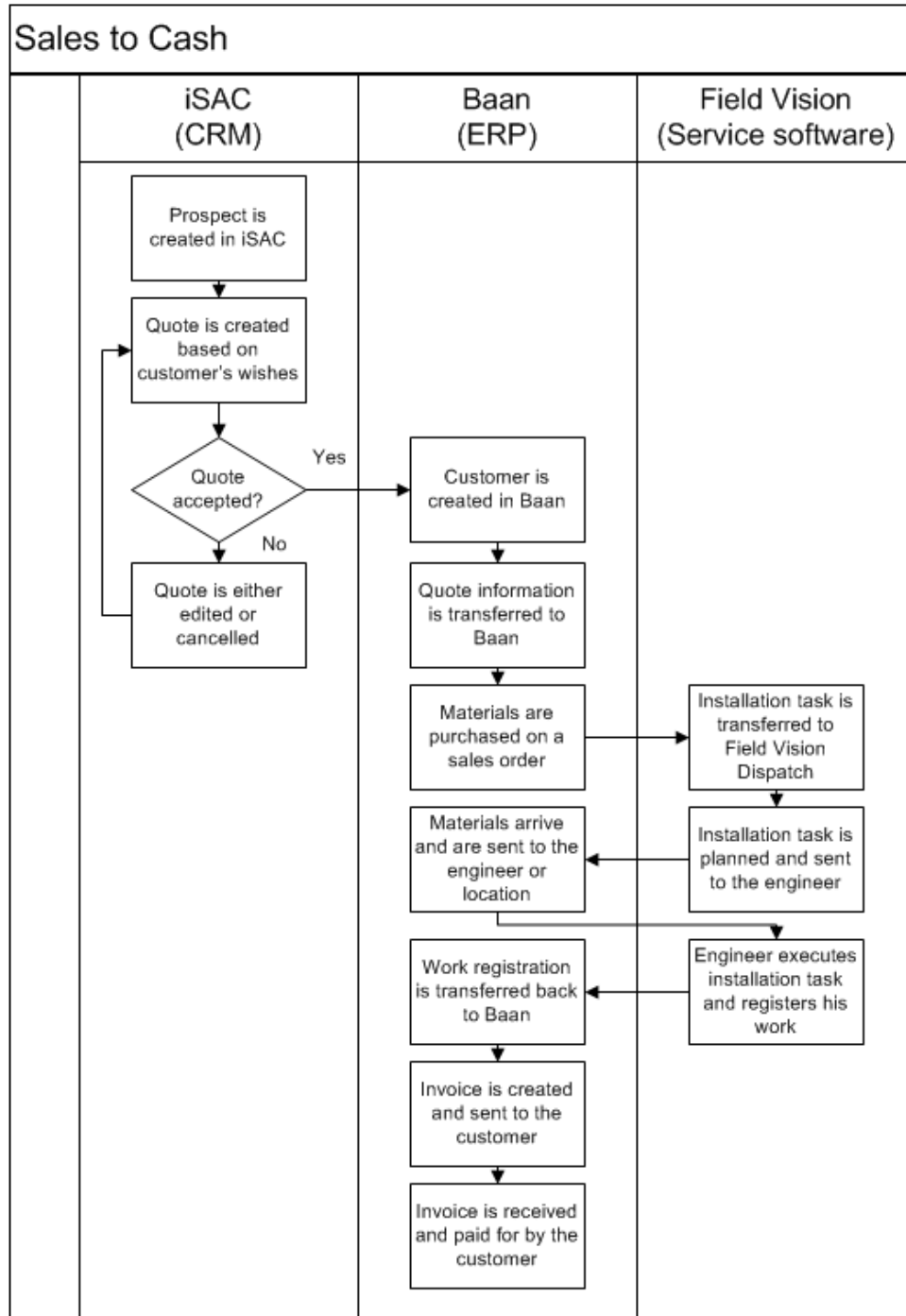


FIGURE 8: FLOWCHART OF THE SALES TO CASH MAIN PROCESS

#### 4.2.3 SERVICE TO CASH MAIN PROCESS

The service to cash main process is quite similar to the sales to cash process but differentiates in a couple of ways. The input for this process is either a customer calling to report a breakdown, a date on which planned maintenance needs to be executed or a tip from the mechanic that a certain installation could use an upgrade. These situations have one thing in common and that is the fact that these situations revolve around existing service objects. In the sales to cash work stream, the service object often needs to be installed first, but in this case the objects are already there. That is why the CRM system (iSAC) is hardly used in the service to cash processes; the customers already have a contract. The flowcharts on the next two pages show the simplified processes of the execution of breakdowns (figure 9) and planned maintenance (figure 10).

What happens next is dependent on the situation; if the customer called to report a breakdown, the customer care employee copies all relevant information to the service order. Information such as the service object that is broken down, contact person, invoice address, telephone number on site, a description of the breakdown et cetera. If planned maintenance needs to be executed, the ERP system will suggest dates based on the previous visit in combination with service agreement. For example: the service agreement states that preventive maintenance needs to be executed twice per year. If a location was maintained in November 2012, the ERP system suggests that the next visit is planned for May 2013. It can generate service orders (which are maintenance orders in essence) automatically so that the orders only need to be sent to the right engineer.

The engineer receives the service order on his PDA and can immediately see whether it concerns a breakdown or a maintenance because of a code given to the order. Once the service order is started by the engineer, the travelling time commences. On arrival at the customer, the engineer will change the status of the service order to "execution" which triggers Field Vision to end the travelling phase and start the work phase. All materials that are used are added to the service order and upon completion the service order is closed.

This triggers Field Vision to finish the work phase, calculate the time spent on each phase and send all this information back to the ERP system. Here, the information is verified and converted into an invoice order which is sent to the customer by either e-mail or regular mail. If the customer doesn't pay within the given time-limit, he or she will receive a couple of warnings and in the worst case a subpoena until the invoice is paid for. Maintenance invoicing is done differently; since maintenance costs are fixed and determined by the contract, a lot of customers have specific wishes for how and when they want to receive the invoice. These wishes are included in the contract in the form of agreements, but are not really relevant for this graduation project.

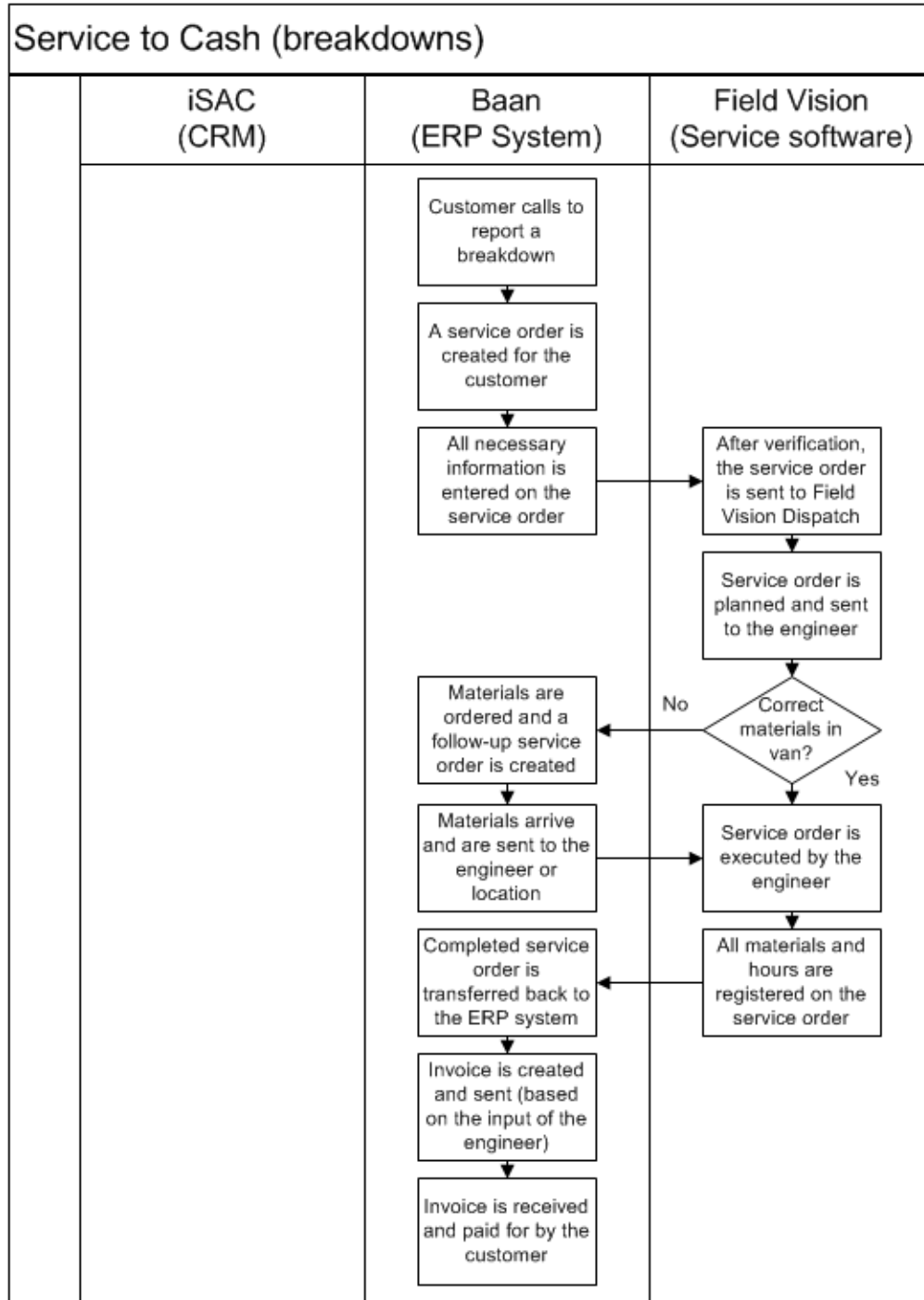


FIGURE 9: FLOWCHART OF THE SERVICE TO CASH MAIN PROCESS (BREAKDOWNS)

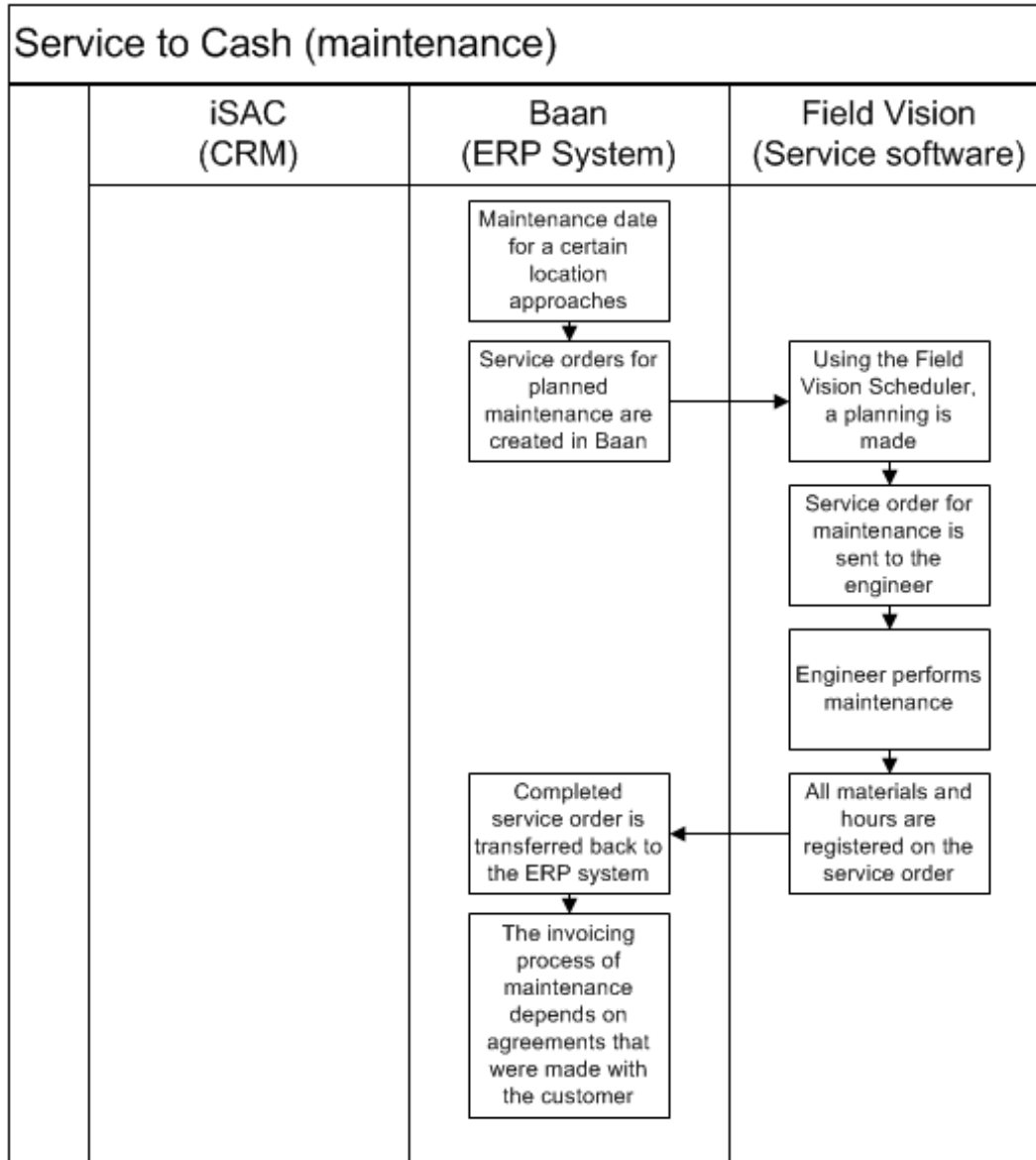


FIGURE 10: FLOWCHART OF THE SERVICE TO CASH MAIN PROCESS (MAINTENANCE)



## 5. ANALYSIS

The current and following chapters (5 - 9) will serve as the core of this bachelor thesis, including the analysis, solution, business case and conclusion and recommendations. In the core we will review and answer the sub-questions and main question while also describing the current (IST) and the desired situation (SOLL). The sub-questions that will be answered by the end of this chapter are sub-questions 1 through 4.

### 5.1 SUB-QUESTION 1

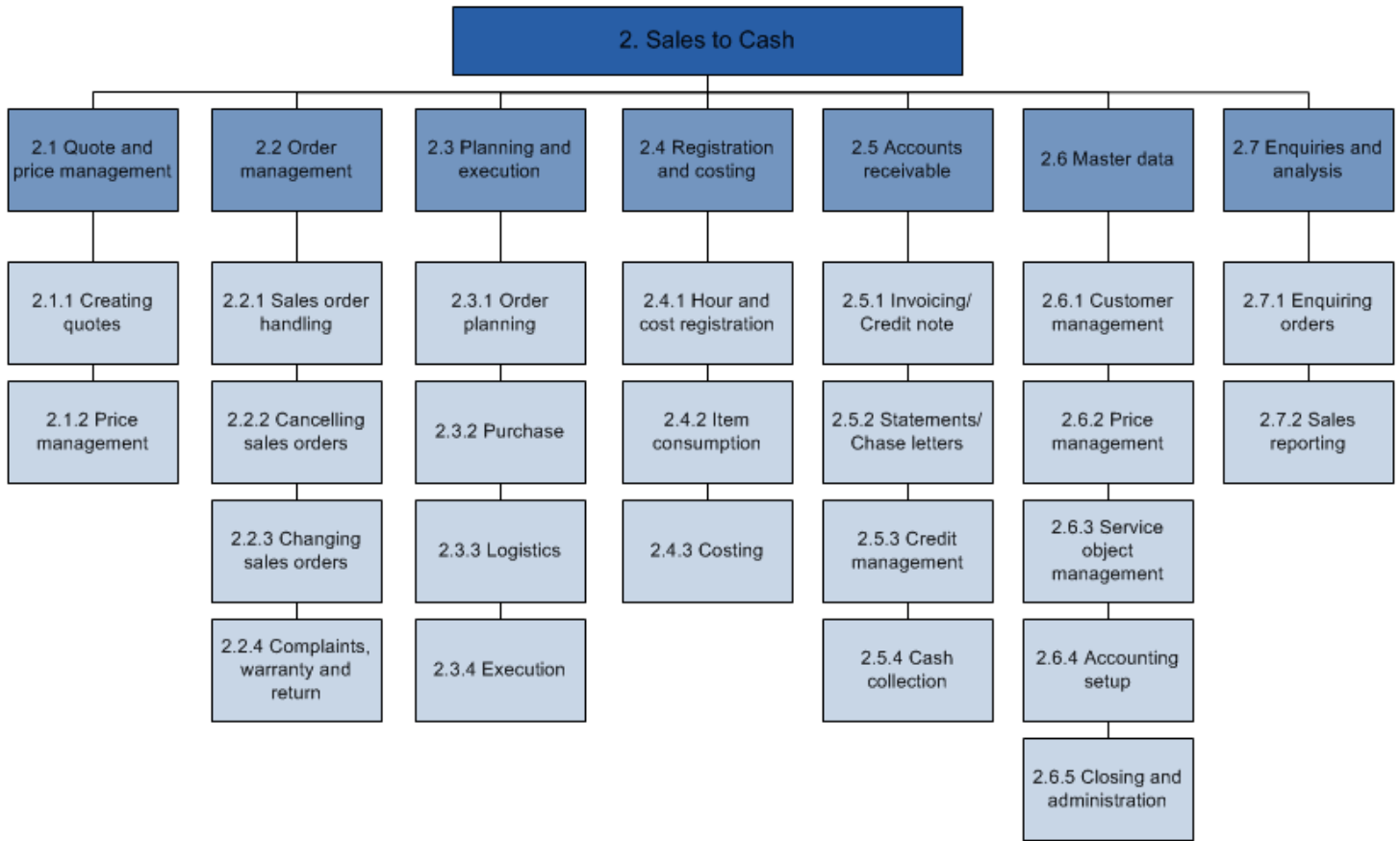
*"WHICH PROCESSES ARE INCLUDED IN THE SALES TO CASH AND SERVICE TO CASH WORK STREAMS?"*

By reading the previous chapters, it should be clear how the work streams are structured. Additionally, a general description (and depiction) of the main processes of the two relevant work streams was given. In this paragraph we will zoom in on the work streams by decomposing them according to the work breakdown structure that was used in paragraph 4.1. This paragraph will be relatively short because the goal of this sub-question is to simply give an overview of the main and sub-processes of the two work streams. The next sub-question and paragraph will be used to select and describe the processes that are relevant to the integration.

#### 5.1.1 SALES TO CASH MAIN AND SUB-PROCESSES

Because the sales to cash process usually takes place before the service to cash process, we will start with an overview of the main and sub-processes of the sales to cash work stream (see figure 11 on the next page). The same color coding from paragraph 4.1 was used to indicate the difference between a main and a sub-process more clearly. The following main processes are present in the sales to cash work stream:

2.1 Quote management	Includes the creation, issuance and acceptance of sales quotes.
2.2 Order management	Includes the creation, editing and cancelling of sales orders.
2.3 Planning and execution	Includes the planning and execution of sales activities.
2.4 Registration and costing	Includes the registration of hours and items of sales activities.
2.5 Accounts receivable	Includes the invoicing, credit management and cash collection of sales activities.
2.6 Master data	Includes the management of master data that is used by the sales to cash work stream.
2.7 Enquiries and analysis	Includes the reporting and analysis of sales activities.



**FIGURE 11: WORK BREAKDOWN STRUCTURE OF THE SALES TO CASH WORK STREAM**

### 5.1.2 SERVICE TO CASH MAIN AND SUB-PROCESSES

The same diagram was created for the service to cash main and sub-processes (see figure 12 on the next page). The main processes of the service to cash work stream include:

- |                              |   |
|------------------------------|---|
| 4.1 Quote management         | Includes the creation, issuance and acceptance of service quotes.   |
| 4.2 Contract management      | Includes the creation, editing, renewing and cancelling of (service) contracts.   |
| 4.3 Order management         | Includes call intake of breakdowns and the creation , editing and cancelling of service orders as well as car and warehouse management. |
| 4.4 Planning and execution   | Includes the planning and execution of service activities.  |
| 4.5 Registration and costing | Includes the registration of hours and items of service activities.   |

4.6 Accounts receivable

4.7 Master data

4.8 Enquiries and analysis

Includes the invoicing, credit management and cash collection of service activities.

Includes the management of master data that is used by the service to cash work stream.

Includes the reporting and analysis of service activities.

