**Information Technology Group**

BSc thesis Management and Consumer studies

# The value of transparency

What is, for the different actors in the pork value chain,
the value of an analytical dashboard for quality auditors?

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# ABSTRACT

This thesis aims to show how a software tool for supporting the auditing of pig farmers on a continuous basis, called a dashboard for proactive auditing, creates value for quality auditors and other stakeholders in the pork value chain. The thesis evaluates a prototype dashboard developed for auditors in a case study performed at the Dutch KDV pork chain. The evaluation involves comparing the auditing process with and without using the dashboard. To do so, business models were created using Value Management Platform, a relatively new but highly advanced and complex tool for modelling business models.

The comparison showed that the dashboard decreases preparation time for the auditing company, while increasing the revenues for the slaughterhouse and the farmers. Another effect of the dashboard can be a reduction of emissions and animal loss if the dashboard is used to intervene timelier at farms where these numbers are too high. Since the model generated by the tool was based on simplified data, the scale of the changes in values created are not precise and conclusive, leaving open an opportunity for future research. However, the results show that as compared to business models created using the Osterwalder business model canvas, we were able to produce a more precise and quantifiable business models using the tool.

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# INTRODUCTION

## PROBLEM DESCRIPTION

Pig farming in the Netherlands has been changing from small, autonomous farms to vertically coordinated value chains over the last decades (Srivastava, Ziggers, & Schrader, 1998; van der Heijden & Cramer, 2017). One of the drivers of this change is the changing demand; consumers are becoming more concerned with extrinsic quality attributes, like animal welfare and environmental impact (Bernués, Olaizola, & Corcoran, 2003; Napolitano, Girolami, & Braghieri, 2010). Because of the higher price for more animal friendly pork, quality labels that communicate these attributes are increasingly important to get consumers to pay the higher price (Janssen, Rödiger, & Hamm, 2016). The current practice to manage quality labels is by periodic auditing of participating companies, and as a result, fraud right after the audit will take some time to be discovered. In the case of a yearly audit for example, fraud or non-compliance can take more than a year to identify, making quality claims less reliable. A more reliable approach is using a transparency system for continuously monitor quality claims (Kassahun et al., 2014). This approach has been used in the IoF2020 project to increase control over a quality label in the pork value chain. The research done on this system is thus part of the meat trail in the European IoF2020 project (Internet of Food & Farm 2020) that aims to accelerate adoption of the "Internet of Things" in farming and food chains in Europe (Maselynea et al., 2017).

The constant monitoring system, in the form of a dashboard, that is examined in this thesis will be used by auditors of a pork quality label, in this case Keten Duurzaam Varkensvlees (hereafter called KDV, translation: Sustainable Pork Chain). The goal of this dashboard is a reduction of preparation time for the auditors and reaction time in case of non-compliance to the criteria for the label and better verification of the quality claims made by the label. For the implementation of a system that requires sharing of data between the different actors, it is important that all involved actors have a clear view of the value creation of such a system.

## AIM OF RESEARCH

This thesis aims to show, with a simplified model, where and how value is created with the implementation of the dashboard used by the auditors. Before that can be done it is important to describe the current practice of auditing and the proposed dashboard. The tool used to show value, Value Management Platform, is relatively new and not widely known (we are unable to find any other scientific publications in major scientific databases except one major article written in cooperation with the makers of the tool (Poels, Roelens, de Man, & van Donge, 2018b)), so before applying the tool, the tool first needs to be critically explained. The model that will be built can be reused later in the IoF2020 project when implementation data is available.

## RESEARCH QUESTIONS

The main research question that needs to be answered in this thesis is:

**What is, for the different actors in the pork value chain, the value of an analytical dashboard for quality auditors?**

To be able to answer this question the following sub questions will need to be answered as well:

- What is the current process of audit preparation?
- How does the proposed analytical dashboard for quality auditors function?
- How can the VMP be applied to provide insights in to value the dashboard created for the various stakeholders?