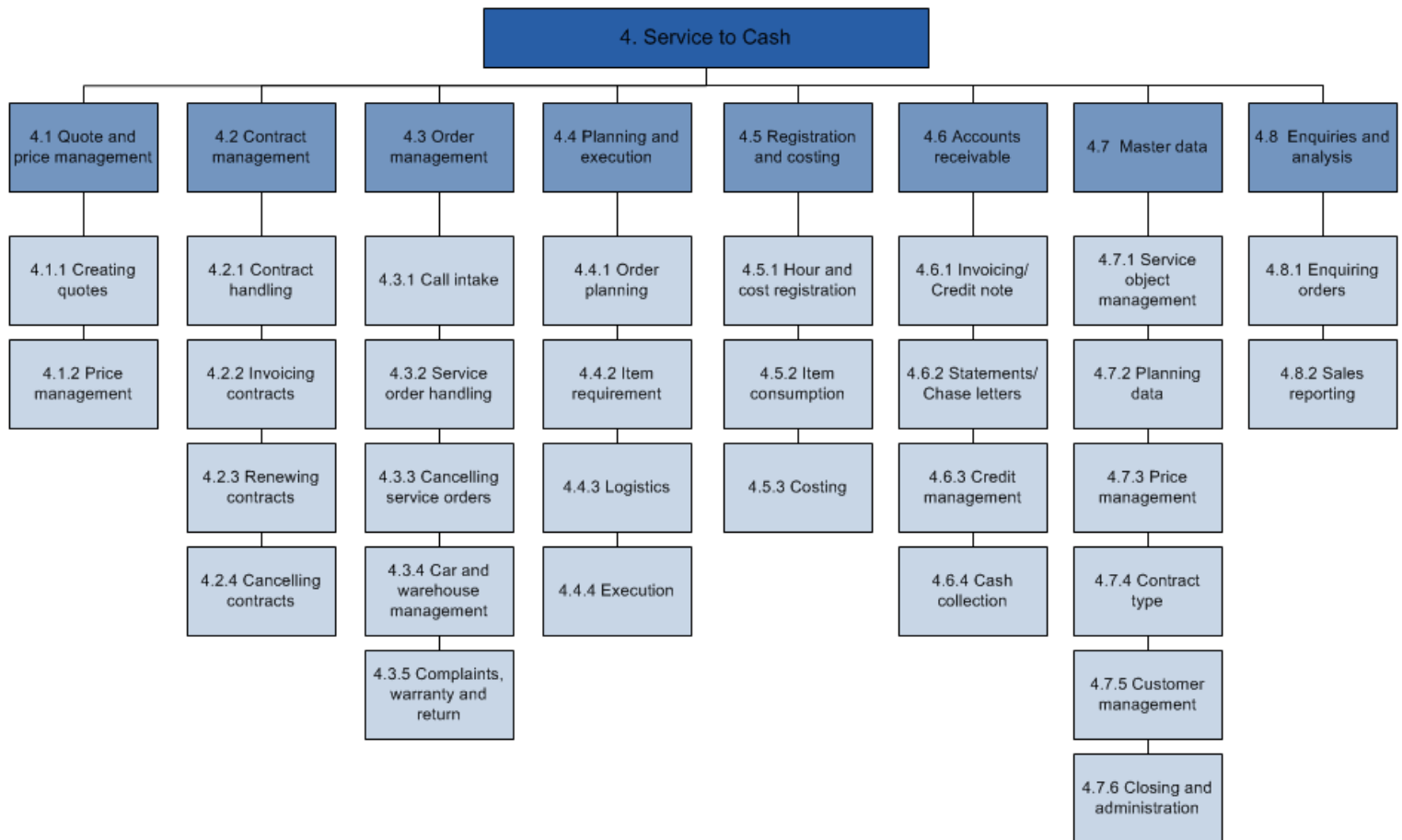


FIGURE 12: WORK BREAKDOWN STRUCTURE OF THE SERVICE TO CASH WORK STREAM

### Summary of the answer to sub-question 1

The sales to cash and service to cash work streams include all processes from the creation of quotes (sales) and contracts (service) to the receiving of payment for performed activities.

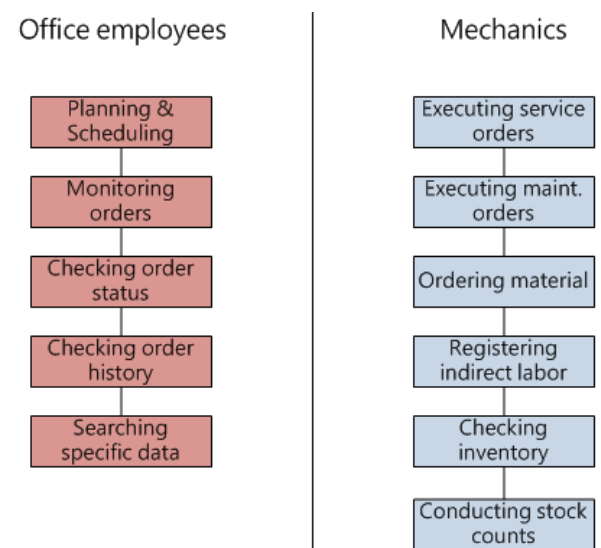
## 5.2 SUB-QUESTION 2

*"WHICH OF THESE PROCESSES ARE CURRENTLY INTEGRATED WITH FIELD VISION AND HOW?"*

In the previous paragraph, an overview of all main and sub-processes of the two relevant work streams was given. However, the flowcharts from paragraphs 4.2.2 and 4.2.3 have shown that Field Vision is only used for parts of the main processes of the sales to cash and service to cash work streams. This paragraph will be used to determine and describe which processes are currently integrated with Field Vision. The method that is used for the current integration will also be reviewed. Because there are two different groups of Field Vision users, the first thing to do is to split up the processes that are currently integrated into two groups.

### 5.2.1 FIELD VISION USER GROUPS

A separation can be made in the types of users of Field Vision; there are office employees, like planners and customer care workers on the one hand and mechanics on the other hand. Office employees use Field Vision to plan, monitor and manage service and maintenance orders whereas mechanics use Field Vision to execute and register service and maintenance orders, order material and check their inventory. The application that is used by office employees is called Field Vision dispatch. The mechanics use a mobile client of Field Vision that can be run on their PDAs. Figure 13 shows the two different user groups and their processes.



**FIGURE 13: OVERVIEW OF THE TWO FIELD VISION USER GROUPS**

### 5.2.2 FIELD VISION OFFICE PROCESSES

Let's start with having a look at the processes of the office employees. Each process will be explained and some will be illustrated with screenshots from the Field Vision dispatch application. There will also be references to the work breakdown structures of the two work streams that were shown in the paragraph 5.1. This is done to show the connection of the process to the *Dynamic Entrance* project. Furthermore, the input and output of each process will be summarized at the start of each description.

### **Planning & Scheduling – WBS reference = 2.3.1 & 4.4.1**

- Input: unplanned service and maintenance orders
- Output: planned service and maintenance orders based on region, skill and capacity

This is the main function of Field Vision for office employees. The way that orders are planned differs within the ASSA ABLOY Entrance System companies. There are two possible options for planning service orders with Field Vision: automated planning and manual planning. Automated planning involves designing the ERP system in such a way that it splits up the whole region into smaller sub-regions. A mechanic is appointed to each sub-region and when a service order is created, the ERP system will compare the address of the customer with the pre-defined sub-regions. If the address is a match with one of the sub-regions, the order will be automatically sent to the PDA of the responsible mechanic without involvement of a planner.

Alternatively, some countries prefer to not divide the region into smaller sub-regions as this can become problematic when planning orders for high-density urban environments. Two major examples of countries for which this applies are the United Kingdom and the United States. In these countries, orders that are created by the ERP system are manually planned to prevent overflowing agendas. The orders "arrive" in the Field Vision dispatch application first and are then reviewed by the planner and allocated to a mechanic who has time and is near the customer. When the right mechanic has been found, the order will be sent to his PDA.

Note that this leads to two different ways of planning; the planners in countries that use automated planning don't actually plan orders but are there to monitor and re-plan orders whereas planners in countries that use manual planning are planners in the true sense of the word. This also has consequences for the way that orders are managed by the mechanics, but more on that in paragraph 5.2.3.

Figure 14 on the next page shows a screenshot of the Field Vision Dispatch client that is used by planners to view, plan and re-plan service orders. The screen can be divided into five different sections which are numbered in the screenshot:

- |                        |  |
|------------------------|--|
| 1. Field Vision menu   | Users can select which menu they want to use;  |
| 2. Planning parameters | Users can customize the way in which Field Vision presents planning information;               |
| 3. Map:                | Users can select an order from the plan board which then appears on the map (can be expanded); |
| 4. Order information   | Users can view the relevant information of an order;   |

## 5. Plan board

Users can view the agenda of each mechanic and select orders;

The screenshot displays the FieldVision Dispatch NL interface. The top navigation bar includes tabs for Service Info, Plan Info, Order Info, Rapportage, and Log uit. The main workspace is divided into several sections:

- Planning (Left Panel):** Includes a Refresh button, a date selector (13-06-2013), a Monteurgroep (Service Sa) dropdown, a Regio dropdown, a Kaart selectie dropdown (Aan), a Planbord section with checkboxes for Ordernr, Tijd, Status, Type, Locatie nr, Postcode, Woonplaa, Gereed, and To Plan, and an Aantal dagen dropdown (1).
- Landkaart (Map):** A map of the Netherlands showing various cities and locations. A specific location is highlighted with a blue box labeled "131892 | DELFT".
- Order gegevens | 131892 (Right Panel):** A detailed view of the selected order. It includes sections for Locatie gegevens (Location nr, Location name, Adres, Postcode, Woonplaats, Installatie, Omschrijving, Servicepakket, Srv.pak code, Servicing) and Activiteit gegevens (Type, Laatste uitv., Symptoom, Probleem, Oplossing, Cause, externe referentie, Opmerking). The order details include contact information for Dhr. M. Pigmans and service details for a DSM G.618 Entree links.
- Planbord | Donderdag 13-06-2013, #24 (Bottom Panel):** A grid showing the agenda for various mechanics. Each entry is color-coded by status: In Progress (red), To plan (yellow), Read (green), and Planned (blue). The grid lists mechanics such as 2AA 722 C. Romijn, 2AB 668 P. van Rijn, 2AC 710 R. Kolu, 2AD 696 J. van der Stel, 2AE 723 S. Fierst, 2AF 640 H. Tas, 2AG 650 H. Rebbouh, 2BA 678 M. de Bruin, 2BB 364 R. Brouwer, 2BC 362 M. de Graaf, and 2BD 651 C. Birsan.

FIGURE 14: SCREENSHOT OF THE PLANNING SCREEN OF THE DUTCH FIELD VISION DISPATCH CLIENT

The presented screenshot was made of the Dutch version of Field Vision, so most of the menu titles are written in Dutch as well. A lot of planning information is presented in this screen, especially in the fourth section (order information). This information originates from the ERP system and is transferred by the Baan – FV integration when the order is released in Baan. If the AAES sub-company uses automated planning, the order will be assigned to the correct mechanic and can be viewed on the plan board.

Each colored block on the plan board represents a service order, maintenance order or indirect task. A color coding is used to define the status of the order/task which makes it easier for the planner to instantly see the location of each mechanic and status of his orders. A red block indicates that an order is in progress, white blocks are orders that are planned, yellow blocks indicate that the mechanic has read the order but has not yet started it and green orders are not yet planned. Companies that don't define sub-regions (UK & US) will have mostly green orders because the orders are planned in Field Vision instead of the ERP system.

### Monitoring orders – WBS reference 2.3.1 & 4.4.1

- Input: Service orders and their statuses and priorities
- Output: Overview of the statuses and urgencies of all service orders

Monitoring orders is another task that is carried out by the planners and this is mostly done by using the escalation screen in Field Vision. Each order that is generated in the ERP system is given a priority which is based on the service agreement. These priorities are linked to a certain time span in which the orders need to be executed (for example: urgent orders have to be executed within 4 hours). When the order is released to Field Vision, the ERP system creates a planned date and time that is calculated by adding the amount of days of a certain priority to the current date. The result is the latest possible date on which the order must be executed. Field Vision monitors these dates by comparing them to the current date and gives the planners a sign when an order is past the due date.

Orders zoeken				
Escalatie	Orderlijst	Ind taak		
Escalatie				Aantal
Breakdowns over planning date				29
Priority Orders over planning date				62
Breakdown orders not received > 1 hour				0
Blank order, Baan order no to fill				0
Refused orders				0
Create follow-up order				0
Ordernr	Engineer	Descript	Locationname	City
109778	4BG 720 M. van Asselt	Storing	Dienst Regelingen	ASSEN
117805	4CE 393 M. Olthuis	Storing	Rabobank Achterh...	BORCULO
126006	4BE 682 Rudi Bos	Storing	Parkheem	STADSKANAAL

FIGURE 15: SCREENSHOT OF THE ESCALATION SCREEN (FIELD VISION DISPATCH)

An overview of these orders can be found in the plan info sub-menu (see figure 15). Based on this information, the planner can choose to seek contact with the mechanic about the status of the order, call the customer to give him an update, re-plan the order or do nothing. Besides checking which orders are past their due date, planners can also get an overview of any non-received orders, blank orders, refused orders, or follow-up orders.

Non-received orders can occur if the mechanic has his PDA turned off or if there is a problem with the connection. This is useful information for the planner, especially if the order has a high priority. Blank orders are orders that can be created by the mechanic on his PDA without having to create an

order in the ERP system. If for example an order is not properly received on the PDA of a mechanic, he is able to quickly create an order that can later be linked to a Baan order. A mechanic is also able to refuse an order; this can happen when he or she has a good reason not to execute the order. The last escalation type is follow-up orders. These are orders for which the mechanic has indicated that another visit is necessary, the planner can view these orders in the escalation screen and creates a new order in the ERP system. Because most of the escalations are managed by Field Vision itself (except sending over the max. planned date) they are excluded from the integration.

#### **Checking order status – WBS reference 2.3.1 & 4.4.1**

- Input: status of service orders unknown
- Output: up-to-date status of any possible service order

This process mostly applies to customer care employees but planners often check order statuses as well. The trigger for this process is usually a customer who contacts an AAES company with a question about an order. These questions normally arrive at the customer care department where they are dealt with by one of the customer care employees. Customers often call for status updates, but sometimes e-mail or even fax is used to contact the customer care department. In case of a phone call the customer usually expects a fast response so it is important that the information is easily accessible. Field Vision offers fast accessibility by having a search option that can be used to look up a customer (see "searching specific data" on the next page).

For instance: a customer calls with a question about a breakdown order that was reported two days ago. The customer care employee asks for the zip code of the location and enters this in the correct search field in Field Vision. Field Vision presents the customer care employee with a list of all customers with that zip code after which the employee selects the right customer. Field Vision then presents a list of all orders for that customer (both executed and planned). After selecting the order, the customer care employee is able to see the status of the order and he or she can provide the customer with an answer. In some cases the customer care employee will put the call through to the responsible mechanic who can usually provide an even better answer as to why the order isn't executed yet or when the order will be executed.

#### **Checking order history – WBS reference 2.3.1 & 4.4.1**

- Input: historical order information unknown
- Output: overview of all historical actions per service object or location

Being able to check the history of an order or the history of a location/service object can also be useful for customer care employees and other office employees. Field Vision stores all orders in its



database, so it is possible to view an order that was executed many years ago (see screenshot below). This can be helpful for when a customer disagrees with an invoice that was sent to him. If this situation arises, the customer care employee will be able to see exactly who has executed the order, how long it took him to finish the order, what materials were used and if any comments were added to the order. So Field Vision is used as a back-up for every order that has ever been planned. This can prevent a lot of awkward situations where the customer says one thing and AAES another. It can also be used to discover installations with lots of breakdowns or to compare the effectiveness of mechanics.

Order geschiedenis			
Archief data			
Ordernummer	Monteur	Activiteit	Geplande datum
931546	2AF 640 H.Tas	Onderhoud	24-04-2013
931545	2AF 640 H.Tas	Onderhoud	24-04-2013
122854	2AF 640 H.Tas	Storing	08-04-2013
863744	2AF 640 H.Tas	Onderhoud	13-11-2012
Historie: 4 regels gevonden			

FIGURE 16: PARTIAL SCREENSHOT OF THE ORDER HISTORY SCREEN

#### Searching specific data – WBS reference 2.6 & 4.7

- Input: certain information regarding locations/installations/service orders unknown
- Output: satisfactory knowledge about locations/installations/service orders

While this topic has already been raised at previous processes, we will have a quick look at the search function of Field Vision. As has been mentioned in the previous sections, planners or customer care employees often need to look up certain information in Field Vision. The search

Zoeken	
Locatie nr	Installatie
Zoeken	Reset
Locatienr	<input type="text"/>
Location name	<input type="text"/>
Postcode	<input type="text"/>
Adres	<input type="text" value="Nijenoord 1"/>
Huisnummer	<input type="text"/>
Woonplaats	<input type="text"/>
Telefoon	<input type="text"/>

FIGURE 17: SCREENSHOT OF THE SEARCH SCREEN (FIELD VISION DISPATCH)

function fulfils that need. Figure 17 shows the different search fields that can be used to look up a customer, installation or order. Again, the language of the Field Vision dispatch version is not the same as the language of this bachelor thesis so what follows is an English summary of possible search fields: location number, location name, zip code, address, house number, city, phone number, installation number and installation type.

When the inserted information is a match with corresponding fields in the FV database, Field Vision displays all matches. Figure 18 shows that only one match could be found. The user is able to view the history of the location (all orders on every object of the selected customer) and it is also possible to see what objects are present on the selected location.

Zoekresultaat locatie				
Locatienr	Naam	Postcode	Adres	Woonplaats
L001-4014	Hogeschool Utrecht	3552 AS	Nijenoord 1	UTRECHT
Zoekresultaat installatie				
Installatie	Omschrijving	Install. type	Install. datum	Contract
1000-3499	Doorgang elektrisch hek	Electrisch schuifhek	05-05-1985	

FIGURE 18: SCREENSHOT OF THE SEARCH RESULTS (FIELD VISION DISPATCH)

### 5.2.3 FIELD VISION FIELD PROCESSES

Next up are the Field Vision processes that are carried out by the mechanics in the field. While some of these processes have been mentioned in previous paragraphs, this paragraph will show the processes from the perspective of the mechanic. The same format will be used to describe the processes: a brief explanation combined with screenshots of the Field Vision mobile client, a reference to the Work Breakdown Structure from paragraph 5.1 and the input and output of each process.

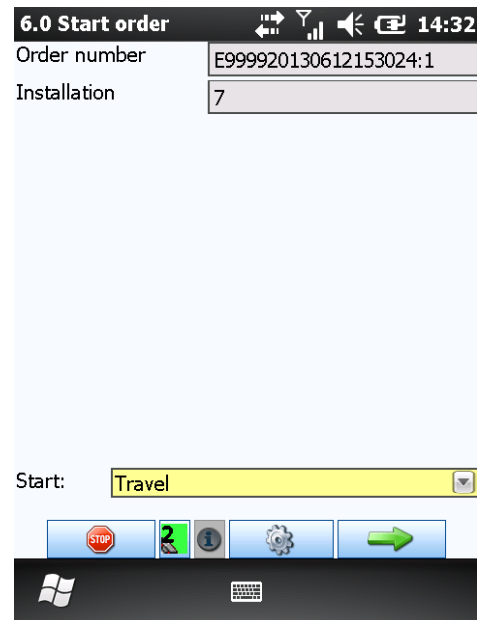
#### Executing breakdown orders – WBS reference 4.4.4, 4.5 & 4.7

- Input: "blank" service order created for a specific customer, object and breakdown
- Output: registration of executed work, consumed items and the chosen solution

This process is often the biggest reason for companies to implement field service solutions like Field Vision. Mechanics are able to digitally register their labor and material consumption and by integrating this information stream with an ERP system, a lot of "paper processes" can be eliminated. Being able to support this process is the largest part of the integration because a lot of information needs to be available for the mechanic to properly register his or her labor. Data elements that need to be integrated include: order information, customer location, installations, opening hours, status updates, item information, stock information and so on. More information regarding data elements can be found in paragraph 7.3: Sub-question 3.

The first thing the mechanic sees when he or she starts the mobile client of Field Vision is his agenda. All open orders that are planned for his sub-region are visible and it is possible for the mechanic to preview an order without starting it. In countries where orders are automatically planned this can come in handy for comparing the priorities of the different orders. The mechanic can also see whether the order is a service/breakdown order or a maintenance order. The process that will be described in this paragraph is about carrying out service orders, maintenance orders will be discussed later.

When the mechanic has selected a service order that he feels is the most urgent or efficient to begin with, he officially starts it (see figure 19). This action triggers the Field Vision application to create a time stamp of the current time that will be used as the "start travel time" and that is exactly what the mechanic does next; he travels to the location of the service order. Upon arrival, the mechanic initiates the next step of the process: "start work time". Another time stamp is created by Field Vision to indicate the end of the travelling time and the start of work time.



**FIGURE 19: SCREENSHOT OF THE SERVICE ORDER SCREEN (MOBILE CLIENT)**

A distinction between the two is made because the work hours that are registered can in most cases be directly invoiced to the customer. Travelling time is registered for reporting and managing purposes; it makes it easy to compare the amount of time that mechanics spend travelling.

During the work time, the mechanic is able to add items to the order that were consumed by fixing the breakdown. Any comments on the breakdown can also be added to the service order. If the visit to the customer takes place around lunch time, there is an option for the mechanic to pause the work time and take a 30 minute break. Another important issue regarding service orders are problem, cause & solution codes. These are generic codes/texts that describe the problem, cause and solution of the breakdown order. This information is registered in Field Vision and will be available for future references and reporting. The mechanic is generally responsible for assigning the correct codes to the breakdown, although the customer care employee is also able to initially assign a symptom code to the service order. At the end of this process, the customer gets to see a summary of the service order and is able to sign with a digital signature. Several Field Vision screenshots of the service order process can be found on this page including descriptions.

**6.2 Execute** 14:36

Order number: E999920130612153024:1

Installation: 7

Problem: [i]

Type: [v]

Remark (labour): [i]

Remark (internal): [i]

Pictures Questionnaire Materials

Go to: Finalize [v]

[STOP] [1] [i] [gear] [green arrow]

[Windows logo] [Keyboard icon]

FIGURE 20: SCREENSHOT OF THE COMMENTS SCREEN

**8.9 Find materials** 14:38

Item number: 192001

Item name: [ ]

Warehouse: ☒ DVE [v]

Find [ ]

Items

Nr.	Description	Stock
19200157	Tryckkn. ZB2-BA335	9999,0 unit
19200163	Kabel EKKR 10x1.5	9999,0 unit
19200168	Kontaktdon ZB-BZ111	9999,0 unit
19200170	Terminal block	9999,0 unit

[back] [0] [i] [gear] [green arrow]

[Windows logo] [Keyboard icon]

FIGURE 21: SCREENSHOT OF THE FIND MATERIALS SCREEN

**7.1 Finalize** 14:46

Problem: [.] [v]

Cause: [.] [v]

Solution: [.] [v]

Operat. hrs prev.: 0

Operat. hrs: 0

Remark (external): asdf [i]

[2] [i] [gear] [green arrow]

[Windows logo] [Keyboard icon]

FIGURE 22: SCREENSHOT OF THE PROBLEM/CAUSE/SOLUTION SCREEN

**7.2 Signature** 14:47

Signee: u [v]

Approval: Yes [v]

Show overview [ ]

E-mail client: ☐ [ ]

sign here [ ]

[0] [i] [gear] [green arrow]

[Windows logo] [Keyboard icon]

FIGURE 23: SCREENSHOT OF THE SIGNATURE SCREEN

### **Executing maintenance orders – WBS reference 4.4.4, 4.5 & 4.7**

- Input: "blank" maintenance order created for a specific service object
- Output: registration of time spent on travelling and maintaining the service object

Maintenance orders are executed in a way similar to service orders. The main difference is the fact that the workflow in the Field Vision mobile client is arranged differently from that of a service order. The difference between a breakdown and a maintenance order can be recognized by Field Vision by looking at the order type. An order type is given to an order upon creation in the ERP system; maintenance orders are generated based on the type of contract the customer has whereas breakdown orders are generated on an ad hoc basis. There are different types of service contracts used by AAES, each with different features, but all of them include planned maintenance. The price of the contract depends on the amount of service objects on location, the types of service objects, the amount of maintenance visits and any additional wishes of the customer.

When an agreement has been reached, the customer is obliged to pay the price of the contract and AAES is obliged to provide service according to the terms of the contract. It could be possible that a location requires two planned maintenance visits annually. If that same location was covered by an AAES contract the previous year, Field Vision is able to calculate the optimal dates for maintenance based on the visits from the previous year. When the optimal date for maintenance approaches, the maintenance orders are generated in Baan. These orders are then sent to Field Vision, but not yet to the mechanic's PDA. The actual planning of maintenance orders is carried out by the Field Vision scheduler. This tool is able to take into account factors like distance, workload and skill sets and automatically creates a maintenance schedule for every existing maintenance order.

When the schedule is accepted by the planners, the mechanics will start receiving maintenance orders in their agendas. These are easily recognized because of the displayed order type. In some countries, the mechanic will seek contact with the customer to check if the suggested maintenance date also works for the customer. In other countries, a planner will make the appointment for maintenance. It could be possible that another date has to be picked because the suggested date is not suitable as the customer expects a lot of visitors, making it difficult and disturbing to perform planned maintenance on the main entrance. When the suggested date works out for the customer, the mechanic can start the maintenance order in the same way that he or she would start a breakdown order.

The difference is, as mentioned earlier, the workflow in the mobile client. Because the maintenance has already been paid for, registering travel and work hours might seem less relevant but this is not the case. One of AAES's goals is to be able to report results for the whole division. This includes

maintenance results. That is also why AAES chooses to generate maintenance orders based on service object instead of location. Generating maintenance orders based on location would be easier and faster, seeing that a lot less maintenance orders would be necessary, but creating one maintenance order for every service object has its advantages. It enables AAES to receive information about their performance. This decision makes it possible for AAES to calculate the average maintenance time of a certain service object or object type, but also the costs and profits. This information can be used to manage maintenance visits better and to prevent unprofitable maintenance. One disadvantage of generating maintenance orders based on service objects is the fact that big locations will create a lot of maintenance orders which can lead to a lack of oversight in the agendas.

The workflow of a maintenance order consists of the same time registration as that of a breakdown order, but the difference lies in the activities. With breakdown orders, the cause for the breakdown has to be found and fixed, whereas maintenance orders are periodic check-ups of the entire service object. That is why most AAES companies use checklists to dictate what needs to be done during a maintenance visit. An example of a Swedish IDDS checklist can be found in appendix E. These checklists contain all the functions and/or parts of an installation that need to be maintained. If a certain function or part does not perform as it should, the mechanic can choose to either fix it on the spot or to advise the customer to replace certain parts of the installation. In case of replacement, the mechanic lists the items that need to be ordered and makes a request for a quote if necessary.

Once all functions and parts have been checked by the mechanic, the maintenance order is closed and the next one can be started. Baan receives information about the execution of a maintenance order because the reporting is done in Baan. This feedback also checks off one maintenance visit for the corresponding service object/location, giving planners a real-time overview of the total planned maintenance.

#### **Ordering material – WBS reference 2.3.3, 2.4, 4.3.4, 4.4.2, 4.4.3 & 4.5**

- Input: need for a certain item (either to refill the inventory or to use for a repair)
- Output: purchase order for the item needed is created in the ERP system

Another important feature of Field Vision is the ability to order items while in the field. This feature permits mechanics to instantly communicate any material needs. In the example of a maintenance order: if a certain part turns out to be faulty during a maintenance visit, the mechanic can search for the item using a special Field Vision menu. When the customer agrees with the price that is listed in Field Vision and does not require a quote to be made, the mechanic can immediately order the item.

Figure 14 shows the screen that is used to order materials. It is possible to search items based on their item number or name.

#### Registering indirect labor – WBS reference 2.4 & 4.5

- Input: indirect task that needs to be executed
- Output: registration of the indirect task

If the mechanic isn't spending his time carrying out breakdown or maintenance orders, it is safe to say that he or she is working on an indirect task. These tasks can be created by the mechanic on his or her PDA without interference of a planner or other office employee. Reasons for creating an indirect task can include: attending a meeting, receiving training, travelling home (travelling to a customer can be invoiced, but driving home cannot).

**8.8.2 Order materials** 14:57

Item name	Lyftband 50x14000 M189140
Item number	19200558
<b>Find item</b>	
Quantity	1,00
To warehouse	DVE
Reason / prio	-
<b>Cancel</b>	

FIGURE 24: SCREENSHOT OF THE ORDER MATERIALS SCREEN

The point of registering indirect tasks is to always know what each mechanic is doing at the moment and to be able to allocate costs to indirect tasks. Registering indirect tasks also leads to the possibility of (management) reporting and individual evaluations. The mechanic is able to register his travel and work time and he can also place comments on the indirect task. Information that needs to be transferred back to the ERP system includes: the identification number of the mechanic, the type of the indirect task, the travel & work times and any comments that were made for the indirect task.

#### Conducting stock counts – WBS reference 2.3.3, 4.3.3 & 4.4.3

- Input: unknown amount of items in the inventories of the technicians
- Output: up-to-date count of all items in the inventories of the technicians

Another function that can be fulfilled with Field Vision is performing stock counts. Since most AAES companies use the vans of the mechanics as mobile warehouses, it is important that the inventory of each van is counted at least once per year. So instead of having one central warehouse to which all materials are delivered, most sub-companies have tens or hundreds of warehouses to manage. The responsibility for this task initially lies with the mechanic, as he or she is the one who orders and

"consumes" the items. Because of this, it is also the mechanic who will be performing the annual/biannual stock counts.

Field Vision supports this process in the following way: by looking at all the items the mechanic has used over the last couple of years, Baan will produce a list of items that are possible present in the mechanic's inventory. This list is sent over to the correct mechanic in Field Vision with the order type set to "stock count". It is important to note that, while Baan can state the (estimated) quantity per item, it will not do so because this could lead to the mechanic accepting the given quantities without actually carrying out the stock count. This would defeat the purpose of a stock count.

When the mechanic finds an appropriate moment, he or she starts the stock count which triggers Field Vision to make a timestamp of the current time (stock counts are officially an indirect task, but are mentioned separately because of the unique elements that are involved). Then, the entirety of the van is emptied and counted, resulting in a list of items plus the corresponding quantities. This list is transferred back to Baan, where it is reviewed and accepted as the actual inventory. Any major differences are discussed with the mechanic.

#### **Checking inventory – WBS reference 2.3.3, 4.3.4 & 4.4.3**

- Input: lack of knowledge about the contents of an inventory
- Output: up-to-date overview of all items and quantities in the inventory

The last field process that will be reviewed in this chapter is inventory checks. A situation where a quick inventory check could be useful can occur when the mechanic visits a customer for a breakdown and realizes that a certain part needs replacement. Unsure whether he or she has the correct part in his inventory, the mechanic is able to search for the item name or number using a special sub-menu in Field Vision. The mobile client then displays all search matches as well as their quantities. If the desired item is available in the inventory, the mechanic is able to use the item on the spot which saves him or her some time by not having to order the item and going back to install the ordered item.

#### **5.2.4 CURRENT FIELD VISION INTEGRATION METHOD**

Now that the processes that are executed with the help of Field Vision have been explained, it is time to discuss the way these processes are currently integrated. Integrating two systems means that there needs to be communication between the two. Digital communication can either be synchronous or asynchronous<sup>1</sup>. Synchronous communication is real time (phone calls, Skype or chat

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<sup>1</sup> <http://www.mutatis-mutandis.nl/themadossiers/logistieke-automatisering/133-trends-in-applicatie-integratie?start=3>



services) whereas asynchronous communication is delayed (e-mails, forums or blogs). More information on synchronous and asynchronous information can be found in the solution chapter (paragraph 7.1). The current Field Vision integration is asynchronous, meaning that it uses messages that are imported and exported on set frequencies. For service orders for example, the export frequency is set to three minutes. This configuration leads to the ERP system checking every three minutes if there are any new service orders. If that is the case, it will send them to Field Vision. More information on the integration frequencies can be found in paragraph 5.3.4.

In the case of an integration between an ERP system and a field service solution, the ERP system will usually serve as the main source of data because it supports most of the business processes whereas the field service solution is meant for a specific part of the total business process. Most of the time that means that the ERP system will provide the field service solution with information, but the field service solution also sends information back to the ERP system, albeit a bit less.

Communication in general is usually only possible if two parties share a common language and this is also true for communication between two systems. Where humans use verbal, non-verbal and visual communication to understand each other, software systems use a programming language to exchange information. The "programming language" that is used for the Baan – FV integration is called XML which is short for Extensible Markup Language. Programming language is surrounded by quotations marks because XML is not considered to be a programming language but rather a markup language. The difference between the two is that programming languages are able to receive and execute commands and markup languages are used as containers for information.

There are alternatives for the XML format, for example JSON (JavaScript Object Notation) and HTML (HyperText Markup Language). The main difference between XML and JSON is the fact that JSON uses the JavaScript scripting language, which enables users to easily import JSON messages into JavaScript applications. Another important difference is the absence of end-tags, making it a slightly slimmed down version of XML. HTML is mostly used for websites and the biggest difference compared to XML is the support of hyperlinks. Hyperlinks are references to data or documents that can be directly accessed by following the link.

XML is a suitable format to use for the integration between Baan and Field Vision because it is able to store information in a way that is customizable by the user. Figure 25 displays an example of the XML format. Most XML documents begin with the

```
<?xml version="1.0" standalone="yes" ?>
- <shop location="Birmingham" size="Large">
- <food>
  <Name>Apple</Name>
  <type>fruit</type>
  <cost>15</cost>
</food>
- <food>
  <Name>Carrot</Name>
  <type>vegetable</type>
  <cost>10</cost>
</food>
</shop>
```

FIGURE 25: EXAMPLE OF AN XML MESSAGE

**XML declaration** which states the version number or other attributes (in the example it is the first, blue line at the top of the XML). What follows is a combination of **markup** and **content**. Markup or "tags" can be recognized by < and > characters and they basically function as headers. In the example on the previous page <Name> and </Name> are start- & end-tags. Everything between a start-tag and an end-tag is considered content (Apple, fruit, 15 etc.). Simply said, markup or tags are used to specify which information is being displayed and content is the actual information.

The current integration uses XML messages to transfer data from the ERP system to Field Vision and back. The same file format is used for the integration between Baan and iSAC. Because of the asynchronous way of communicating, any errors can be easily found and fixed. If there is an error in an XML message, the XML gateway will block it, allowing the user to view, edit and/or delete the message. When one or both of the systems are offline, the messages will simply be delayed until the connection is restored. For messages that contain master data this isn't a problem, but for messages that contain urgent service orders, this can be a problem.

The fix that is currently used for offline situations is the creation of blank service orders in Field Vision. These blank service orders do not require a connection and can be specified for a specific customer, location or installation. Upon restoring the connection, an office employee will need to create a matching service order in the ERP system to be able to import the blank service order. So not being connected is not a disastrous scenario for asynchronous communication, it just creates an extra delay in the integration. In the next paragraph we will have a look at the different types of XML messages that are currently used and the information that they contain.

### Summary of the answer to sub-question 2

The processes that are currently integrated with Field Vision can be split up into two groups (see paragraph 5.2.1) and the current integration is asynchronous, meaning that XML messages are sent back and forth between the ERP system and the field service solution.

## 5.3 SUB-QUESTION 3

*"WHICH DATA ELEMENTS ARE IMPORTANT IN THESE PROCESSES?"*

The best way to start this paragraph is to establish what data elements are. According to [www.thefreedictionary.com](http://www.thefreedictionary.com)<sup>2</sup>, a data element can be described as:

1. A basic unit of information built on standard structures having a unique meaning and distinct units or values.

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<sup>2</sup> <http://www.thefreedictionary.com/data+element>

2. In electronic recordkeeping, a combination of characters or bytes referring to one separate item of information, such as name, address, or age.

Since we are still analyzing the current situation, this paragraph will be used to illustrate the different types of messages (XML files) that are used by the Baan – FV interface and the information that they contain. Some data elements and XML messages have already been mentioned in earlier paragraphs and some will be new. Any adjustments to these messages for the AX – FV integration will be listed in the Solution chapter.

### 5.3.1 THE DIFFERENT TYPES OF XML MESSAGES

Before we delve into the current XML messages and their data elements, it is important to note the two different directions that a message can have. As highlighted in paragraph 5.2.4, the ERP system will usually provide the field service solution with information, but the opposite is true as well. The information that needs to be transformed in an XML message is gathered by Baan and sent to a network location that was specifically set up for the Field Vision interface. The path to this location is entered in Field Vision as the import map. Field Vision will check this location frequently to see if any new XML messages have arrived (how often this happens is explained in paragraph 5.3.4). If this is the case, the messages are loaded into the Field Vision database. Any messages that are produced by Field Vision are also sent to a network location where they can be picked up by Baan. The picture on the next page shows the simplified information stream between Baan, the shared network location and Field Vision.



FIGURE 26: DIAGRAM OF THE BAAN - FV INFORMATION STREAM

Since the ERP system is often viewed as the source system, we will describe messages that are sent from Baan to Field Vision as **export** messages and messages from Field Vision to Baan as **import messages**. Export messages are used to feed the Field Vision database with both master data and transaction data. **Master data** represents key business information that is frequently read, but rarely updated (customer name, address, service objects). **Transaction data** usually describes an event or an action (service orders, status updates, stock changes).

Import messages are used to feed the ERP system with transaction data. Master data can only be changed in the ERP system since this is the place where all the master data is stored. Managing the master data in one central location also prevents duplication and inconsistencies. Transactions can be made in both the ERP system and Field Vision which is why transaction XMLs can be sent in both directions.

The table below shows the different types of XML messages that are used by the Baan – FV interface. It also specifies if the stated XML message is an import or an export message and whether it transfers master data or transaction data. In the next paragraph, we will take a closer look at these XML messages and their corresponding data elements.

XML message	Import or Export?	Function
Order information	Export	Transfer service order information to FV (trans. data)
Locations	Export	Transfer location master data to FV
Installations	Export	Transfer installation/service object master data to FV
Installation type	Export	Transfer installation type master data to FV
Items	Export	Transfer item master data to FV
Stock	Export	Transfer stock information to FV (transaction data)
Cycle count	Export	Transfer stock count lists to FV (transaction data)
Opening hours	Export	Transfer opening hours master data to FV
Debrief orders	Import	Transfer debrief information to Baan/ERP (transaction data)
Status updates	Import	Transfer status updates to Baan/ERP (transaction data)
Indirect hours	Import	Transfer indirect hours transactions to Baan/ERP
Item replenishment	Import	Transfer material orders to Baan/ERP (transaction data)
Item transfer	Import	Transfer item transfers to FV (transaction data)
Cycle count	Import	Transfer filled in stock counts back to Baan/ERP (transaction data)

TABLE 3: XML MESSAGES AND THEIR FUNCTIONS

### 5.3.2 DATA ELEMENTS IN THE XML MESSAGES

In this paragraph it should become clear what the function is of the different XML messages by looking at the data elements in these messages. The way XML files are built up has already been explained in paragraph 5.2.4. The terms **markup** and **content** were used to describe the information in an XML message, markup being the "header" for the information and content being the actual

information. A data element can be seen as markup because it describes the type of information that is transferred, but since content is always linked to markup, we shall use the term **data elements** for the **combination of markup and content**. Keep in mind that these XML messages and data elements are the current XML messages; any changes or recommendations for changes will be made in chapter 7.

### Order information (Export)

The largest and most-used XML message is called order information. It is used to transfer both breakdown orders and maintenance orders to Field Vision, making it arguably also the most important XML message.

• Service order ID	Identifying number of the service order
• Activity type ID	Description of the activity type (breakdown/maintenance)
• Cause code	Code that is used to specify the reason for visiting
• Service object ID	Identifying number of the service object
• Invoice name	Name of the invoice recipient
• Invoice street	Street name of the invoice recipient
• Invoice city	City of the invoice recipient
• Invoice zip code	Zip code of the invoice recipient
• Entry by	Name of the creator of the service order
• Entry date	Creation date of the service order
• Plan start date	Planned start date that is generated by Baan
• Contract date	Date on which the next maintenance is planned to be executed
• Maintenance period	Week number of the next maintenance visit
• Duration	Average time it takes to execute maintenance
• Plan end date	Planned end date that is generated by Baan
• Engineer ID	Identifying number of the engineer
• Fax	Fax number of the invoice recipient
• Contract ID	Identifying number of the contract for that location
• Symptom code	Generic symptom code that is entered by the creator
• Parent order	Identifying number of the parent service order
• Follow up order	Identifying number of the follow up service order
• Activity notes	Description of the problem and any additional info
• Location name	Name of the location/site
• Location street	Street name of the location/site
• Location city	City of the location/site

• Location zip code	Zip code of the location/site
• Contact person	Name of the contact person on site
• Contact person phone	Phone number of this contact person
• Region ID	Identifying number of the region of the location
• Sub region ID	Identifying number of the sub region of the location
• Skill ID	Code that is used to specify the required skill
• Priority ID	Code that is used to signify the priority
• Email	Email address of the invoice recipient
• Previous date	Date of the last time maintenance was executed
• External reference	Reference code that is sometimes given by the invoice recipient which they use to distinguish different activities for invoicing purposes
• Invoice relation number	Customer number/ID of the invoice recipient
• Contract type	Description of the contract type
• Planner ID	Identification number of the planner of the area
• Historical information	Lists the previous service orders (max. 5), including service order ID, engineer ID, activity notes, contact person and execution date
• Customer ID	Identifying number of the customer
• Activity status type	Code that is used to specify the status of the service order
• Language ID	Code that is used to specify the language of the location

### Locations (Export)

Location XML messages contain location master data that needs to be transferred to Field Vision. This information is linked to the installations through the data element "customer ID". Any service objects that share the same customer ID number as a location are automatically grouped. Location information is also linked to opening hours through the same data element.

• Customer ID	Identifying number of the customer
• Customer name	Name of the customer
• Customer street	Street name of the customer
• Customer city	City of the customer
• Customer zip	Zip code of the customer
• Customer fax	Fax number of the customer
• Customer phone	Phone number of the customer
• Location type	Category of the customer (example: hotels)
• Location language	Language that is used on the location



- |                    |  |
|--------------------|--|
| • Material price   | Base sales price of the item   |
| • Material type ID | Code that is used to specify the category of the item                        |
| • Signal code      | Code that is used to specify if the item can still be ordered/sold           |
| • Alternative item | Identifying number of an alternative for this item                           |
| • Notes            | Notes regarding the item   |
| • Is active        | Code that is used to state if the item is active (1) or inactive (0) in Baan |

### Stock (Export)

The stock XML is used to update the digital Field Vision inventory with information from the ERP system. When an ordered item is shipped from the central inventory to the mechanic, the quantity of that item needs to be updated in Field Vision.

- |                 |   |
|-----------------|---|
| • Engineer ID   | Identifying number of the mechanic whose stock is being updated               |
| • Material ID   | Identifying number of the item that is being updated                          |
| • Quantity      | The new quantity of the item (old quantity is overwritten)                    |
| • Mutation date | Date on which the mutation takes place  |
| • Is active     | Code that is used to state if the stock is active (1) or inactive (0) in Baan |

### Cycle count (Export)

This XML file is sent to the mechanic whenever a stock count has to be conducted. The idea of a stock counts/cycle counts was briefly explained in paragraph 7.2.3. An important thing to notice, is that there are two cycle count XMLs; one with a list of items without quantities that is sent to the mechanic (import) and another one with a list of items **with** quantities that is sent to the ERP system (export).

- |                 |  |
|-----------------|--|
| • Activity type | Code that is used to specify the activity type   |
| • Engineer ID   | Identifying number of the mechanic that is going to conduct the stock count                          |
| • Material ID   | Identifying number of the item that needs to be counted (this will be a long list of possible items) |
| • Planned date  | Planned start date of the cycle count  |



### Opening hours (Export)

Because mechanics are almost always in the field at a lot of different customers, knowing when a location is open and closed is extremely useful. The opening hours XML sends this information from the ERP system to Field Vision.

- Customer ID Identifying number of the customer
- Opening hours Monday Opening hours of the location on Mondays
- Opening hours Tuesday Opening hours of the location on Tuesdays
- Opening hours Wednesday Opening hours of the location on Wednesdays
- Opening hours Thursday Opening hours of the location on Thursdays
- Opening hours Friday Opening hours of the location on Fridays
- Opening hours Saturday Opening hours of the location on Saturdays
- Opening hours Sunday Opening hours of the location on Sunday
- Use opening hours Code that is used to state if the opening hours should be used (1) or ignored (0)

### Debrief orders (Import)

Debrief orders can be described as the answer to service orders; every service order that is sent to Field Vision comes back to the ERP system in the form of a debrief order. This debrief order is used to register the hours and materials, but also to register symptom, problem & fix codes. These are codes that are used to describe generic symptoms/problem/fixes of the service order. The advantage of registering these codes on a large scale is being able to detect typical symptoms and problems of a certain service object or object type. When common symptoms or problems occur, it is possible that there is also a common solution/fix. Having this sort of information readily available can be valuable when training new (and current) mechanics.