# 1 BACKGROUND

In this background section first, the different concepts of business modelling will be explained. Secondly the tool that will be used for modeling KDV, VMP, and the use of VMP will discussed. After that the different standards and languages that are used in the tool and in the thesis will be introduced. Finally, auditing and various concepts related to auditing will be explained.

## BUSINESS MODELS

A business model is a model that describes for an organization the value it offers to its customers, what is needed to create and deliver this value and how value is created for the organization itself. Two types of business models that will be used or related to in this thesis will shortly be introduced in the following paragraphs.

### Business Model Canvas

The Osterwalder Business Model Canvas (BMC) is a method to describe and visualize a business model through nine building blocks. The creators of the tool propose to use a large, printed version of the canvas to sketch and discuss the business canvas in a group of people, with post-it notes or a board marker (Osterwalder & Pigneur, 2010). First the building block of *Customer Segments* is filled in. Groups of people and organizations that are served are defined as customer segments. The block for *Value Propositions* is filled with the products or services that create value for the customer segments. The building block *Channels* contains how the company reaches customer segments to give the value proposition. The *Customer Relationships* block describes the type of relationships between the company and customer segments. The *Revenue Streams* building block contains information about the cash generation of a company from the customer segments. The building blocks *Key Resources* and *Key Activities* are about the most important attributes a company has and the things a company must do that are required to make the model work. In the block *Key Partnerships,* the network of key suppliers and partners is described. Finally, the *Cost Structure* contains all information about costs made when the business model is operated.

Criticism on the canvas is that the model is a static representation of a company while companies are very dynamic and working in networks in reality (Euchner, 2016). Another point of critique on the Osterwalder BMC is that it is focused purely on economic values or profit, while there are numerous other business-enhancing values such as environmental value and social value (Joyce & Paquin, 2016). Finally it is argued that the BMC can, depending on the case, lack consistency due to overlapping points that belong to multiple building blocks (Verrue, 2014).

## Lindgren's Business Model Cube

The Business Model Cube by Peter Lindgren is an attempt to integrate the most important aspects of other business model frameworks in a visual model. Lindgren's cube describes a business model through 7 building blocks that form the visual representation, the cube. The six sides that shape the cube are as follows: *Value Proposition*, *Customer and/or User*, *Value Chain Functions*, *Competences, Network* and finally *Value Formulae*. The 'R*elations'* building block is depicted in the middle of the cube (Lindgren & Rasmussen, 2013). This relations block describes relations from within the model and between business models. The Business Model Cube is applicable for both describing the current state and future scenarios of businesses.

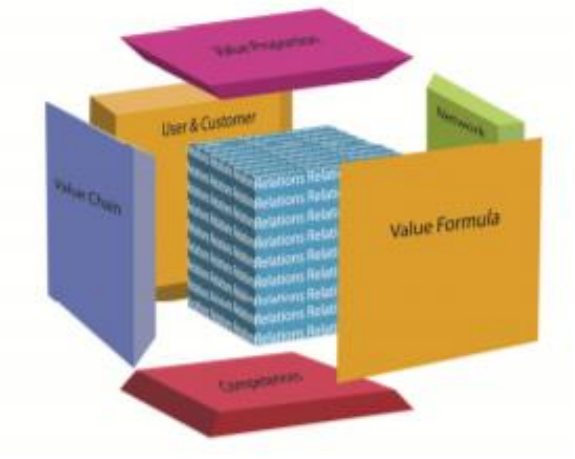



Figure 1. The Business Model Cube (Lindgren & Rasmussen, 2013).

## VMP

The 'Value Management Platform' (VMP) is a product of VDMbee which allows users to map out value creation and exchange within a value chain or network. Within VMP value is seen "as a measurable factor of benefit delivered to a recipient in association with a deliverable" (Object Management group, 2018b)VMP targets managers who are tasked to map out current strategy and design new business strategies. VDMBee states that the result of using VMP is business strategies of all participating organizations that are aligned with each other.