- Service order ID Identifying number of the service order
- Activity type Code that is used to specify the activity type
- Activity status type Code that is used to specify the status of the service order
- Engineer ID Identifying number of the mechanic that executed the service order
- Symptom code Code that is used to specify a generic symptom
- Problem code Code that is used to specify a generic problem
- Solution code Code that is used to specify a generic solution
- Cause code Code that is used to specify the reason for visiting
- Service object ID Identifying number of the service object

- Material ID Identifying number of the items that were used on the service order
- Quantity States the amount of items that were used on the service order
- Travel start time Date and time on which the travelling was initiated
- Travel end time Date and time on which the travelling was ended
- Work start time Date and time on which the work was initiated
- Work end time Date and time on which the work was ended
- Travel minutes Total amount of minutes spent travelling
- Work minutes Total amount of minutes spent working

### Status updates (Import)

The status of a service order is transferred to the ERP system anytime the mechanic changes his activity from "nothing" to travelling, travelling to working and working to travelling. This way, the ERP system can show the actual status of a service order which can be useful for office employees. However, the main reason for updating the status should be to be able to plan better. But seeing that planning is done with the Field Vision dispatch application (which always has the up-to-date statuses), status updates are not as necessary as other XML messages. The fact that debrief orders contain a status update as well ("completed"), lower the effectiveness of status updates even more.

- Service order ID Identifying number of the service order
- Engineer ID Identifying number of the mechanic
- Status date Date on which the status was changed
- Planned start date Planned start date of the service order
- Planned end date Planned end date of the service order
- Activity status ID Code that is used to specify the status of the service order (for example: planned, travelling, working etc.)
- Activity notes Description of the problem and any additional notes

### Indirect hours (Import)

The process of registering indirect hours has also been explained in paragraph 7.2.3. Because indirect tasks are created in Field Vision and not in the ERP system, they do not have a service order ID that looks like regular service order IDs. Instead, Field Vision creates a unique number that is used to distinguish different indirect tasks. Indirect hours XMLs can be seen as debrief orders for indirect tasks since they contain the time registration of indirect tasks. Also note that these XMLs do not contain travel registration because none of the hours spent travelling or working will be invoiced.

- Service order ID Identifying number of the "service order" (generated by Field Vision)
- Activity type Code that is used to specify the indirect task type
- Activity status type Code that is used to specify the status of the indirect task
- Engineer ID Identifying number of the mechanic
- Activity notes Comments or notes that the mechanic made on the indirect task
- Work start time Date and time on which the indirect task was initiated
- Work end time Date and time on which the indirect task was ended

### Item replenishment (Import)

The item replenishment XML is used to communicate material orders. Using the special sub-menu, the mechanic is able to order any item in the database by simply stating the item number and quantity. That information is then translated into an XML file and sent to the ERP system.

- Service order ID When ordering items for a specific service order, this field will be used to state the identifying number of that service order
- Activity type Code that is used to specify the activity type
- Engineer ID Identifying number of the engineer that is ordering the material
- Material ID Identifying number of the ordered material
- Quantity Quantity of the ordered material
- Work start time Date and time on which the material order was started
- Work end time Date and time on which the material order was ended

### Item transfers (Import)

Item transfers are used to (digitally) move items from one inventory to another. This situation can occur when a mechanic is too busy to install a certain item and asks a colleague to do it instead. The item is physically picked up or dropped off, but the digital inventory needs to be updated as well and that is where item transfers come in. The mechanic that gives the item to his colleague is responsible for the digital transfer of the item.

- Service order ID If the item was pre-ordered for a certain service order, this field will state the service order ID
- Engineer ID Identifying number of the mechanic from which the item is transferred

• Activity type	Code that is used to specify the activity type
• Material ID	Identifying number of the item that is being transferred
• Quantity	Quantity of the item that is being transferred
• Location ID	Identifying number of the receiving mechanic
• Work start time	Date and time on which the item transfer was started
• Work end time	Date and time on which the item transfer was ended

### Cycle count (Import)

The export cycle count XML is of course used to report the stock count back to the ERP system. The import cycle count XML was used to provide the mechanics with a list of items that are possibly in their inventories. After counting his or her inventory, the mechanic will send that list back with filled in quantities.

• Service order ID	Identifying number of the "service order"/cycle count
• Activity type	Code that is used to specify the activity type
• Engineer ID	Identifying number of the engineer that conducted the cycle count
• Material ID	Identifying number of the items that were counted
• Quantity	Quantities of the counted items
• Notes	Notes on the items that were counted
• Work start time	Date and time on which the cycle count was started
• Work end time	Date and time on which the cycle count was ended

### 5.3.3 ENTITY-RELATIONSHIP DIAGRAMS

In order to visually support these lists of XML messages and their data elements, entity-relationship diagrams will be created. Invented by Peter Chen in 1976<sup>3</sup>, these diagrams are used to provide database designers with a modeling tool for relationships between database entities and their attributes/data elements. An entity-relationship diagram or ERD consists of four basic shapes:

- **Rectangle** An entity or "an object or concept about which data is stored" (examples: installation, item, technician);
- **Diamond** The relationship between two entities which is described by a verb (examples: contains, performs, lives in);
- **Oval** An attribute or data element that contains information about the entity (examples: street name, price, service object ID);
- **Line** The connection between entities, relationships and attributes;

Besides these basic shapes, entity-relationship diagrams can also include line ends that say something about quantitative relations between entities. In the diagrams in this paragraph, this quantitative relation is expressed by either a "1" or an "N". The meaning of these characters is simple; if an entity that is marked with a "1" is connected to an entity that is marked with an "N", it means that the first entity (1) can contain multiple second entities (N). An example: in the first diagram it shows the location entity marked with a "1". The location entity is linked to the installation entity, which is marked with an "N". This means that a location can contain multiple installations. If both entities are marked with a "1" it means that the entities have a 1:1 relation (example: one installation can only have one installation type).

Because of the wide variety of XML messages and the amount of attributes, multiple ERDs will be shown. The first two diagrams show detailed versions of two sets of entities and attributes and the third and final diagram shows a less detailed, complete image. Attributes that are filled with a **light green color** indicate that the attribute is used to link two or more XML messages in Field Vision.

Some XML messages are not included in the ERDs (cycle count, debrief orders, status updates, item transfers and item replenishment). The reason behind this is that these messages only transfer information (transactions) back to the ERP system without containing any new entities. It should also be noted that these diagrams were made from a Field Vision point of view.

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<sup>3</sup> <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.123.1085>

The first ERD (see figure 27) contains three entities: locations, installations and installation type, but the contents of four different XML messages are processed in the ERD. Because opening hours are considered to be an attribute of the location instead of an entity on its own, they are not displayed with a rectangle. The same could be said about installation type, but the main difference here is the fact that installation type is defined by a unique code or identification number. While it is not a physical object, it can be seen as a digital "object" in the database. Installation type is linked to installations through the object type ID and installations are linked to locations through the customer ID attribute.

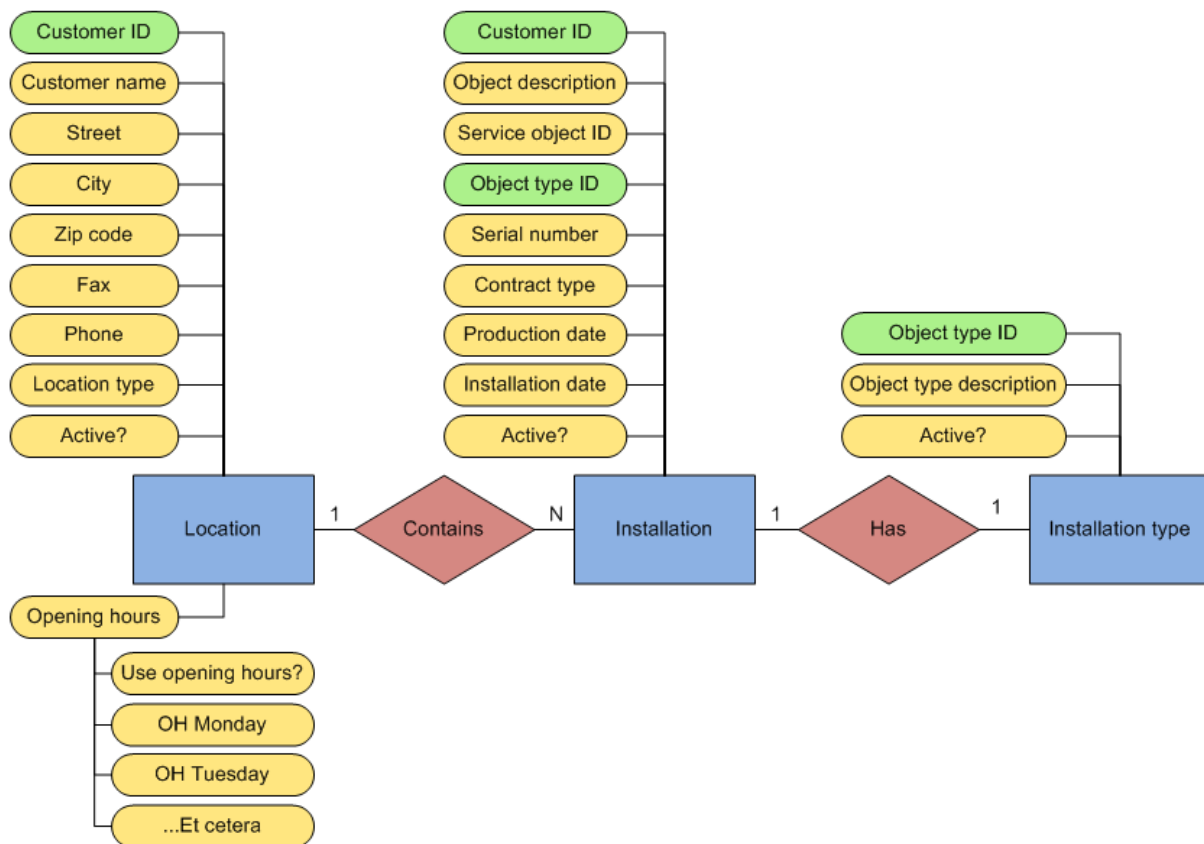


FIGURE 27: ENTITY-RELATIONSHIP DIAGRAM OF LOCATION ENTITIES

The next entity-relationship diagram (figure 28) shows the entities and attributes that are involved in the execution of service orders. The technician (entity) can execute either a service order or an indirect task. Both are considered an entity since they both have numerous attributes linked to them. The data element that links a service order or indirect task to the technician is the engineer ID attribute. During service orders, it is possible for the technician to use items from his inventory. Items as well as stock are also considered entities, each containing a couple of attributes. Stock is linked to the technician through the engineer ID attribute and stock of course also has a link with items through the material ID attribute.

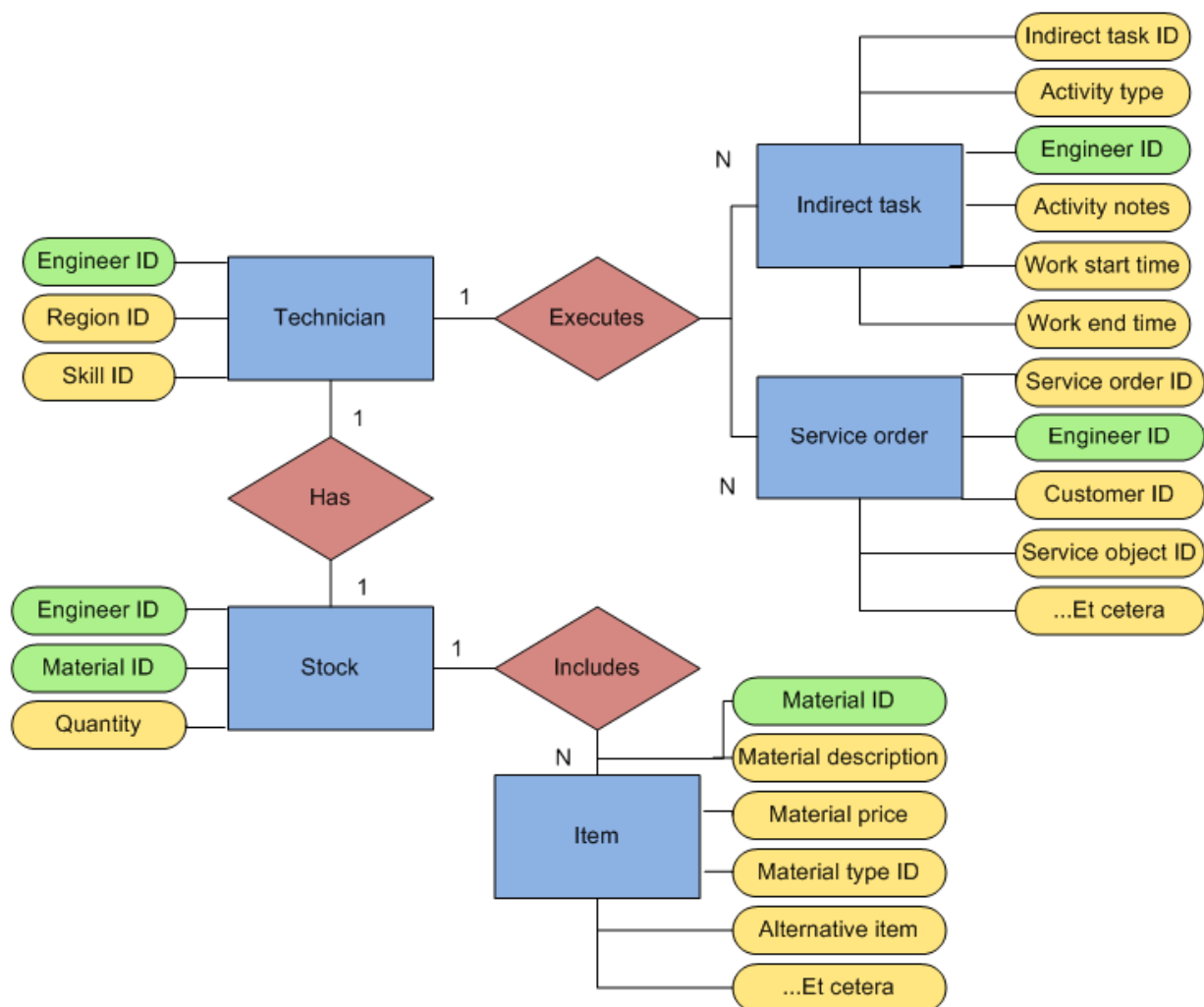


FIGURE 28: ENTITY-RELATIONSHIP DIAGRAM OF TECHNICIAN ENTITIES

The entity-relationship diagram below (figure 29) summarizes the previous two ERDs. Since a lot more entities had to be processed, not all attributes are displayed in the diagram, but it does show the complete image of all the relevant entities and their relationships.

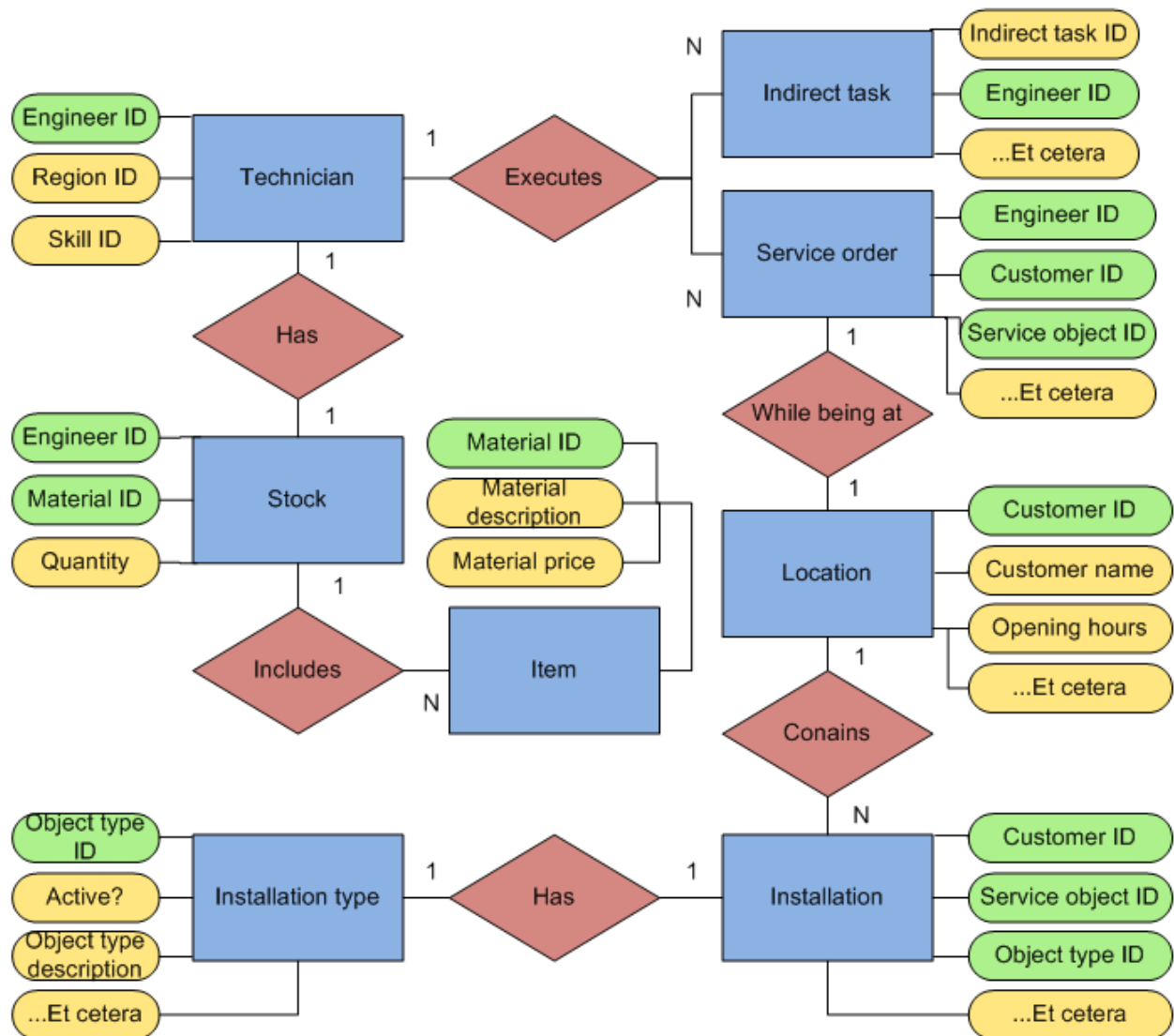


FIGURE 29: ENTITY-RELATIONSHIP DIAGRAM OF ALL ENTITIES

Visualizing the entities and their relationships by using the terminology from the current XML messages has hopefully led to a better understanding of the information structure. Now that the information that is currently transferred and the connection between the XML messages has been discussed, it is time to look at the frequency at which the different messages are imported and exported.



#### 5.3.4 INTEGRATION FREQUENCIES

This paragraph will be used to review the frequencies at which the different XML messages are imported and exported. In paragraph 5.2.4 it was mentioned that the current integration is asynchronous (delayed). One of the major advantages of asynchronous communication is the fact that the source system can generate and send messages to the target system without having to wait for a response. The biggest disadvantage is the absence of immediate interaction; there will always be a delay between sending and receiving a message. This could theoretically be problematic in the case of very urgent breakdowns, but since the import and export frequencies are customizable, immediate interaction can nearly be achieved.

Not every XML message is as urgent as service orders. Messages that transfer master data for example are not as urgent as messages that transfer breakdown information. An important factor in this statement is the fact that master data is not changed frequently. This lowers the chance of changes in master data having any actual impact in the operational processes. If for example the address of a customer is changed in the ERP system, this will only have an impact on service orders of that customer that are not yet sent to Field Vision. The export frequency of the location XML message is set to twice per day (once during lunchtime and once around midnight). So a change of address that is made during the morning will be processed after lunchtime and the same change made during the afternoon will be processed the next day. This frequency combined with the small chance of master data needing to be edited results in a practically flawless integration.

The differences in integration frequencies exist because setting all frequencies to three minutes (or less) would result in an overloaded server. An important thing to understand is the fact that the current integration between Baan and Field Vision only transfers changed (master) data. Baan checks the current location table against a location table that was created upon the last integration moment. Any changes between the two will become new XML messages which will update the Field Vision database and the current location table will be saved for the next integration moment. This cycle repeats itself twice per day (the same goes for the other master data XML messages).

One of the frequencies mentioned in the table on the next page is somewhat odd. Currently the stock XML message is seen as master data and is thus only exported twice per day. However, stock quantities are often changed which is why exporting stock information not more than twice per day might not be enough to keep an up-to-date overview of inventories (see paragraph 7.3). Another unique frequency is the cycle count XML message. Because of its periodic nature, cycle counts usually take place twice per year, the trigger for this integration is a human one. When it is time for a stock count, the inventory administrator will initiate the integration that sends over the list of materials to the technician. Upon completion, the filled-in list is sent back to the ERP system.

XML message	Import/ Export?	Master/transaction data?	Integration frequency
Order information	Export	Transaction data	Every 3 minutes
Locations	Export	Master data	Twice per day (lunchtime & midnight)
Installations	Export	Master data	Twice per day (lunchtime & midnight)
Installation type	Export	Master data	Twice per day (lunchtime & midnight)
Items	Export	Master data	Twice per day (lunchtime & midnight)
Stock	Export	Transaction data	Twice per day (lunchtime & midnight)
Cycle count	Export	Transaction data	Twice per year (manually triggered)
Opening hours	Export	Master data	Twice per day (lunchtime & midnight)
Debrief orders	Import	Transaction data	Every 3 minutes
Status updates	Import	Transaction data	Every 3 minutes
Indirect hours	Import	Transaction data	Every 3 minutes
Item replenishment	Import	Transaction data	Every 3 minutes
Item transfer	Import	Transaction data	Every 3 minutes
Cycle count	Import	Transaction data	Twice per year (manually triggered)

**TABLE 4: INTEGRATION FREQUENCIES OF THE CURRENT XML MESSAGES**

### Summary of the answer to sub-question 3:

Data elements are units of information and the current data elements are listed at the start of this paragraph. Have a look at the entity-relationship diagrams to see how the most important data elements are connected to each other.

## 5.4 SUB-QUESTION 4

*"WHAT ARE THE REQUIREMENTS FOR THE PROCESSES THAT NEED TO BE INTEGRATED WITH FIELD VISION?"*

One of the final steps in the analysis phase of the Microsoft Sure Step methodology is called "gather business requirements". The way this is done, is by conducting workshops between the project members of a work stream and the relevant business process owners/employees involved in that work stream. Since IDDS Sweden is the first AAES company to go live, the initial business requirements were gathered from employees of this company. The workshops for the service to cash work stream were conducted over a time span of about six weeks, with project members travelling to Goteborg, Sweden to carry them out. Because this graduation project was still in the initiation phase at the time, the student was not present during these workshops. However, the student did get the opportunity to create some of the questions that were asked during the requirement workshops.

The results of these workshops have been summarized in a Functional Requirement Document (FRD) which contains all the IDDS requirements for the service to cash work stream. The large size of this document makes it a bit impractical to add it to the appendices. That is why the document was uploaded to Google Docs; a link to the document is provided in appendix F. Luckily, not all of these requirements apply to the Field Vision processes. The ones that do apply, will be copied or referred to in this paragraph. It is important to note that a lot of the answers in the FRD describe the current situation. But since the current situation has already been described quite extensively in previous paragraphs, we are looking for requirements that describe added features instead of existing ones. The main goal of the *Dynamic Entrance* project is to support the current business processes of the AAES companies and make improvements when possible. So the functionality of the current processes described in earlier paragraphs will also count as requirements; they are just not mentioned in this paragraph.

Another important thing to note, is the fact that the current situation at IDDS Sweden is a bit different than that of other AAES companies. For instance: vans are not used as mobile warehouses, instead there are 9-10 local warehouses that are used to resupply the vans. However, with the implementation of AX 2012, IDDS Sweden is going to start using vans as mobile warehouses. Unfortunately the FRD is very focused on the current situation in Sweden, meaning that a lot of the "requirements" describe an outdated way of working. A lot of processes that are automated in other AAES companies, are executed in Microsoft Office applications (Excel mostly) in IDDS Sweden. The result of this is that a lot of the requirements are not applicable to the AX – FV integration since the goal of the Dynamic Entrance project is to create as much seamless processes as possible.

The work breakdown structures from chapter 5 will be used to organize the requirements in the FRD. That is why all of the relevant processes and their WBS references are listed including any requirements that describe added features.

#### 5.4.1 IDDS SWEDEN REQUIREMENTS

##### Service order handling (4.3.2)

None of the requirements describe added features with regard to the current situation.

##### Cancelling orders (4.3.3)

None of the requirements describe added features with regard to the current situation.

##### Car and warehouse management (4.3.4)

Req. #	Question	Requirement description
-	Is there a standard stock for field	Yes and no, the ambition is to use a

	technicians?	standard stock, problem is that we don't have stock control today.
-	In which units items are registered? Piece, liter, decimal, etc.	Pieces, length, (m2), liter, pair.
-	Are serial numbers of items used in any way looking at warehouse management?	No, no warehouse management in place, but this is something that would be good to have serial numbers on specific parts like PCBs (printed circuit boards).
-	Describe how stock counts on service vans are performed?	Finance sends out a list and the engineer fills in the list, sends the list back to finance who enters the information in excel.
-	Is there a requirement for the technician to have an overview on his stock?	Not today, but of course in AX
-	Is there a requirement for the technician to have an overview on the item file? Which items are available?	Yes in the future, for quoting selling spare parts etc..
-	Is it possible for the technician to online display the item quantity of the local/main warehouse?	No hopefully in the future.

**TABLE 5: CAR AND WAREHOUSE MANAGEMENT REQUIREMENTS**

#### Order planning (4.4.1)

Req. #	Question	Requirement description
GBG-04-142	Are item requirements a planning condition? Are items considered when doing planning? Do you use fixed planning when planning with items?	There is an integration with DHL, when status is '70', the item is on site (or local warehouse). Order can then be planned. This status can be different in other countries.
GBG-04-142	Is there a stock check for item availability when planning an order?	About 10-20% of orders are low runners, this can be checked in M3, for example when it is old equipment. This to inform the customer that the delivery could take longer.
GBG-04-142	Is size and weight considered when	Delivery will take longer for bigger/longer

	doing planning? When having items in the van? Or is this no option?	items. Technician is allocated (pre-planned) based on standard lead time. When lead time is longer planning is changed.
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**TABLE 6: ORDER PLANNING REQUIREMENTS**

#### Item requirement (4.4.2)

Req. #	Question	Requirement description
GBG-04-148	Are wear and tear items purchased for an order in advance?	Not, but is a requirement looking at the future.
GBG-04-148	What are other requirements looking at wear and tear items?	To have pre-ordered W&T items based on # of cycles.
GBG-04-149	If dedicated material is used for on order where can they be shipped to, directly to the customer, directly to the technician, to a local warehouse or to a distribution center?	Everything is possible, decided by planner.
GBG-04-150	Is a technician allowed to purchase items locally (on route)?	Yes, bought from local suppliers where we have on account, service order ID is used as the purchase order number. Same dummy item number is used.

**TABLE 7: ITEM REQUIREMENTS**

#### Logistics (4.4.3)

The FRD does not contain any requirements for this process.

#### Execution (4.4.4)

Req. #	Question	Requirement description
GBG-04-153	Is there a requirement for the technician to have an overview on his stock?	Yes, there is. This is not possible right now; there is no real warehouse connected to the technician.
GBG-04-153	Is there a requirement for the technician to have an overview on the item file? Which items are available?	200 most used items are visible on PDA. Other items can be found in the Spare Part book. Then there is a Spare part catalogue which is available via the web. It is a requirement to have more items available in the PDA. Why are not all items

		in the PDA? What is the requirement It will be a very large file to transfer to the technicians if all 14.000 articles should be sent. I think that around 2000 of the articles should cover the most.
GBG-04-153	What does the technician needs to see regarding prices?	Standard price is visible, no customer discount are visible. Also in Spare parts book and the online version. Requirement to see customer specific prices/discounts - as this is needed for price limits and for verbal quotation before doing work.
GBG-04-154	Is there a requirement to confirm items used that were estimated on the order?	For Equipment Sales not! Is a requirement for service, especially for not fix price orders.
GBG-04-156	What kind of service object information is needed for the service technician to execute the work?	Now: serial number of object (when known), customer reference number and two lines of comment in the text, site contact / telephone number, type of door (if serial number know - else in free text). Requirements are: 1. To see service object type. 2. To see dimension (size, color). 3.Warranty. 4. need for specific tools.
GBG-04-156	What kind of location information is needed for the service technician to execute the work?	Site address and contact information. And whether any material needs collecting on site or from DHL.
GBG-04-156	What kind of service contract information is needed for the technician to execute the work? If any? SLA information?	Type of service contract, if parts are included for example. To see customer discount. To see remarks; specific customer/ object demands.
GBG-04-158	What kind of site information is needed regarding other objects? If any?	Not possible right now. To see Service contract information and next inspection visit is a requirement.
GBG-04-162	What kind of material information is needed for the technician to execute the work? Is it a requirement to see estimated material?	Can see pre-ordered material (Item no and qty.). Missing is the delivery address (DHL/site for example). When pre-ordered material is not used; would be good if the tech could un-use the material

		(confirmed not used).
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**TABLE 8: EXECUTION REQUIREMENTS**

#### Hour and cost registration (4.5.1)

None of the requirements describe added features with regard to the current situation.

#### Item consumption (4.5.2)

Req. #	Question	Requirement description
GBG-04-213	How are items registered on a order? Is and electronic way of registration used? Barcodes?	There is no label on the part itself. Barcodes are a requirement (or any other way of item identification).
GBG-04-213	How are non existing items (special service item) registered having the correct cost on the order.	A dummy item is used. Registered when invoice is coming in from supplier. Service order is used as purchase order number.
GBG-04-213	What kind of different items are used? (e.g. Price/piece, price/meter, price matrix..)	Pieces, length and square meters are used. E.g. Cables 1 box = 25 meter = item A, then sold per meter using item B.

**TABLE 9: ITEM CONSUMPTION REQUIREMENTS**

#### Service object management (4.7.1)

Req. #	Question	Requirement description
GBG-04-280	What other reasons are there to register a service object? What is the starting point to register a service object?	When a service contracts is sold; after the first inspection visit the objects are registered. Also for breakdowns, same procedure. Technician is giving the door a serial number (he has stickers in his van). Serial numbers are sometimes changed by technician (missing serial number) and communicated by technician, this is then changed in the back office.
GBG-04-280	Describe what is registered? What is mandatory? What is at least necessary to register a service object?	Serial number, customer reference code, installation date (actual installation date is also start date for warranty) etc. Standard warranty is 2 years, can be 5 year if customer is paying for this. This is sold together with the new object included in the new sales order. Transactions in finance is done yearly. Other option: 3

		years warranty when object needs to in contract right away, agreement with the customer. Customer will not pay extra, will only pay for inspection.
GBG-04-280	How are service object registered when they are more or less physically linked together? Dock leveler and a shelter.	Yes, for example docking 1 which contains a leveler, door and a shelter. This is linked in the system using the customer reference.
GBG-04-287	Is the BOM registered on service object level? How detailed is this? Is this a requirement?	Yes, that is the end-user file. Only for products from sectional doors, not for folding doors, levelers, etc.
GBG-04-287	Is the BOM updated on service object level when items are replaced?	Only when modernization is done; manual to electric door.

**TABLE 10: SERVICE OBJECT MANAGEMENT REQUIREMENTS**

#### Planning data (4.7.2)

Req. #	Question	Requirement description
GBG-04-301	Is a preferred technician used. How is the preferred technician determined?	Yes, per geographical area, or customer need, or special skills based. There are 4 regions and about 10 sub regions (planning areas).
GBG-04-308	How are technicians grouped in the system? Work center? How is this used?	Technician are linked to a planner and a planner is to a region, this is set in the system.

**TABLE 11: PLANNING DATA REQUIREMENTS**

#### Price management (4.7.3)

Req. #	Question	Requirement description
GBG-04-322	Are there relation between items looking at prices?	No, but is a wish. E.g. left and right items, must have a relation to each other.

**TABLE 12: PRICE MANAGEMENT REQUIREMENTS**

#### Contract type (4.7.4)

Req. #	Question	Requirement description
GBG-04-338	Are 'to be replaced items' linked to a service agreement? Is there a requirement for this?	Not, but is definitely a wish.

**TABLE 13: CONTRACT MANAGEMENT REQUIREMENTS**



#### Customer management (4.7.5)

Req. #	Question	Requirement description
GBG-04-341	Are e-mail addresses registered on customer level? Is there a requirement for this?	Only one e-mail address can be registered. Yes, it is a requirement to add more.

TABLE 14: CUSTOMER MANAGEMENT REQUIREMENTS

#### 5.4.2 ADDITIONAL REQUIREMENTS

As has been mentioned at the start of this chapter, some of the IDDS Sweden processes are outdated in comparison with other AAES companies. The main reason for this is the fact that they use a field service solution called Serviceware instead of Field Vision. A lot of the "special processes" are managed in Excel files or are executed verbally/based on knowledge. This is one of the downsides of implementing an ERP solution per company instead of per division.

A countermeasure for this downside is listing any known additional requirements. These additional requirements are not documented in functional requirement documents, making it difficult to manage them. Some of the additional requirements that are listed in this paragraph were gathered by talking to *Dynamic Entrance* project members who possess knowledge of the sales and service processes and some were devised by the student based on interviews and general knowledge of the processes.

- Being able to see the name of the default contact person on a certain location including his contact information (phone and e-mail)
- [Optional]: Adding geocodes to locations to be able to pinpoint a location when using planning or navigation software
- Instead of letting the technicians carrying around paper files with documentation about certain installations or items, provide them with an online overview of all the necessary files.
- In order to reduce the size of the order information XML message it can be effective to link historical information to the installation instead of the service order. That way, the information will only be updated twice per day instead of every three minutes.
- The item entity in Field Vision could be augmented with the name and contact information of the default supplier. This would make it easier for the technician to contact him with questions about delivery periods and item availability.
- The newest version of Field Vision supports images being linked to items/objects/locations. This could be a useful addition to these entities because having visual information in addition to textual information can decrease mistakes.

## 6. FIT/GAP ANALYSIS

### 6.1 SUB-QUESTION 5

*"DO THE REQUIREMENTS OF THE PROCESSES MATCH THE FUNCTIONALITY OF DYNAMICS AX 2012 AND FIELD VISION?"*

The next step in the Microsoft Sure Step methodology is to compare the business requirements with the possibilities of the solutions (AX & FV in this case). This step is in line with the waterfall method where the fit/gap analysis forms the transition between the analysis phase and the design phase. Any requirements that cannot be fulfilled with standard features, must be fulfilled in another way. This usually means that the solution requires a customization that can be described in a functional design document (FDD), but anytime two systems need to be integrated, an integration design has to be created from scratch. In other words: the complete integration between AX and Field Vision can be seen as a gap.

The *Dynamic Entrance* project is currently in the fit/gap phase, meaning that the requirements have been gathered and are being analyzed to check if Microsoft Dynamics AX 2012 supports them. Because the integration has so many links and dependencies with other processes and work streams, no progress has yet been made by the project team to check if the data elements listed in paragraph 5.3 are currently available in AX. Since these data elements are currently used by the Baan – FV integration, they are of course available in Field Vision.

The student has spent some time in exploring the functions and fields in AX, but his moderate IT knowledge restricted the efforts. It is his estimation that approximately 50%-70% of the currently used data elements are available in AX. This might not seem like much, but the adaptability of AX makes it relatively easy to add custom data elements. It is also possible to edit existing data elements that will not be used by any of the AAES processes. Adding and/or editing these custom data elements is something that is done during the implementation phase of the waterfall model. In the Functional Requirement Documents that are disclosed in appendix G, the student has tried to map (match) the data elements from AX with the data elements in Field Vision.

The "integration gap" mentioned in the first section of this chapter can be closed by describing a method that transfers the required information between AX 2012 and Field Vision. In the current integration, XML messages are used to transfer information, but it is possible to use different methods. In chapter 7, we will discuss several possible methods that can be used for this purpose. One of the possibilities will be selected as the ideal solution and worked out in detail.

## 7. SOLUTION/DESIGN

As stated in previous paragraphs, this chapter will include several options for the integration between Dynamics AX 2012 and Field Vision (or other field service solutions). Each option will be briefly described, including the advantages and disadvantages of the option. Eventually, the most suitable option will be chosen and further worked out.

### 7.1 INTEGRATION OPTIONS

#### 7.1.1 SYNCHRONOUS INTEGRATION

The two types of communication have been mentioned earlier in paragraph 5.2.4. While the current integration uses asynchronous communication, its opposite might be a suitable solution for the AX – FV integration. The most applicable form of synchronous communication with regards to integrating an ERP system with another application is a current trend in the IT sector: cloud computing. The idea behind cloud computing is based on shared services. It is possible for people and businesses to use applications or access files through the internet ("the cloud"). This cloud is usually owned by a third-party supplier and consists of a combination of hardware, servers and storage. The possibility to run applications in the cloud is interesting for companies, since this can prevent them from buying dedicated hardware to run applications. The worth of dedicated hardware is usually depreciated over a certain amount of years, but in the case of cloud computing you pay for what you use without owning any of the hardware (except the computers that are necessary to access the cloud).

In the case of the AX – FV integration it would be necessary to develop a Field Vision application that is supported by cloud computing. But since the Field Vision application is owned by a supplier called Tensing, the application would have to be developed by them. Another option is to develop a new field service solution that is compatible with cloud computing, but this can be a big investment seeing that the solution would have to be developed from scratch. The third option is using an existing cloud solution, like ServiceMax<sup>4</sup>. A nice feature of ServiceMax is the support of mobile devices like phones, tablets or PDAs.

Besides the extra costs of having to develop a field service solution for the cloud, there is also the necessity of an internet connection. If your device is not connected to the internet, it is not possible to use the application. This might not seem like a big problem in the modern day era, but it can be for mechanics who visit industrial and/or remote locations with limited signal strength. Not being able to register hours or items when offline is a major disadvantage compared to the current, asynchronous integration.

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<sup>4</sup> <http://www.servicemax.com>

Web services are another form of synchronous integration that could be interesting for the AX – FV integration. A web service is a software function that allows users access to (parts of) an application in the cloud through a web browser. It is for instance possible to develop a web service that requests stock information from an online ERP system. This would make it quick and easy for mechanics to get an up to date overview of their own stock or the stock of the main warehouse. But again, the downside of web services is the necessity of an internet connection, which is not always possible.

#### Advantages

- Improved accessibility
- Reduced hardware and license costs
- More flexibility (easy to expand capacity)
- Easy back-up and recovery options
- Optimal resource utilization through shared services

#### Disadvantages

- Security issues
- Possible downtime
- Limited compatible applications
- Large initial investment if a custom application has to be designed
- Requires a constant internet connection

### 7.1.2 ASYNCHRONOUS INTEGRATION

This is the current integration method and also a strong contender for the integration between AX & Field Vision. An explanation of the current integration method has already been given in paragraph 5.2.4, but we will review the consequences of asynchronous integration for Microsoft Dynamics AX 2012. An important feature of AX 2012 is the Connectivity Studio. The Connectivity Studio is used to integrate AX with other applications and supports a couple of file formats, including XML. The possibilities of the connectivity studio are summarized below (source: Connectivity Studio fact sheet<sup>5</sup>):

#### Compatibility and extendibility

*Connectivity [Studio] enables you to import or export data using a variety of formats, including XML, CSV, TXT, XLS, ODBC, and the Microsoft Dynamics AX database itself. For system integration needs, Connectivity Studio supports file-based messaging, Microsoft Message Queue, FTP connections, and direct database connections. You can add new formats and transport mechanisms with minimal effort.*

#### Complete message history

*Connectivity [Studio] keeps track of the complete data conversion and message history. A unique feature is a data buffer that captures records that could not be processed. From the message history form, you can review, edit, and re-run buffered records and messages.*

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<sup>5</sup> [www.to-increase.com](http://www.to-increase.com)

### Configurable transaction scope

*You can set the configurable transaction level to one record, the entire document, or a specific block in a document. For example, a message with 10 orders can function as one large transaction or 10 smaller transactions. If one line in an order fails, then that order, including all its order lines, will be rolled back and optionally stored in the data buffer.*

The amount of options that are possible with regard to message management is definitely an improvement when compared to Baan. In addition to better message management, it should also be noted that the implementation of a new ERP system will be smoother for the involved employees than the implementation of a new ERP system as well as a new field service solution. This reduces the overall risk and costs of the implementation. It is not required to choose the XML format for the AX – FV integration, but the adaptability and existing knowledge of the format do make it the most suitable option.

A disadvantage of asynchronous integration is the delay in communication. The way that this disadvantage is currently countered is by setting a high import and export frequency for important messages. This is a viable countermeasure that could also be applied for the AX – FV integration. A downside of using a customized field service solution like Field Vision is the dependency on the supplier (Tensing). While minor tweaks can be carried out by the software specialists of AAES, bigger adaptations require the help of the supplier. According to a project member, Tensing sometimes takes quite a while to process change requests. This could become a problem if Field Vision needs to be adapted to fit the requirements of the integration with AX.

#### Advantages

- XML format is easy to customize
- Most AAES companies are familiar with FV
- FV is already customized to support the general service processes
- Connectivity Studio makes it easier to manage XML messages
- Keeping FV is cheaper than introducing a new field service solution

#### Disadvantages

- Field Vision is slightly outdated, limiting its functionality
- Costly due to the amount of licenses
- Information is not 100% up-to-date
- Dependent on the supplier
- XML integration requires dedicated hardware

### **7.1.3 NO INTEGRATION**

The third and final option that will be suggested in this chapter is not integrating the ERP system with a field service solution. While this directly contradicts one of the main goals of the *Dynamic Entrance* project (i.e.: seamlessness), the "do nothing option" should always be offered and

considered. This option comes in two flavors: manually transferring information between AX and Field Vision or discarding Field Vision completely. Manually typing over information between the two systems will lead to a lot of time spent on typing and is very error-prone. The only advantage of this is the fact that it is initially cheaper because you do not have to invest in the design of the integration. However, this initial investment is easily earned back by the all time it will save of not having to type over every single service order or work sheet.

Discarding Field Vision completely also saves money by not having to design and maintain an integration, but it also leads to less costs by not having to pay yearly license fees. That might be the only advantage though, because it also takes away the option for mechanics to digitally register anything. This means that the registration must be carried out by writing everything down or typing it in an email or a Microsoft Office application (which aren't even available on the PDA of the mechanic). It would also render the function of the PDAs more or less useless, since they would be used as glorified phones.

#### Advantages

- Lower initial investment (due to lack of integration)
- No more FV license fees

#### Disadvantages

- Loss of a lot of useful functionality that FV offers
- Will lead to a lot of time wasted on typing over information
- Extremely prone to errors
- Increases the ROI of the PDAs
- The opposite of seamlessness

## **7.2 THE MOST SUITABLE SOLUTION FOR THE CURRENT SITUATION**

Now that an overview of possible options for the integration has been offered, it is time to choose the most suitable one for ASSA ABLOY Entrance Systems. A few other important issues that are to be considered for the selection of one of the options include:

- The requirement of the AAES management for IDDS Sweden to go live at the end of the first quarter of 2014;
- The limitations of the current hardware (i.e. PDAs);
- The costs of implementing a new field service solution;
- The limitations of the current field service solution (FV);
- The necessity of a constant internet connection with regard to cloud computing;

Based on this list, the goals of *Dynamic Entrance* and the advantages and disadvantages of the possible solutions, it is safe to say that the "do nothing option" can be discarded. It would be a major step back in terms of efficiency, seamlessness and profit (in the long run). Additionally, it would require the technicians (and office employees) to drastically change the way they work without offering any substantial advantages.

The runner-up option is synchronous integration/cloud computing. The reason that cloud computing is the second-most suitable option has everything to do with the fact that the current limitations make it nearly impossible to implement a cloud solution. Important factors for that statement include the requirement to go live at the end of Q1 of 2014 and the necessity of a constant internet connection. Some project members have pointed out that the current deadlines are quite optimistic already, introducing a new software project at this point in time would only further lower the feasibility of the required deadlines. That is not to say that it is impossible to introduce cloud computing at the next AAES company implementation, but that would contradict the wish to utilize the same software for the whole division.

The other important factor is the necessity of a constant internet connection which is just not realistic for a lot of situations. Especially in the industrial sector, mechanics are often providing service in remote places with limited or non-existent signal strength, making it difficult to access cloud services. There are of course ways to mitigate this problem, like moving the PDA until it is in range of sufficient signal strength, but this is a flawed solution. Another factor that should be mentioned is the cost of implementing a completely new cloud service solution. A special cloud application has to be developed or bought and customized, which is quite expensive. Additionally, mechanics and office employees would require extensive training before being able to use the application correctly.