VMP is the first implementation of Value Delivery Modelling Language (VDML), which will be explained in a later section, however no VDML knowledge is required for working with the tool. According to the creators use of the tool should result in a shared vision and strategy, increase effectiveness in decision making, and it lets companies analyze alternatives and assess risks before implementing new business plans (VDMbee, 2019c). The business modelling and scenario analysis is done with a method called Continuous Business Model Planning (CBMP). The dashboard functionality makes VMP useful as a decision support system for choosing strategic plans (Poels, Roelens, de Man, & van Donge, 2018a).

The CBMP process in the VMP tool is structured in three phases: Discover, Prototype and Adopt (Poels, 2019). In the trainings provided by VDMBee, three different personas are described that together deliver the final model. The 'Workshop leader' who is responsible for the Discover phase, the 'Analyst' who is responsible for the Prototype stage, but will start modelling during the Discover stage when consensus is reached and a 'Change agent' who uses the results of the Prototype stage to facilitate decision making and possible adoption of a new business model.

The next sections will describe the process of using the VMP tool by going through the different steps in the CBMP process. Since VMP is flexible in use and not all functionalities have to be used to build a model, only the functions that are used for this thesis will be described. Some of the terms used in VMP have a specific meaning and will be indicated in *italic*, the definition of these terms can be found back in the glossary in **Appendix A:**.

## Discover

In the discover phase of the CBMP process the goal is to discover and describe the current state of affairs or the future business model. This process is usually done in several workshops supported by a "*Workshop Leader"* and takes place in multiple sessions. In the first session, key participants are identified, and the business ecosystem is worked out. In the second session business model canvasses are made of these key participants. The third workshop session is used to identify *values* that are considered in the model and cause-and-effect relations are determined that influence these *values*. The fourth session is used to develop alternatives to the current situation and describe phases where specific objectives can be set. (Poels et al., 2018a)

The different maps that are created during the discover phase by the workshop leader will be explained in the following paragraphs, except for the earlier explained Osterwalder Business Model Canvas that can be generated by the Analyst of the key participants throughout the whole discover phase. The development of maps by the workshop leaders is called *drawing* in VMP, translating this visual data to structured data is called *mapping*. The following paragraphs explain the drawing of the different maps.

### *Business Ecosystem Map*

The *business ecosystem map* is created as a visual representation of the *value proposition* exchanged between *participants* of a *network* to provide a big picture of the relations between businesses within a business ecosystem (VDMbee, 2019a). Companies that will get a *structured business model* in the prototype phase are entered as *enterprise*, while anonymous groups of suppliers or customers are entered as *market segments*. It is also possible to represent individuals, roles or even business models of businesses in the ecosystem map; however, this functionality is not used for this thesis. Between *participants* in the ecosystem *value propositions* can be drawn, representing essential contributions of one participant to another participant. *Participants* are member of at least one *network* that functions as an "island of collaboration". These networks are indicated by colors of the *connectors* used to show the direction of a v*alue proposition*.

### *Value Stream Map*

*Value stream maps* show, for one *value proposition*, value adding *activities* needed to deliver that *value proposition*. The *activities* on the map represent value adding work that must be performed by the *participant* for that *value proposition*. Graphically this is done by placing boxes with the *activity*'s name on a shape representing the value proposition. In the *value stream map competencies* are drawn and linked to activities to show the resources and competencies that are used in performing that *activity*.

### *Strategy Map*

A *strategy map* is a graphical framework that is used to define important *values* for the business it describes and the *customers* of this business. This is done by graphical storytelling that shows how *competencies* and *activities* aggregate to values, and how these values influence or create other value. In VMP, information can be *drawn* in 4 so-called swimlanes named competency, value stream, customer and business value. In the business value lane high level *values* that are important for the business itself is drawn, in the customer lane high level *values* for the customer. The value stream lane is used to tell the story from *activities* and values that lead to the values in the customer and business value streams. Finally, the competency lane shows *competencies* used for *activities* and *values* in the value stream lane. *Connectors* show by what *competencies*, *activities* or other values a *value* is influenced.