Looking at the current situation and limitations, the most suitable option is using an asynchronous integration similar to the current integration but with added features based on requirements. While this option is not a completely perfect solution, there are compelling arguments for this choice:

- It is relatively safe to keep using FV in the same way that it is currently used (there will be no surprises about the functionality of FV);
- Most of the AAES companies already work with FV, making it easier to transition to a new ERP system, as opposed to changing both the ERP system and the field service solution;
- The connectivity studio from Microsoft Dynamics AX 2012 provides an easy way to import, export and manage XML messages;

- With the proper hardware and knowledge already in place, it is the least expensive option overall;
- It is also the most time-efficient option with regard to the design of the integration (not considering the "do nothing option");
- The current XML messages can serve as a starting point for the design of the AX – FV integration, which also saves time in the design;
- This option does not exclude other possibilities like the use of web services, increasing its potential for future improvements;

Current limitations of Field Vision and the use of XML files will still apply of course, but these limitations do not seem to drastically impact present day processes. Please remember that this choice was made based on the current situation, it could be possible that switching to cloud computing (or another alternative) is more profitable in the future. Technological advancements that are not yet released can also lead to huge changes in what is considered the best option, but it is not possible to say anything meaningful about that.

### 7.3 SUB-QUESTION 6

*"HOW CAN THE GAP BETWEEN REQUIREMENTS AND FUNCTIONALITY BE CLOSED?"*

Now that the most suitable integration option has been established, the time has come to work the chosen solution out in greater detail. A convenient method for this task is applying the MoSCoW method to the requirements/data elements of the XML messages. This method is used in business analysis and software development to reach a common understanding on the importance of each requirement. It distinguishes the following four priorities when assessing each requirement:

- Must have: describes a critical requirement that must be satisfied in the solution to be considered a success.
- Should have: represents a high-priority requirement that should be included in the solution, although they are not critical for the first release of the solution.
- Could have: a less-critical requirement that is considered desired, but not necessary. These requirements should be fulfilled if the "Musts" and "Shoulds" are delivered, but only if the planning and budget allow it.
- Would like/Won't: these requirements might be desired in the future, but will not be fulfilled in the current solution.



While all requirements are important in one way or another, the MoSCoW method provides a method to prioritize the different requirements, making it easier to make choices if the budget and/or project planning are threatened. In the ideal situation, developers will strive to meet all the **M, S & W** requirements, but realistically, the **S & W** requirements are the first to be abandoned when push comes to shove.

Once again, we will review the different types of XML messages and their data elements, but this time the requirements from IDDS Sweden and any additional requirements will also be taken into consideration. To prevent repeating the same information, the following rule will be applied: if a data element that exists in the current XML is not mentioned in the table, it is considered a **Must**. Any data elements that exist in the current XML messages but are not considered a **Must** will be mentioned in the table with a different priority. For an overview of the current XML messages, see paragraph 5.3.2. The tables will contain the source of the requirement, the name of the data element, its function and the MoSCoW priority.

#### The order information XML message (Export – transaction data)

- Suggested export frequency: every 3 minutes

The functional requirement document from IDDS Sweden lists a couple of data elements that should/must be included in the first release of AX 2012. For example: they conveyed the wish for mechanics to be able to see if any materials were ordered specifically for a service order. While this is not possible currently, it could be a useful addition to the information that is available for the mechanic. However, it is not something that must be included in the first release for it to be considered a success, hence the **S** priority. Another requirement is showing the next date on which a planned maintenance visit is scheduled. If the next PM date is near the current date, the mechanic could decide to perform the maintenance while he or she is there for a breakdown order, potentially saving time by not having to travel twice to the same location. Because of the potential time-saving aspect of this requirement, it is labeled as a **Must**.

Employees of IDDS Sweden have also stated the wish of being able to see whether the service object is covered by an active warranty. A simple yes or no answer would suffice, but because this is service object information, this change is also mentioned in the installations XML message. The last order information related IDDS requirement is the ability to see if any specific tools are necessary to carry out the service order. Usually the mechanic and planner will communicate via the phone in the case of specific tools, but displaying this information in the service order could function as an extra safety measure. If it can save the mechanic from an unnecessary visit because he or she does not have the correct tools, it **Must** be included in the first release. Another IDDS Sweden requirement is

showing the location to which any pre-ordered materials were delivered, this Should be included in the first release.

The additional requirements were not mentioned during the requirement workshops, but could be a nice addition to the order information XML. Currently, only the contact person on site and his or her contact information is included in the order information XML. It Could be nice to also see the name and contact information of the person who reported the breakdown (the invoicing party). This is less relevant for the mechanic, but could be useful for "back-up purposes". If there is a disagreement about the way the breakdown was reported, the contact information of the person who reported the breakdown can be easily recovered.

Req. source	Data element	Function	MoSCoW
IDDS FRD	Pre-ordered material ID	Identifying number of the item(s) that was (were) ordered for the service order	<u>S</u>
IDDS FRD	Pre-ordered material description	Description of the item(s) that was (were) ordered for the service order	<u>S</u>
IDDS FRD	Pre-ordered material quantity	Quantity of the item(s) that was (were) ordered for the service order	<u>S</u>
IDDS FRD	Next PM date	Date on which the next planned maintenance visit is planned	<u>M</u>
IDDS FRD	Warranty active	States whether the service object is covered by warranty	<u>S</u>
IDDS FRD	Specific tools	States any tools that are necessary to carry out the service order	<u>M</u>
IDDS FRD	Delivery location	States the location at which the materials were delivered	<u>S</u>
Add. Req.	Invoice contact person	Name of the person who reported the breakdown	<u>C</u>
Add. Req.	Invoice phone number	Phone number of the person who reported the breakdown	<u>C</u>
Add. Req.	Invoice email address	Email address of the person who reported the breakdown	<u>C</u>

**TABLE 15: ADDED FEATURES FOR THE SERVICE ORDER XML**

### The location XML message (Export – master data)

- Suggested export frequency: twice per day

Unfortunately, not many requirements were stated regarding location information during the IDDS Sweden workshops. That is why the only requirements that are mentioned in the table are additional requirements. Adding the default contact person and his or her contact information to the location file is thought to be the most impactful change and is therefore categorized as a **Should**.

An interesting idea that was pointed out by Mr. van Eden is merging the opening hours XML with the location XML. Since opening hours are always linked to a location, why not include them in the location XML? This adjustment could potentially save time during the actual development of the integration. Each XML message needs to be configured in both AX and FV, business logic has to be applied and the batch schedule has to be set, making it more efficient to create one larger XML message instead of two smaller ones. There wouldn't be any operational consequences by applying this idea, so it is a win-win situation and **Should** be taken into consideration. The last additional requirement is the option of adding a geocode to the location XML message. This geocode could be useful if a change occurs in the way that orders are planned (currently Field Vision is used, but it might be possible that AX will be used for planning in the future).

Req. source	Data element	Function	MoSCoW
Add. Req.	Default contact person	Name of the default contact person on site	<u>S</u>
Add. Req.	Contact person phone number	Phone number of the default contact person on site	<u>S</u>
Add. Req.	Contact person email address	Email address of the default contact person on site	<u>S</u>
Add. Req.	Opening hours Monday	States the opening hours of the location on Mondays	<u>S</u>
Add. Req.	Opening hours Tuesday	States the opening hours of the location on Tuesdays	<u>S</u>
Add. Req.	Opening hours Wednesday	States the opening hours of the location on Wednesdays	<u>S</u>
Add. Req.	Opening hours Thursday	States the opening hours of the location on Thursdays	<u>S</u>
Add. Req.	Opening hours Friday	States the opening hours of the location on Fridays	<u>S</u>
Add. Req.	Opening hours Saturday	States the opening hours of the location on Saturdays	<u>S</u>

Add. Req.	Opening hours Sunday	States the opening hours of the location on Sundays	<u>S</u>
Add. Req.	Geocode	Universal geographic code that can be used to pinpoint a location	<u>C</u>

TABLE 16: ADDED FEATURES FOR THE LOCATION XML

#### The installation XML message (Export – master data)

- Suggested export frequency: twice per day

A lot of changes regarding the installation XML message are suggested in the functional requirement document of IDDS Sweden. This has everything to do with the different types of products that are serviced compared to PDS companies. The industrial sector uses different doors than the pedestrian sector; they are usually larger and consist of multiple installations (dock levelers, the door itself, shelters). One of the wishes expressed by the IDDS Sweden employees is to add customer reference to the service object file. This customer reference states the name that is given to the door (and its associated objects), for example: Door #1. Adding this reference to the dock leveler will make it easier for the mechanic to keep the different installations apart and it also allows the ERP system to group installations that belong together. This easy to implement change can really make a difference, especially for IDDS companies.

Other requirements include the addition of object dimensions, like size and color, to the service object. This change will make it simpler to order the correct materials, as the chance of ordering an item with the wrong color for example will become smaller. Another easy to implement measure that **Must** be included in the first release. The warranty end date is another **Must**. The order information XML was expanded with a warranty check and this information should also be linked to the service object.

It is possible that certain installations always require specific tools, especially in the industrial sector. If this is the case, this information **Should** be added to the service object because it can be the difference between visiting a location "empty-handed" and visiting a location with proper equipment. IDDS Sweden also registers the amount of times that a door is opened, making it easier to predict breakdowns and to efficiently plan maintenance visits. This information **Should** also be added to the installation XML message.

The last requirement is not something to be included in the first release, but rather a **Would like** for the future. There is a lot of documentation available regarding service objects (manuals for example), but this is currently only available through printed files that are stored in the van of the mechanic. It would be nice to store this documentation online and allow mechanics to access the

documentation by visiting an online database. The link to the relevant documentation would be added to the installation XML message.

Req. source	Data element	Function	MoSCoW
IDDS FRD	Customer reference	Description of the service object as used by the customer	<u>M</u>
IDDS FRD	Object dimension – size	States the size of the service object	<u>M</u>
IDDS FRD	Object dimension – color	States the color of the service object	<u>M</u>
IDDS FRD	Warranty end date	States the date on which the warranty expires	<u>M</u>
IDDS FRD	Need for specific tools	States the need for specific tools on service object level	<u>S</u>
IDDS FRD	Amount of door openings	States the amount of times the door/service object has been opened	<u>S</u>
Add. Req.	Link to relevant documentation	Link to an online database that contains information regarding service objects	<u>W</u>

**TABLE 17: ADDED FEATURES FOR THE INSTALLATION XML**

#### The installation type XML message (Export – master data)

- Suggested export frequency: twice per day

The current message that contains information about the installation type is already quite small (just three data elements) and adding extra data elements will not expand the functionality of the XML message. No improvements can be made.

#### The item XML message (Export – master data)

- Suggested export frequency: twice per day

There is a lot of room for improvement on the item XML message. An important requirement that came up during the IDDS Sweden workshop is the addition of the unit type (pieces for example). This would make it easier to order the correct quantity and reduces overall confusion about unit types. Adding the unit type synergizes with another data element called "item conversion factor". This data element states the conversion factor of the item, for example 1 box = 25 items. While being less relevant than the actual unit type, the conversion factor is something that Should be added.

Other features that **Must** be added are the item configuration and lead time. The employees of IDDS Sweden reported that there is a connection between the weight/size/age of the item and the time it takes to receive an ordered item. That is why adding an item configuration data element could be effective. This data element should consist of a free text field which can be used to define the size, color, weight and any other specifications of the item. Since the item configuration influences the delivery time, another data element should be added, displaying the standard lead time of the item. If the mechanic is able to see the estimated time it takes for the item to be delivered, he or she can use this information to inform the customer better.

All items are sent to the Field Vision database, but not all of them are sent to the PDA of the mechanic. There **Should** be a data element that defines if the item belongs to the top 2000 of most used items. If it does, the item information will be sent to the PDA of the mechanic, if not, it will only be visible in the FV database. Another IDDS Sweden requirement is displaying the item number of any related items (the example that was used mentioned a left and right item). While this is certainly important, it is not critical and it is categorized as a **Should**.

Additional requirements to the item file include adding the name of the standard supplier and its phone number. Although most items are delivered from an AAES owned spare part center/factory, there are also external suppliers. With this information, the mechanic would be able to quickly contact the supplier with questions about the stock quantity or delivery time. Items also have extensive documentation which is currently only available in the form of paper documents. Storing this documentation online **Would** be nice for the future. The same goes for a picture of the item; this **Would** make it easier to recognize and distinguish different items.

Req. source	Data element	Function	MoSCoW
IDDS FRD	Unit type	Description of the unit type in which the item is specified (pieces, m2, liter etc.)	<u><b>M</b></u>
IDDS FRD	Item configuration	Text field that can be used to describe item characteristics (size, color, weight etc.)	<u><b>M</b></u>
IDDS FRD	Lead time	States the average amount of days it takes from order to delivery of the item	<u><b>M</b></u>
IDDS FRD	Top 2000 item?	States if the item belongs to the top 2000 most used items	<u><b>S</b></u>
IDDS FRD	Related item number	Identifying number of another item that is related to the item	<u><b>S</b></u>
IDDS FRD	Item conversion factor	States the conversion factor of the item unit	<u><b>S</b></u>

Add. Req.	Supplier name	Name of the standard supplier of the item	<u>C</u>
Add. Req.	Supplier phone number	Phone number of the standard supplier of the item	<u>C</u>
Add. Req.	Link to relevant documentation	Link to an online database that contains information regarding items	<u>W</u>
Add. Req.	Picture	An image of the item	<u>W</u>

TABLE 18: ADDED FEATURES FOR THE ITEM XML

#### The stock XML message (Export – transaction data)

- Suggested export frequency: every 3 minutes

Since stock messages are considered to be transaction data, there is less focus on the type of information that is included and more on the actual transaction. That is why the XML messages that transfer transaction data usually contain less data elements than XML messages that transfer master data. The result of this, is that there will be less adjustments to transaction data XML messages, since they mostly transfer transactions.

In Baan, the ID of the engineer is linked to a warehouse which allows the integration to only send over the engineer ID when making stock transactions. It is not yet sure if AX also supports linking an engineer with a warehouse, but if this is not the case, the integration should specify the warehouse on which the transaction is made. Therefore, adding the warehouse ID data element can either be a **Must** or a **Won't**.

Req. source	Data element	Function	MoSCoW
Add. Req.	Warehouse ID	Identifying number/code of the warehouse on which the stock transaction is made	<u>M/W</u>

TABLE 19: ADDED FEATURES FOR THE STOCK XML

#### The cycle count XML message (Export – transaction data)

- Suggested export frequency: when necessary

The way IDDS Sweden performs stock counts is different than that of other AAES companies; the finance department sends out the lists with items to the mechanic, which are filled in and sent back. A finance employee then enters the information in an Excel file. However, there already is a more seamless version of the stock count process (see paragraph 7.3.2). The XML message that is used for stock counts can hardly be improved by adding more data elements, but the same "problem" occurs if AX is not able to link engineers to warehouses. If that is the case, the data element warehouse ID should also be added to the cycle count XML message. Again, this is either a **Must** or a **Won't**.

Req. source	Data element	Function	MoSCoW
Add. Req.	Warehouse ID	Identifying number/code of the warehouse on which the stock transaction is made	<u>M/W</u>

**TABLE 20: ADDED FEATURES FOR THE CYCLE COUNT XML**

The debrief order XML message (Import – transaction data)

- Suggested import frequency: every 3 minutes

The only IDDS requirement that applies to the debrief order XML message is the ability to report if pre-ordered materials were used. This is something that needs to be done in Field Vision by the mechanic. The adjustments to the order information XML message regarding pre-ordered material are critical for this requirement. Without them, it would not be possible to confirm or deny if the pre-ordered materials were really used. The best way to report pre-ordered material consumption is to present the mechanic with a list of materials that were ordered and a check box that can be ticked if the materials were actually used.

Req. source	Data element	Function	MoSCoW
IDDS FRD	Pre-ordered materials used	Yes/no function that states whether or not the pre-ordered materials were consumed	<u>M</u>

**TABLE 21: ADDED FEATURES FOR THE DEBRIEF XML**

The status update XML message (Import – transaction data)

- Suggested import frequency: every 3 minutes

Again, there were no requirements that emerged from the IDDS Sweden workshops regarding the status update XML message. But when looking at the current status update message, it is safe to remove two of the data elements that are currently included. Planned start date and planned end date do not add any value to the status update and can therefore be removed from the status update XML message.

Req. source	Data element	Function	MoSCoW
Original XML	Planned start date	States the planned start date of the service order	<u>W</u>
Original XML	Planned end date	States the planned end date of the service order	<u>W</u>

**TABLE 22: ADDED FEATURES FOR THE STATUS UPDATE XML**

The indirect hours XML message (Import – transaction data)

- Suggested import frequency: every 3 minutes

Another IDDS Sweden process that is behind when compared to other AAES companies, is the registration of indirect hours. Indirect tasks are manually registered by filling out paper forms and in



some cases, dummy service orders are used to register indirect tasks. Like some of the other transaction data XML messages, the current indirect hours XML message already contains all the necessary information. Therefore, no adjustments will be made.

#### The item replenishment XML message (Import – transaction data)

- Suggested import frequency: every 3 minutes

While there were no requirements regarding the item replenishment XML message, there is one data element that Could be useful to add. It might be a good idea to let the mechanic choose the location to which the ordered items should be delivered. These locations could be categorized into the following possibilities: deliver to site/van/central warehouse/DHL. And again, because transactions are made on the engineer ID currently it might be necessary to add the data element warehouse ID in order to be able to perform transactions in AX.

Req. source	Data element	Function	MoSCoW
Add. Req.	Preferred delivery location	States the location category to which the items should be delivered	<u>C</u>
Add. Req.	Warehouse ID	Identifying number/code of the warehouse on which the stock transaction is made	<u>M/W</u>

**TABLE 23: ADDED FEATURES FOR THE ITEM REPLENISHMENT XML**

#### The item transfer XML message (Import – transaction data)

- Suggested import frequency: every 3 minutes

There were no requirements that apply to the item transfer XML message, meaning that the only possible adjustment is the addition of a warehouse ID for AX transactions.

Req. source	Data element	Function	MoSCoW
Add. Req.	Warehouse ID	Identifying number/code of the warehouse on which the stock transaction is made	<u>M/W</u>

**TABLE 24: ADDED FEATURES FOR THE ITEM TRANSFER XML**

#### The cycle count XML message (Import – transaction data)

- Suggested import frequency: when necessary

Same as the import message; the only change is the possible addition of a warehouse ID.

Req. source	Data element	Function	MoSCoW
Add. Req.	Warehouse ID	Identifying number/code of the warehouse on which the stock transaction is made	<u>M/W</u>

**TABLE 25: ADDED FEATURES FOR THE CYCLE COUNT XML**

## 8. BUSINESS CASE

Once again it is time to work out the business case. An initial business case was created for the Project Initiation Document (PID) and while some of the costs and benefits from the initial business case are still valid, a revision is in order. It is important to define what should and should not be included in the costs and benefits of the business case. In the initial business case, the costs of letting the student develop an integration plan were compared to the costs of letting an AAES employee or external consultant come up with an integration strategy. This time we will take look at the costs that were made during the graduation project in addition to the estimated costs of actually carrying out the recommended solution. These costs will be compared to the estimated benefits of the solution. The business case will be concluded by a calculation of the payback period of the solution.

### 8.1 COSTS

Let's start with the costs that were made to hire and support the student during the graduation project. The accurate expense for this graduation project is the monthly internship compensation (4 x €400,-). The company supervisor has invested a lot of time in introducing the student to the company, supplying the student with information and providing the student with feedback on both project documents and business documents. The total amount of time that was spent on guidance is estimated on 80 hours, or 20 hours per month. And while it is always awkward to guess (let alone ask) someone's salary, the company supervisor is thought to cost ASSA ABLOY Entrance Systems ~€25,-/hour. This estimation was based on the average salary in the information sector<sup>6</sup>.

Other costs include the expenses that were made during the visit to Sweden at the start of the project (~€500,-). But there are also costs to be found in the interviews and meetings with AAES employees that were conducted during the graduation project. The time spent on meetings and interviews is estimated on 40 hours. Seeing that meetings and interviews were held with a lot of different people, the hourly costs will be estimated on ~€20,-, which is the average hourly income in the Netherlands according to the central bureau of statistics. Last and coincidentally also least, are the costs that were made by providing the student with a workspace, laptop and telephone. These are estimated on ~€50,-/month.

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<sup>6</sup> <http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=81431NED&D1=2,5-8&D2=0&D3=0-1,4-8,11-16,18-19,22-24,26-27&D4=I&HD=120116-1358&HDR=G3,G1,T&STB=G2>

#### Costs of the graduation project

Internship compensation	4 months x €400,-	€1600,-
Company supervisor guidance	80 hours x €25,-	€2000,-
Travel expenses		€500,-
Interviews & meetings	40 hours x €20,-	€800,-
Workspace/laptop/phone	4 months x €50,-	€200,-

**TABLE 26: ESTIMATED COSTS OF THE GRADUATION PROJECT**

The total costs that were made during this graduation project are estimated on €5100,-.

Since the suggested solution from chapter 9 only offers the design of an integration between AX and Field Vision, it is also necessary to make an estimation of the future costs of development, testing and maintenance of the suggested integration solution. The result of this graduation project for AAES will consist of this thesis in combination with the functional requirement documents and functional design documents for the interface. The functional design documents will be the foundation for the technical design documents that are used by developers to actually create the solution.

This step will not be executed by the student, so the amount of time spent on creating technical design documents has to be accounted for. The total amount of TDDs that need to be created for the integration is 13 (one for each suggested XML message) and the time spent per document is estimated on 5 hours, resulting in a total of 65 hours. Because the *Dynamic Entrance* project is executed internally, the costs of development and testing will be lower than they would be if it was done by an external consultancy agency. The estimated hourly rate for development and testing purposes is based on the same source as the hourly costs of the company supervisor (€25,-/hour).