## Prototype

In the prototype phase of VMP the data gathered in the discovery phase is used by the '*Analyst*' to develop a *structured business model* according to the VDML standard that will be explained later in this report. The concept used to visualize the business model in the prototype phase in VMP is inspired by Lindgren's Business Mode Cube. The six sides of the cube used in VMP consists of Value propositions, Customers, Activities, Network Partners, Value Formulas and Competencies. The prototyping process can be done after or during the Discover phase, VMP is flexible in this regard. Most of the information used in constructing this cube comes from the visual maps made in the discovery phase (Poels et al., 2018a). The first steps of prototyping are the *mapping* to structured data of the maps drawn in the discover phase.

### *Business Ecosystem Mapping*

The first step in *mapping* the *business ecosystem map* is to create *structured business models* for the focal companies, because all model data is linked to these business models. After this the *networks* and the *roles* of network *participants* must be *mapped*. If a *participant* is business model owner, customer or supplier in multiple business models this information must be *mapped* to all these business models. *Value propositions* are then *mapped* on both business models of business model owning *participants* or on one in case the supplier or customer is a *market segment*.

### *Value Stream Mapping*

The first step in *mapping* a *value stream map* is to link the *value stream* to a *value proposition*. This can be done by "mapping to reuse" and selecting a *value proposition* that is already mapped to a business model. *Mapping to reuse* is linking a graphical element to an element in the *structured model*, instead of the other way around. After this is done, the *activities* can be *mapped* to the business model of the business performing the *activity*. Lastly the *competencies* can be *mapped* and linked to the *activities* that make use of them.

### *Strategy Mapping*

The *competencies* and *activities* that are drawn on the strategy maps can be *mapped to reuse* because they are already *mapped* from the *value stream map*. The *mapping* of the *values* is dependent on the type of *value* and will be explained in the following paragraph.

### *Mapping values*

*Mapping* values can be done via *the business ecosystem map*, *value stream map* and *strategy map,* albeit for different types of *values*. In the *ecosystem maps values* can be added to *value propositions*. These *value proposition values* contain value that is given from one *participant* to another. In *the value stream map value* can be added to *activities*. These *activity values* are values that are created by an *activity* and are used to compose *value proposition values*. *Value proposition* and *activity values* can also be *mapped* from the *strategy maps* to *structured model* data or *mapped for reuse* if the *values* are mapped already via the *ecosystem map* or *value stream map*. Two more types of values can be mapped from the *strategy map*: *plan values* and *my proposition values. Plan values* are values that are not linked to one business model but are seen as values important for the whole ecosystem or society. *My proposition values* are values that are important to the business model owner and are linked to a "my proposition" on the business model of the business, that is like a *value proposition* only the receiver is the *enterprise* that offers the proposition.

*Formulas*

After or during the *mapping* of the *values,* values can be aggregated to each other. Formulas can be used to further calculate higher level *values*. Because of limitations in VMP not every formula can be entered directly, sometimes a "*ghost value*" is needed to split the formula in two. These *values* can be all types of values, but since they are not important for the story of value creation, they typically don't show in the *value stream map*.

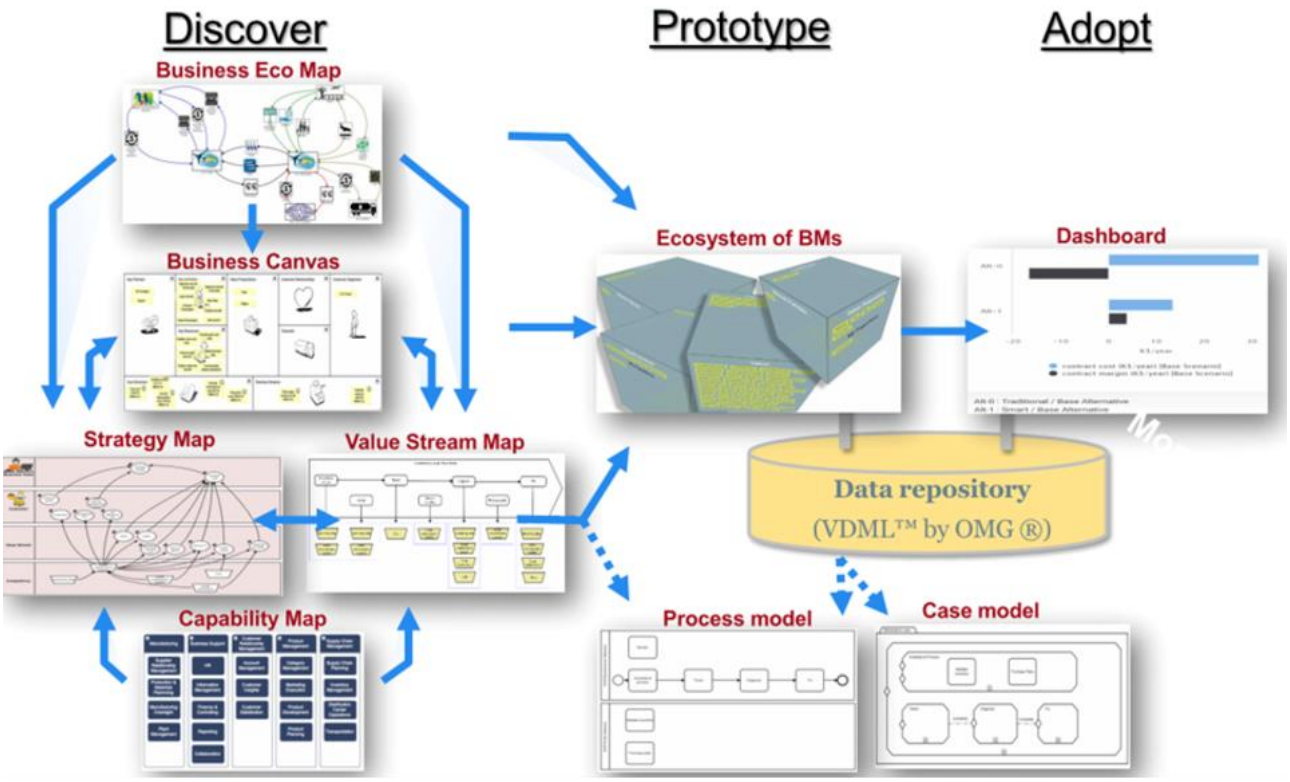



*Figure 2: Overview of the conceptual models that can be used in the different stages of CBMP. (Reproduced from Poels, 2019)*

## Adopt

In the adopting phase of VMP a dashboard can be designed by the *'Change Agent*' for presentation of the prototyping results to assist decision making. Dashboards support management decisions by demonstrating the value impact of created plans and their related business models, made in the prototype phase. Different dashboard can be created for different stakeholders in the decision making process and they can consist of multiple frameworks such as business canvases, business ecosystem maps or value stream maps (VDMbee, 2019b).

Also, a report can be made to document and explain the plan. Depending on the situation the report can be adjusted in many ways to fulfil the user's needs.

## STANDARDS AND LANGUAGES

For a better understanding of VDML, the modelling language used in VMP, the underlying modelling languages will be explained before the explanation of VDML itself.

## UML

Unified Modeling Language (UML) is a visual modeling language provided by the Object Management Group and is used to visualize the design of systems. UML is mainly used in software development, but can be used for business modeling and other systems too (Object Management group, 2015). UML consists of graphical elements that can be used to form diagrams. The three categories of diagrams that are defined in UML 2.0 are structure, behavior and interaction diagrams.