When the technical design documents have been created, it is possible to start the development of the interface. This can be quite time consuming since you have to work with two different systems. You need to know where and how to gather the information that is described in the designed XML messages, make adjustments in both systems if the information is not available and configure the Connectivity Studio to import and export the messages according to business logic. While some integration elements will be easier to develop than others, the average time spent on developing an XML message and its integration is estimated on 50 hours. This amount needs to be multiplied with the amount of different XML messages.

So now the initial integration has been developed. The next logical step is to test if the integration actually works according to the requirements and functions described in the functional design

document. Any errors or incorrect functionality will have to be redeveloped and tested again, making the testing phase another expensive activity. If the units/XML messages work individually, you will also need to perform a system integration test, which tests if the integration works as a whole. The average time spent on unit tests, redevelopment and the system integration test is estimated on 35 hours per XML message.

When the development and testing phase is complete, the go live moment has arrived. By this time, the major expenses have already been made and the only expenses for the integration will consist of maintenance costs and improvement projects. How high these costs will be is entirely dependent on the initial quality of the integration. In other words: if a lot of time was spent on developing and testing the integration beforehand, chances are that maintenance costs will be lower than when the development and testing was rushed. Notice that it is generally cheaper to extensively test the integration before going live, since errors or shutdowns after going live will result in extra costs. Imagine that there is an error which leads to Field Vision not being able to import service orders. Mechanics would be forced to create blank service orders in Field Vision to be able to perform service activities. These blank service orders all need to be transformed back into AX service orders at a later moment, resulting in an enormous amount of time wasted on copying the service orders. Because the estimations for time spent on development and testing are a bit high, the maintenance costs for the integration will be estimated lower than usual: 100 hours/year (=€2500,-).

The last costs that need to be taken into account is the training of employees. A lot of the AAES employees are already trained in working with Field Vision, but since Field Vision will also be adjusted to fit the requirements, extra training might be necessary. The total amount of AAES employees, as stated in paragraph 3.2, was 7429 in 2012. Of this group of people, ~2000 are mechanics. Let's say that about two hours of training is necessary to familiarize the mechanics with the added features of the improved Field Vision. This results in a total of 4000 hours of training. The costs of not being able to use mechanics is estimated on €35,-/hour. The table below summarizes the costs of the suggested solution.

Initial costs of the suggested solution

Translation FDDs → TDDs	65 hours x €25,-	€1625,-
Developing the integration	50 hours x 13 x €25,-	€16250,-
Testing the integration	35 hours x 13 x 25,-	€11.375,-
Training employees	4000 hours x €35,-	€140.000,-

**TABLE 27: ESTIMATED COSTS OF THE SUGGESTED SOLUTION**

The initial costs of the suggested solution are estimated on €169.250,- (maintenance costs not included). If you add the costs of the graduation project to the initial costs of the suggested solution, the total costs would amount to €174.350,-, but let's round that up to €175.000,- with €2500,- annual maintenance costs.

## 8.2 BENEFITS

To make an estimation of the benefits, we first need to establish what the added value of an integration between AX and Field Vision is. Do you estimate benefits by comparing the current integration to the future integration or do you estimate the benefits of having an integration versus having no integration? The only reason that a new integration had to be designed is because ASSA ABLOY Entrance Systems decided to implement Microsoft Dynamics AX 2012 at all subsidiary companies. This decision forced AAES management to also think about all the other applications that are currently used (Field Vision, iSAC, HRM systems, finance systems etc.). Which of these are kept and which are discarded? The decision was made to only keep iSAC and Field Vision, both of which would be integrated with the new ERP system.

Considering that the costs that were estimated in the previous paragraph apply to the creation of a completely new integration, we will look at the benefits of having an integration versus having no integration in this paragraph. After all, if those estimated costs will not actually be made, there also wouldn't be an integration between AX and FV. The difficult part is to make a realistic estimation of the consequence of having an integration. The benefit of having an integration can be expressed in time that is not spent on manually transferring information between AX and FV. Not integrating AX with FV would result in employees having to manually transfer each service order, indirect task, but also keeping the master data up to date. Additionally, typing everything over will lead to more errors which will also result in extra time spent on manually integrating the two systems.

According to the key figures of 2012, the total expenditures of the ASSA ABLOY Entrance Systems division amounted to 9.43 billion SEK or 1.09 billion Euros. Let's assume that not integrating AX with Field Vision will result in 1% extra costs (quite optimistic). This would mean that 11 million Euros can be saved by seamlessly integrating these two systems for AAES as a whole. These potentially saved costs must be specified for IDDS Sweden, since they are the first to go live and will thus be the first to start saving costs. IDDS Sweden employs 85 employees versus the 7429 employees of the AAES division (see appendix A). The annual costs of IDDS Sweden can be interpolated by using the employee ratio on the total costs of the AAES division, resulting in ~€126.000,-.

Potentially saved costs

For the AAES division	1% of 1.09 billion Euros	€11.000.000,-
For IDDS Sweden	1.14% of €11 million Euros	€126.000,-

TABLE 28: POTENTIALLY SAVED COSTS OF THE INTEGRATION

### 8.3 PAYBACK PERIOD

To calculate the payback time of the integration, the following formula can be used:

$$\text{Payback Period} = \frac{\text{Initial costs}}{\text{Periodic cash flow}} = \frac{\text{Initial investment}}{(\text{Annual benefits} - \text{Annual costs})}$$

If the aforementioned costs and benefits are entered in this formula, the result is:

$$\text{Payback Period} = \frac{€175.000,-}{(€126.000 - €2.500)} = 1.4 \text{ years}$$

This is a relatively short payback period and it only applies to the potential benefits of the IDDS Sweden branch, while the costs of the complete integration were used. If the potentially saved costs of the complete AAES division were to be used in this formula, the payback period would be even less. These potentially saved costs are not tangible and although the costs of the integration are definitely tangible, the return on investment of integrating the two systems would be huge.

Other intangible, strategic benefits of an integration between AX and FV include:

- Professionalism: how many modern-day companies still write stuff down as opposed to digitally processing information?
- Seamlessness: having as few human interactions in the process as possible will lead to fewer mistakes and a faster integration.
- Division-wide reporting: the whole AAES division uses the same ERP system and field service solution, making it extremely easy to create division-wide, management reports.
- Lower overall costs: the integration will improve and speed up service processes, resulting in lower overall costs.

## 9. CONCLUSION & RECOMMENDATIONS

At last we have arrived at the conclusion of this bachelor thesis. This chapter will be used to conclude findings that were made during the graduation project and to provide recommendations for the integration and for the *Dynamic Entrance* project as a whole.

### 9.1 CONCLUSION

A large part of this bachelor thesis is focused on the current situation. This was done intentionally, because creating an integration strategy for a new system and an existing system requires you to analyze the current processes, since most of them will need to be supported by the future integration. It could be stated that the current processes are the minimum requirements for the integration between AX and Field Vision. By elaborately describing the processes that are currently executed in Field Vision and the integration with the current ERP systems, a foundation was laid for the integration between AX and FV.

Following this train of thought, any requirements that were gathered during the IDDS Sweden workshops and the additional requirements can be seen as improvements on the current situation. We have seen that the level of seamlessness greatly differs within the different AAES companies. At first, this occurrence made it difficult to oversee the different "requirements", but eventually it was easy to determine which requirements should be applied and which requirements could be ignored. This is especially true for the requirements of the IDDS Sweden workshops, because a lot of them were simply outdated. The invested time in the analysis of the current processes of other AAES companies paid off during the requirements chapter, since it was easy to recognize which of the requirements were actual improvements.

In the design chapter we reviewed a couple of possibilities/alternatives for the current integration. Cloud computing seemed like an interesting possibility, but turned out to be an unrealistic option for the current situation. The only benefit of the "do nothing option" is the fact that you initially save money by not having to design, develop and test an integration between AX and FV. However, the business case chapter made it clear that while an integration is certainly expensive, the return on investment is entirely worth it. Eventually, the choice was made to go with an integration similar to the current integration. The most important arguments for this decision were related to efficiency, money and the lack of a realistic alternative.

The chosen solution was worked out by revisiting the current XML messages and applying the relevant IDDS Sweden requirements and any additional requirements that were either gathered from project members or from the imagination of the student. With the help of the MoSCoW

method, it was relatively easy to determine the priority of each change/requirement. The end result has been this thesis, the functional requirement documents and the functional design documents.

Summarizing, the following conclusions can be drawn:

About integration in general:

1. It is possible to integrate Microsoft Dynamics AX 2012 with Field Vision.
2. There are three ways of integrating two systems, namely: synchronous integration, asynchronous integration and manual integration.

About the work streams:

3. In order to divide the *Dynamic Entrance* project into smaller parts, nine work streams are applicable.
4. The integration between AX and Field Vision is related to the sales to cash and service to cash work stream.
5. The sales to cash and service to cash work streams describe two different main processes; sales to cash is focused on all new sales activities, whereas service to cash is focused on all service activities.
6. A selection was made of the main and sub-processes that are relevant to the integration between AX and Field Vision (see paragraph 7.1.3).

About the Baan – FV integration:

7. There are two types of Field Vision user groups, namely: office employees and technicians.
8. The two user groups use different versions of Field Vision (dispatch & mobile client respectively) and use them for different purposes (planning and monitoring on the one hand, and registration and inventory management on the other hand).
9. The current ERP systems are integrated with Field Vision through asynchronous integration, using messages with the XML file format to send over information back and forth.
10. In the current situation, XML messages are used to send over both master data and transaction data.
11. The XML messages that transfer master data have a low export frequency when compared to the messages that transfer transaction data; this leads to a delay in the integration.

About the AX – FV integration:

12. The integration between AX and Field Vision should support (and improve) all the current sales and service processes.
13. Business requirements were gathered from the first company to go live (IDDS Sweden).



14. A lot of the IDDS Sweden requirements were outdated when compared to other AAES companies.
15. The IDDS requirements, the current processes and some additional requirements were used as the foundation for the design of an integration between AX and Field Vision.
16. The AX – FV integration can be seen as one big gap, since there is currently no integration at all.
17. The integration gap can be filled by selecting one of the three aforementioned integration methods.
18. The chosen integration method is asynchronous integration.
19. The most important factors that justify the chosen solution are: the go-live deadline of IDDS Sweden, the lower costs of asynchronous integration, the existing knowledge and familiarity with Field Vision and the limitations of the current hardware.
20. The design of the asynchronous AX – FV integration uses the current XML messages as a starting point and translates the requirements from IDDS Sweden and any additional requirements into added data elements/features.
21. The added data elements/features were prioritized using the MoSCoW method.
22. The costs of the AX – FV integration are €175.000,- (initial investment) with €2500,- annual maintenance costs, whereas the benefits for IDDS Sweden come down to €126.000,- annually.
23. The payback period of the integration for IDDS Sweden is 1.4 years.
24. The benefits of the suggested integration far outweigh the costs of the integration.

## 9.2 RECOMMENDATIONS REGARDING THE AX – FV INTEGRATION

The conclusions that were drawn in paragraph 9.1 will be used as the input for any recommendations regarding the AX – Field Vision integration:

1. It is recommended that AX and Field Vision are integrated with each other to prevent unnecessary extra costs in the form of manual information transfers, errors and overall professionalism.
2. Taking into account the current limitations in terms of time, money and current knowledge, the most suitable option is an asynchronous integration.
3. If the current limitations would somehow dissolve, it might be profitable to research the synchronous integration method because there are some interesting advantages to that method (see paragraph 7.1.1).

4. It is recommended to use the current XML messages in combination with the added features of the suggested solution (paragraph 9.4) as a starting point for the technical design of the integration.
5. The additional requirements/features can improve the current processes and should thus be considered.
6. It is recommended that the FRDs and FDDs, that are (going to be) designed by the student, are reviewed and assessed by a project member in the relevant work streams.
7. The assessment of the FRDs and FDDs should lead to the creation of the Technical Design Documents (TDDs) which can be used for the actual development of the integration between AX and Field Vision.
8. The fit/gap analysis should be completed as fast as possible in order to get an accurate insight in the amount of data elements that need to be added or edited in AX.
9. It is recommended to keep a close contact with the representatives of Tensing so that there will be no surprises when adaptations in Field Vision are in order.
10. It might be necessary to change the deadline of the first go live date (Q2 of 2014) if all of the aforementioned added features have to be created.

### 9.3 RECOMMENDATIONS REGARDING THE DYNAMIC ENTRANCE PROJECT & AAES IN GENERAL

Besides recommendations for the AX – FV integration, some recommendations for the *Dynamic Entrance* project and ASSA ABLOY Entrance Systems in general can also be given:

1. Improve the communication or increase the amount of contact moments between work streams. Currently, the project members of different work streams do have occasional meetings, but the amount of meetings could be increased to improve the implementation project, seeing that a lot of work streams are connected to each other in some way, shape or form.
2. A development that is taking place at the moment, is an increased focus on the fit/gap analysis. This is done to get a clear overview of the necessary steps that need to be taken and it is recommended to continue this development.
3. Following the previous recommendation, some project members have only just now started working with AX, making it difficult to perform an accurate fit/gap analysis. It is recommended to let the project members familiarize with AX before doing an in-depth fit/gap analysis.
4. In order to prevent redundant work, it might be a good idea to already design features that are required by other business areas instead of focusing on one business area. By

implementing AX one company at a time, a lot of the project steps will be iterated, resulting in extra costs.

5. Looking at the amount of work that needs to be done for IDDS Sweden to go live at the start of the second quarter of 2014, it is probably a good idea to create extra capacity by either hiring more project members or forcing current project members to only work on the *Dynamic Entrance* project.
6. To increase the overall seamlessness of AAES, it could be worthwhile to work out the idea of storing all technical documentation (manuals, product catalogues etc.) online instead of letting the technicians carry them with them in their vans.
7. Another important, current development in the ASSA ABLOY Entrance Systems division is centralization. The goal is to create one direct sales company, one indirect sales company and one production company per country and by doing this, saving costs and increase efficiency. While this is definitely a positive development, discarding the brand names of the individual companies could be a bad move in terms of recognizability.

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### Web pages

Unfortunately, the notation of websites is incorrect. This is a consequence of not properly registering sources during the graduation project (see the evaluation report for more on this).

- [www.assaabloyentrance.com](http://www.assaabloyentrance.com)
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- [www.salesforce.com/nl/cloudcomputing/](http://www.salesforce.com/nl/cloudcomputing/)
- [www.infoworld.com/d/cloud-computing/what-cloud-computing-really-means-031](http://www.infoworld.com/d/cloud-computing/what-cloud-computing-really-means-031)
- [www.financialforce.com/resources/research/salesforce-platform/cloud-computing-advantages/](http://www.financialforce.com/resources/research/salesforce-platform/cloud-computing-advantages/)
- [www.mindtouch.com/blog/2008/05/28/differences-between-saas-and-cloud-software/](http://www.mindtouch.com/blog/2008/05/28/differences-between-saas-and-cloud-software/)
- [www.mutatis-mutandis.nl/themadossiers/logistieke-automatisering/133-trends-in-applicatie-integratie?start=3](http://www.mutatis-mutandis.nl/themadossiers/logistieke-automatisering/133-trends-in-applicatie-integratie?start=3)
- [www.academictech.doit.wisc.edu/ideas/otr/communication/asynchronous-synchronous](http://www.academictech.doit.wisc.edu/ideas/otr/communication/asynchronous-synchronous)
- [www.businessanalystlearnings.com/ba-techniques/2013/3/5/moscow-technique-requirements-prioritization](http://www.businessanalystlearnings.com/ba-techniques/2013/3/5/moscow-technique-requirements-prioritization)
- [www.statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=81431NED&D1=2,5-8&D2=0&D3=0-1,4-8,11-16,18-19,22-24,26-27&D4=I&HD=120116-1358&HDR=G3,G1,T&STB=G2](http://www.statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLNL&PA=81431NED&D1=2,5-8&D2=0&D3=0-1,4-8,11-16,18-19,22-24,26-27&D4=I&HD=120116-1358&HDR=G3,G1,T&STB=G2)
- [www.coleyconsulting.co.uk/moscow.htm](http://www.coleyconsulting.co.uk/moscow.htm)
- [www.marketingtermen.nl/begrip/moscow-methode](http://www.marketingtermen.nl/begrip/moscow-methode)
- [www.thefreedictionary.com](http://www.thefreedictionary.com)
- [www.mijnwoordenboek.nl](http://www.mijnwoordenboek.nl)
- [www.thesaurus.com](http://www.thesaurus.com)
- [www.google.com](http://www.google.com)
- [www.youtube.com](http://www.youtube.com)
- [www.wikipedia.com](http://www.wikipedia.com)

### **Business documents**

- Business Process Documents 2.2 to 2.5 and 4.1 to 4.8
- FRD Service to Cash v2.7
- AAES Process Overview v1.33
- Fit/Gap List for Dynamic Entrance Sales Pilot
- FRD Interface Template
- FDD Template
- Service Management in AX 2012
- Sales and Marketing in AX 2012
- ASSA ABLOY Annual Report 2012
- Connectivity Studio Fact Sheet

## GLOSSARY

<u>AAES</u>	Abbreviation for ASSA ABLOY Entrance Systems.
<u>Breakdown</u>	The act or process of failing to function. Breakdowns are the reason why customers contact an AAES company.
<u>Business area</u>	Term that is used to distinguish the three different business areas of AAES: PDS, IDDS & HPDS.
<u>Change request</u>	Request document that is created in the case of a gap; describes a method to close said gap.
<u>Cloud computing</u>	Using applications that are stored on an external server without having to buy dedicated hardware.
<u>Connectivity Studio</u>	Microsoft Dynamics AX 2012 add-on that allows users to quickly import and export data to other applications.
<u>CRM (software)</u>	Abbreviation for Customer Relationship Management. Allows users to manage customer information and interactions.
<u>Data mapping</u>	The process of creating data element mappings between two separate data models or applications.
<u>Dedicated material</u>	Term that is used to indicate items that were purchased for a specific service order (also known as pre-ordered material).
<u>Engineer</u>	Term that is used to indicate a mechanic/technician/field employee.
<u>Entity-relationship diagram</u>	Data model used for describing a database in an abstract way. Uses entities, relationships and attributes to visualize the data structure.
<u>ERP (software)</u>	Abbreviation for Enterprise Resource Planning. Business management software that integrates all facets of an operation.

<u>Export message (XML)</u>	Term that is used to indicate all messages that are created in the ERP system and sent to another system.
<u>Field service solution (software)</u>	Programs that are specifically created for service companies who send out technicians into the "field".
<u>Field Vision</u>	Name of the field service solution that is used by AAES.
<u>Field Vision dispatch</u>	Field Vision module that is used by planners to plan and monitor all service orders.
<u>Field Vision Mobile client</u>	Field Vision mobile application that is used by technicians who can access it on their PDAs.
<u>Field Vision Scheduler</u>	Field Vision tool that can be used by planners to automatically plan maintenance orders based on skill sets, regions and capacity.
<u>Fit Gap analysis</u>	A study that is done to identify whether the present system fits the requirements or if a gap is present.
<u>FRD</u>	Abbreviation for Functional Requirement Document; these are used to document the requirements of a work stream/process.
<u>FDD</u>	Abbreviation for Functional Design Document; these are used to document designed solutions to gaps.
<u>HPDS</u>	Abbreviation for High Performance Door Solutions; one of the three business areas of AAES specialized in high speed doors.
<u>IDDS</u>	Abbreviation for Industrial Door & Docking Solutions; one of the three business areas of AAES specialized in industrial doors.
<u>Integration</u>	The process of linking together different computing subsystems, while adding value to the total system.
<u>Invoice</u>	Commercial document issued by a seller to a buyer that includes the prices for the service activities or products (synonym: bill).

<u>Import message (XML)</u>	XML message that is imported by the ERP system, either from iSAC or Field Vision.
<u>iSAC</u>	Name of the CRM application that is used by AAES companies.
<u>Master data</u>	Persistent, non-transactional data that is not changed frequently. Master data can be reference data used to support transactions.
<u>Microsoft Dynamics AX 2012</u>	Name of the ERP system that is being implemented by the <i>Dynamic Entrance</i> project team (also referred to as "AX").
<u>MoSCoW Method</u>	Technique that is used to prioritize the requirements during an implementation project or business analysis.
<u>PDS</u>	Abbreviation for Pedestrian Door Solutions; one of the three business areas of AAES specialized in pedestrian doors.
<u>PID</u>	Abbreviation for Project Initiation Document; used for PRINCE2 projects to determine the project goals, scope, approach and business case of a project.
<u>Planned maintenance</u>	Scheduled maintenance of an object, item or equipment that is done to prevent future breakdowns and keep the object in good conditions (also referred to as "PM").
<u>Quote</u>	Commercial document that is used to give potential buyers an overview of the estimated costs of an installation/service/product.
<u>Seamless flow</u>	Term that is used to indicate processes that are designed in such a way that there are as few (human) interferences as possible.
<u>Service order</u>	Order that is created in the ERP system and sent to Field Vision for mechanics to register their work and items used. The term service order is used to indicate all service and sales activities (breakdowns, maintenance and installations).



<u>Sure Step</u>	Name of the application/method that is used to manage the implementation of Microsoft products.
<u>TDDs</u>	Abbreviation for Technical Design Document; these are used to describe the technical design of a configuration or feature.
<u>To go live</u>	Term that is used to indicate the act of starting to work with a newly implemented system.
<u>Transaction data</u>	Non-persistent data that usually describes an event or action, can change often (example: stock quantities).
<u>Waterfall model</u>	Name of a software development methodology that includes the total development process, from concept to maintenance.
<u>WBS</u>	Abbreviation for Work Breakdown Structure; decomposition of a project into smaller components that can help define the scope of a project.
<u>Work stream</u>	Term that is used in the <i>Dynamic Entrance</i> project to divide AAES processes into smaller parts (see WBS).
<u>XML</u>	Abbreviation for Extensible Markup Language; format that is used for the current integration between the ERP systems and Field Vision.

## APPENDICES

### APPENDIX A – KEY FIGURES & COMPETITORS

#### Key figures

Figure 30 on right hand side of this page shows some of the key figures of the Entrance Systems division. Be aware of the fact that these numbers are in Swedish Kronor and not in Euros; the figure was taken from ASSA ABLOY's annual report of 2012. Converted to Euros, the total sales of AAES in 2012 would amount to 1.28 billion Euros and the total operating income of AAES in 2012 comes down to 180 million Euros. Both of these numbers have gone up since 2011 (963 million Euros in sales vs. 139 million Euros in operating income).