## MOF

MetaObject Facility (MOF) is a specification of the Object Management Group that has the highest level of abstraction in the metamodel. The four layers in MOF are a top layer that is used to construct metamodels in the second layer (for example the UML metamodel), that in turn describes the models in layer 3. The last data layer describes real objects. The purpose of MOF is to model metadata driven systems (Overbeek, 2006). MOF 2.0 reuses the UML 2.0 infrastructure library to increase alignment between the two standards.

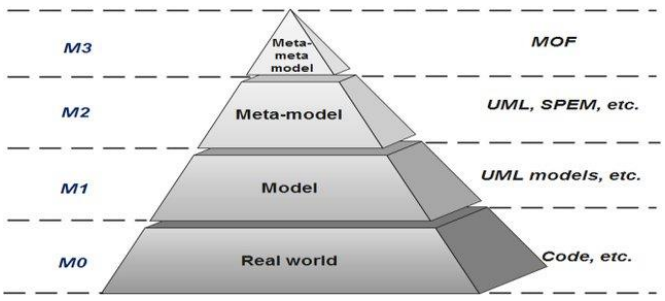



*Figure 3 Modeling Pyramid of the OMG. (Erraissi & Belangour, 2018)*

## SMM

The Structured Metrics Metamodel (SMM) of the Object Management Group is a metamodel for representing measurements in structured metamodels such as MOF. (Object Management Group, 2018a). The SMM is used to keep metrics between different Object Management Group specifications.

## VDML

The Value Delivery Modelling Language (hereafter VDML) is a UML-based modelling language provided by the Object Management Group. The metamodel of VDML satisfies the characteristics of a MOF metamodel. VDML integrates several existing value models and business models to model interactions between businesses or business units. The concept of value is central in VMML and is, as explained earlier as well seen "as a measurable factor of benefit delivered to a recipient in association with a deliverable" (Object Management group, 2018b). VDML can describe value exchange and collaboration between business entities functioning in a network or value chain, making it useful to analyze strategies and improve or design value networks. VDML incorporates SMM libraries for defining metrics to quantify values. VDML is scalable from key operational activities to large scale business models, however it is aimed to use on a strategic level rather than on an operational level.