However, the organic growth has declined over the last year; 5% in 2011 versus -2% in 2012. The reason for this, according to the annual report, was the economic crisis that had a major impact on the European sales of 2012. Demand in North and South America remained at a stable level which allowed the division to grow. Asia also showed positive growth, especially in the industrial sector. Nearly 40% of the division's sales are generated by service activities because of high, regular sales whereas product sales are more cyclical and dependent on the economic climate.

ASSA ABLOY Entrance Systems is determined to keep growing and tries to achieve this by take-overs. That is also why total sales in 2012 have increased, but organic growth has decreased. While AAES is increasing investments in new product development on the one hand, it is

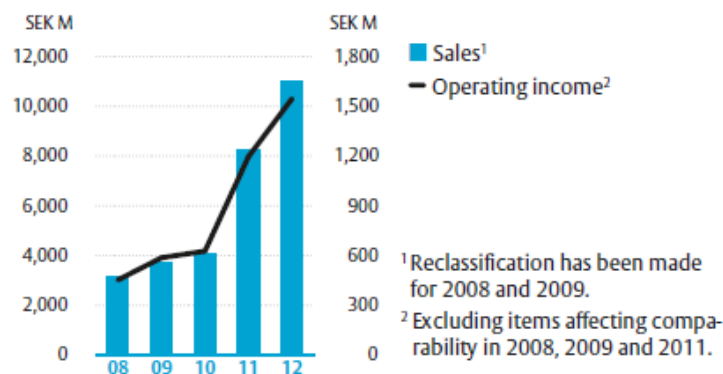
#### KEY FIGURES

SEK M	2011	2012
<b>Income statement</b>		
Sales	8,278	10,979
Organic growth, %	5	-2
Operating income (EBIT) <sup>1</sup>	1,197	1,546
Operating margin (EBIT) <sup>1</sup> , %	14.5	14.1
<b>Capital employed</b>		
Capital employed	10,837	13,189
– of which goodwill	7,153	8,323
Return on capital employed <sup>1</sup> , %	12.2	12.3
<b>Cash flow</b>		
Cash flow <sup>2</sup>	1,317	1,648
Average number of employees	5,605	7,429

<sup>1</sup> Excluding items affecting comparability of SEK 423 M in 2011.

<sup>2</sup> Excluding restructuring payments.

#### SALES AND OPERATING INCOME



#### SALES BY PRODUCT GROUP

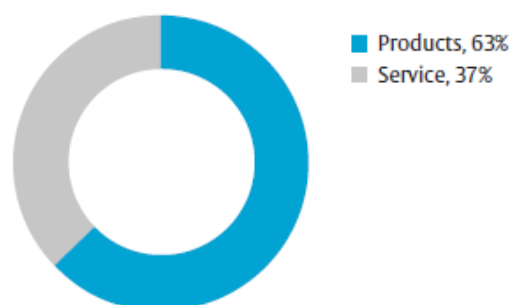


FIGURE 30: KEY FIGURES OF 2012

cutting costs by simplifying the complexity and streamlining the structure of production and administration on the other hand.

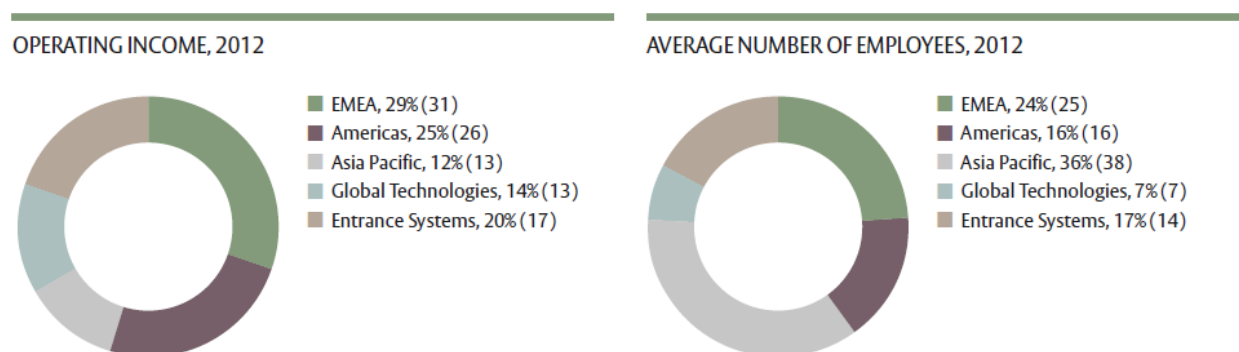


FIGURE 31: OPERATING INCOME AND EMPLOYEES OF 2012

As can be seen in figure 31, the Entrance Systems division amounted to exactly one fifth of the total operating income of ASSA ABLOY in 2012. This percentage has increased since 2011, when it was just 17%. Back in 2011, Entrance Systems employed 5,605 people (14% of total employees of ASSA ABLOY), this number has increased to 7,429 employees in 2012 (17% of total employees of ASSA ABLOY). Some other interesting figures about the growth of ASSA ABLOY in general; since the group's formation in 1994, the operating income of ASSA ABLOY has increased by over 4,700%. During this period, sales have increased from SEK 3 billion (350 million Euros) in 1994 to SEK 47 billion (5.5 billion Euros) in 2012. The amount of employees of ASSA ABLOY has of course also increased; from 4,700 in 1994 to 43,000 in 2012.

### Market & competitors

Customers of ASSA ABLOY Entrance Systems are somewhat divided between the three business areas. Pedestrian Door Solutions (PDS) focuses on customers in the following market branches: healthcare, transportation, hotels, retail and public facilities. Clients in the industrial sector (manufacturing, distribution and extractive industries) are covered by Industrial Door & Docking Solutions (IDDS). High Performance Door Solutions (HPDS) has customers in most of the mentioned sectors and comes into play when "regular" doors are insufficient. Examples of these situations are: clean room doors, food processing doors, machine protection doors and (some) hospital doors. Overlapping market sectors are sometimes handled by two different business areas, for instance a hospital that uses HPDS doors for its quarantine rooms and PDS doors for its entrances and exits. Being able to handle complex and elaborate projects is something that AAES strives to accomplish and it tries to do so by acquiring different kinds of companies.

Because of the overlap within the different business areas, it is hard to estimate the market share of ASSA ABLOY Entrance Systems. According to an article from IMS Research, the global market for

door automation had an estimated worth of \$5.4 billion in 2011 (≈4.2 billion Euros). This number includes revenues from sales, service and maintenance of automatic doors in the non-residential market. If you compare this to AAES's total sales in 2011 (963 million Euros), the market share of AAES would come down to 23%. This figure is an estimate for 2011, meaning that the number has probably increased in 2012, but this cannot be verified due to a lack of reliable sources on the subject.

Pointing out the main competitors of ASSA ABLOY Entrance Systems is also a problematic task, since the company (and market) is quite segmented. However, it is possible to state some of the big players per business area. In the pedestrian sector, KONE is one of the major competitors. KONE specializes in elevators and escalators but it also has an automatic door branch. Unfortunately though, sales per branch are not available in their annual report (total sales in 2012 were 6.3 billion Euros<sup>7</sup>). DORMA is a pedestrian competitor in revolving doors, but it also produces and sells door control systems and glass fittings. Again, no information could be found about their pedestrian specific sales (total sales in 2012 exceed 1 billion Euros<sup>8</sup>). Tormax is another global competitor in the pedestrian sector, but information regarding revenues could not be found. Other competitors in the pedestrian market include The Kaba Group, Boon Edam, The Agta Record Group & Horton.

In the industrial/high performance sector, Hörmann is one of AAES's rivals. Although they don't focus solely on the industrial sector, it is their main source of income. International door is an American player in the industrial market and offers a wide array in door solutions. Another competitor of AAES in general is Stanley Access Technologies which is a part of Stanley Black & Decker. Other examples of competitors of AAES in general are: AllStar Door & Maintenance, Nabco Entrances Inc. & EuroDoor AG.

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<sup>7</sup>[http://www.kone.com/corporate/en/Investors/Documents/2012/Q4%202012/KONE\\_Financial%20Statements\\_2012\\_en.pdf](http://www.kone.com/corporate/en/Investors/Documents/2012/Q4%202012/KONE_Financial%20Statements_2012_en.pdf)

<sup>8</sup> [http://www.dorma.com/en/front\\_content.php?idart=20665](http://www.dorma.com/en/front_content.php?idart=20665)

## APPENDIX B – MICROSOFT SURE STEP METHODOLOGY

Microsoft Dynamics Sure Step is a full customer lifecycle methodology for all Microsoft Dynamics® solutions, providing the Microsoft ecosystem with comprehensive sales through delivery guidance, project management discipline alignment and field-driven best practices. Sure Step is designed to enable the solution provider to better serve their customers by helping reduce their Microsoft Dynamics total cost of ownership. Sure Step content covers the Microsoft Dynamics ERP and CRM solution suite of solutions, including Microsoft Dynamics AX, Microsoft Dynamics CRM, Microsoft Dynamics GP, Microsoft Dynamics NAV, and Microsoft Dynamics SL. The guidance, tools, templates and best practices provided in the methodology can help increase the consistency, timeframes, quality and success of the Microsoft Dynamics engagements.

Sure Step is considered a full lifecycle methodology because it encompasses all phases of a customer engagement. Sure Step begins with a Solution Envisioning phase to help the customer determine the right solution to meet their needs, followed by Solution Delivery phases to implement their solution, and also includes guidance for the operation and maintenance of the solution in production. For existing Microsoft Dynamics customers seeking to progress their solutions to the latest product releases, Sure Step also provides Upgrade Assessments in the Solution Envisioning phase, followed by Solution Delivery phases to upgrade their solution, then maintaining the production solution in operation.

Sure Step has six phases: Diagnostic, Analysis, Design, Development, Deployment and Operation. The Diagnostic phase encompasses Solution Envisioning, and provides guidance on product capabilities, including content on focus industries for a corresponding product. The Decision Accelerator Offering is an important part of the Diagnostic phase, designed to reduce the risks and concerns for the customers in their decision making process for new/upgrade ERP/CRM solutions.

The Analysis, Design, Development, Deployment and Operation phases represent the five phases of solution delivery, with the Operation phase also encompassing post-delivery activities, covering the transition of the production solution to support. Sure Step provides five Implementation and Upgrade project types spanning these phases, for projects encompassing large, medium, and small end-to-end engagements.

Besides providing different project types to suit a given engagement, Sure Step also provides Optimization Offerings featuring proactive and post go-live services designed to assist the customer and solution provider with an additional level of due diligence in the solution delivery lifecycle.

Additionally, Sure Step provides Project Management and Organizational Change Management libraries, with content to support these key functions in a solution delivery engagement. Sure Step also includes an overview of roles typically involved in an engagement, both from a consulting (solution provider) perspective and a customer perspective.

## APPENDIX C – INTERFACE FRD TEMPLATE

The link below leads to Google Docs, a site that can be used to upload and share documents. Google Docs is used because the FRD template is quite large and adding it to the appendices would only lead to an unnecessary waste of paper. Only people who have the link can access this document, so please make sure that it is kept privately.

<https://docs.google.com/file/d/0B41tUKGkUuxwSkxzaDY3Sk4tdnc/edit?usp=sharing>

## APPENDIX D – WORK STREAMS AND THEIR MAIN PROCESSES

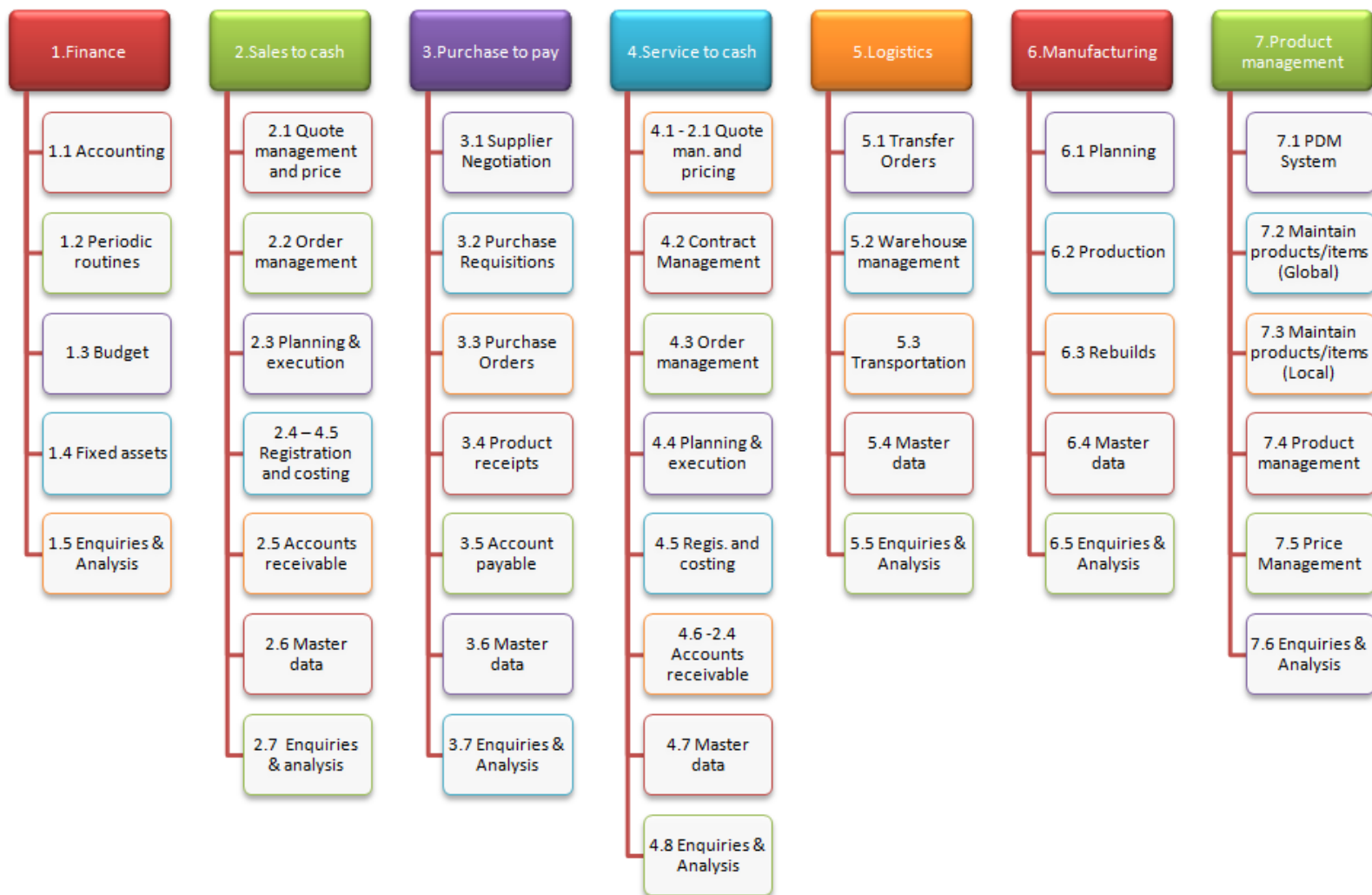


FIGURE 32: OVERVIEW OF THE SEVEN MAIN WORK STREAMS AND THEIR MAIN PROCESSES



## APPENDIX E – MAINTENANCE CHECKLIST (SWEDISH VERSION)

		<b>ASSA ABLOY</b>		<b>Förebyggande underhåll</b> Taksjutport		Kontorets exemplar ISO 9001 certifierade sedan 1997	
Avtalsnr: <b>5467</b>		Kund: <b>ATRIA SUPPLY AB</b>		Kundmätning: <b>TRUCKVENSTAD</b>		Produktstatus:	
Anläggningssadress:		Serie nr: <b>1301157601</b>		AD nr.: <b>111071</b>		<input type="checkbox"/> Säkerhetsrisk	
Ort: <b>SMÖLLERSTAD</b>		Antal portcykler i råkeverk:		Utförd datum: <b>8/3 - 2013</b>		<input checked="" type="checkbox"/> Funktionsproblem	
Kontaktperson / fn.:		Antal portcykler i råkeverk:		Utförd datum: <b>8/3 - 2013</b>		<input type="checkbox"/> Port ok	
Förebyggande underhåll, justeringar och smörjningar har utförts enligt våra produktblad. Brister är noterade vid anmärkning							
<b>Säkerhet</b>				<b>Anmärkningar</b>		* Ref. SS-EN 13241-1 och produktens anvisningar	
1 Utbalansering		6 år		Säkerhetsrisk <input type="checkbox"/> Utseende <input type="checkbox"/>		Rullhållare	
2 Sektioner		6 år		Rullhållare		Rullhållare	
3 Fönster		6 år		Rullhållare		Rullhållare	
4 Skenor / Takjörn / Infästningar		6 år		Rullhållare		Rullhållare	
5 Axlar / lager		6 år		Rullhållare		Rullhållare	
6 Stötdämpare		6 år		Rullhållare		Rullhållare	
7 Rullar / Rullhållare / Gångjärn		6 år		Rullhållare		Rullhållare	
8 Linor		6 år		Rullhållare		Rullhållare	
9 Säkerhetsdrag		6 år		Rullhållare		Rullhållare	
10 SBD / CBD Fjädrar & Linbrottskydd		6 år		Rullhållare		Rullhållare	
11 Bottenkonsol		6 år		Rullhållare		Rullhållare	
12 Gångdörrsbrytare		6 år		Rullhållare		Rullhållare	
13 Bottenpackning (manuell port)		5 år		Rullhållare		Rullhållare	
14 Säkerhetslist (eldriven port)		3 år		Rullhållare		Rullhållare	
15 Spiralkabel		3 år		Rullhållare		Rullhållare	
16 Styrskåp / Manöverdon		3 år		Rullhållare		Rullhållare	
17 Automatik / Fotoceller		3 år		Rullhållare		Rullhållare	
18 Släktlinebrytare		3 år		Rullhållare		Rullhållare	
19 Varvtalsvakt / Slirkoppling		3 år		Rullhållare		Rullhållare	
20 Snäckväxel / Gränslågen		3 år		Rullhållare		Rullhållare	
21 SU Luftbrytare		3 år		Rullhållare		Rullhållare	
22 Stoppdon / Skyftar		3 år		Rullhållare		Rullhållare	
23 Drift och skötsel		3 år		Rullhållare		Rullhållare	
24 Myndighetsbesiktigad		3 år		Rullhållare		Rullhållare	
25 Loggbok		3 år		Rullhållare		Rullhållare	
<b>Funktion</b>				<b>Anmärkningar</b>		* Ref. SS-EN 13241-1 och produktens anvisningar	
26 Lås / Skjutregel		5 år		Rullhållare		Rullhållare	
27 Sido / Topptätningar		5 år		Rullhållare		Rullhållare	
28 Gångdörr i port		5 år		Rullhållare		Rullhållare	
29 Frikoppling		5 år		Rullhållare		Rullhållare	
30 Neddragningsrep		5 år		Rullhållare		Rullhållare	
31 Motor		5 år		Rullhållare		Rullhållare	
32 Kedja / Drivrem		5 år		Rullhållare		Rullhållare	
33 Övrigt		5 år		Rullhållare		Rullhållare	
Om säkerhetsrisker inte åtgärdas friskriver sig Crawford från allt ansvar.							
FÖRESLÅR UTBYTE AV PORT				Anmärkningar:			
Ja <input type="checkbox"/> Nej <input checked="" type="checkbox"/>				Teknisk ombesörjer kundkontakt <input type="checkbox"/> Kund önskar effort från Servicesäljare <input type="checkbox"/>			
Servicetekniker (Text): <b>JS</b>				Teknisk ombesörjer kundkontakt <input type="checkbox"/> Kund önskar effort från Servicesäljare <input type="checkbox"/>			

FIGURE 33: SWEDISH VERSION OF THE MAINTENANCE CHECKLIST

## APPENDIX F – LINK TO SERVICE TO CASH FRD

The link below leads to Google Docs, a site that can be used to upload and share documents. Google Docs is used because the FRD document is extremely large and adding it to the appendices would only lead to an unnecessary waste of paper. Only people who have the link can access this document, so please make sure that it is kept privately.

<https://docs.google.com/file/d/0B41tUKGkUuxwVDBNZXJ4RlpqZzA/edit?usp=sharing>

## APPENDIX G – LINKS TO INTERFACE FRDs

The link below leads to Google Docs, a site that can be used to upload and share documents. Google Docs is used because the FRD interface documents are quite large and adding it to the appendices would only lead to an unnecessary waste of paper. Only people who have the link can access this document, so please make sure that it is kept privately.

FRD Interface "Order information"

<https://docs.google.com/file/d/0B41tUKGkUuxwTkRlaHZsTVRMbDg/edit?usp=sharing>

FRD Interface "Locations"

<https://docs.google.com/file/d/0B41tUKGkUuxwZ25RMmhHeXBiMEk/edit?usp=sharing>

FRD Interface "Installations"

<https://docs.google.com/file/d/0B41tUKGkUuxwZ3ITWUVBOHM2ZTA/edit?usp=sharing>

FRD Interface "Items"

<https://docs.google.com/file/d/0B41tUKGkUuxwemFMSzNYeUQwTTA/edit?usp=sharing>

FRD Interface "Stock"

<https://docs.google.com/file/d/0B41tUKGkUuxwRXV5QTZsVWQ4T0k/edit?usp=sharing>

FRD Interface "Cycle count"

<https://docs.google.com/file/d/0B41tUKGkUuxwM202cHpEazBOWUU/edit?usp=sharing>

FRD Interface "Opening hours"

<https://docs.google.com/file/d/0B41tUKGkUuxwVVN1RTZEQkQxcUE/edit?usp=sharing>

FRD Interface "Debrief orders"

<https://docs.google.com/file/d/0B41tUKGkUuxwSHV2ZVlxcWtLd2s/edit?usp=sharing>

FRD Interface "Indirect hours"

<https://docs.google.com/file/d/0B41tUKGkUuxweUZOTIE4dWdDUzQ/edit?usp=sharing>

FRD Interface "Status updates"

<https://docs.google.com/file/d/0B41tUKGkUuxwVjhlc1rWWVfNHc/edit?usp=sharing>