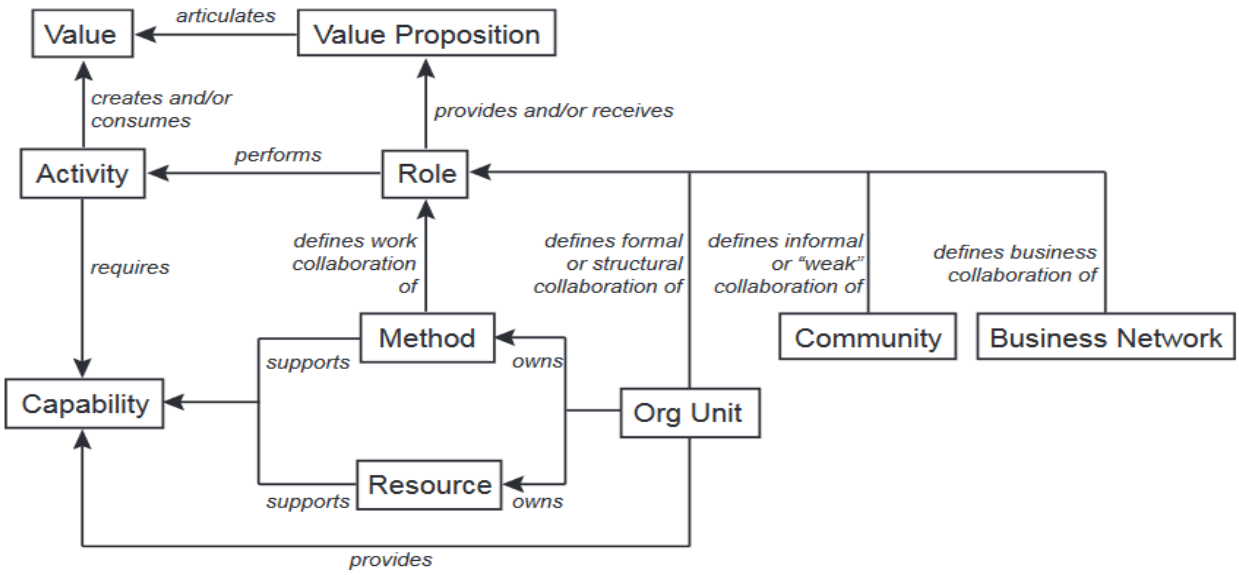



*Figure 4 Relationships in VDML, reproduced from Object Management Group, n.d.*

Figure 4 depicts the core concepts and relationships of VDML, where organizations provide capabilities needed to perform activities leading to the creation and use of Value. Collaboration in VDML is represented by the interactions of participants for a shared purpose, where participants may include companies, government other institutions or individuals having one or more roles providing and receiving value propositions.

## Business Process modelling

Often business processes require several steps to be taken in a specific order, often by multiple people, to come to the intended outcome. A formal method of describing such steps is called business process modelling. The Business Process Model and Notation (BPMN) is a graphical way to model business processes (Chinosi & Trombetta, 2012). The four categories of elements needed for a diagram are Flow Objects, Connecting Objects, Swimlanes and Artifacts. Flow objects are the core of BPMN and can be events, activities and gateways. Events in BPMN represent things happening in a business process like sending and receiving

messages, activities describe work that must be done in a process like tasks, and gateways can show different paths of flows. Connecting objects show the relationships between different objects, participants and artifacts. Swimlanes are used to categorize different activities, where pools represent major participants and lanes categorize on role or function. Finally, artifacts are a way to increase readability of a model and are elements with information about data objects, groups and annotations.

## AUDITING

Third party auditing is a method that enables companies to emphasize reliability of quality claims and certifications to consumers. Auditing in food chains consists of an on-site visit of the auditing company to the production sites of the product that is being certified. Because the audit is executed by another party than the producer of the product, consumers tend to have more trust in externally certified food compared to food with a quality claim of the producer (Naspetti & Zanoli, 2009).

### Dashboards

In auditing dashboards can be used to see core numbers at glance. A widely used definition of a dashboard is the one of Stephen Few: "A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance" (Few, 2004). The main benefit of dashboards is the fact that it is possible to quickly view important information. Dashboards are used in many different domains and can be strategic, analytical and operational (Few, 2006). The dashboard to be used for auditors in the pork value chain can give the auditing company more recent information about the compliance to the label's values, than that is the case right now.

### Transparency standard

A transparency standard enables different businesses to share information without the need to convert or retype data. In the case that will be used in this thesis the EPCIS standard is used. EPCIS (Electronic Product Code Information Services) is a GS1 standard that enables businesses to record information about a physical product while it moves through the supply chain or within the business (GS1 EPCglobal, 2016). The information shared according to the EPCIS standard will provide information on the what, where and when of events that happen to the product (Goebel & Tribowski, 2008).

# 2 METHODOLOGY

## Case study KDV

For this thesis a case study on KDV has been done. KDV is a cooperative venture between pig farmers, slaughterhouses, wholesalers, butchers, cold meat producers, retailers and caterers that advocates sustainable pig farming by enforcing strict standards on their members (Keten Duurzaam Varkensvlees, 2019). KDV mostly works with smaller sized family farms with the farmer living near the animals. Currently the control system in place to ensure the wanted quality is an entry check and annual checks of the farm performance indicators and on-site inspection by the auditing company 'De Hoeve BV'. De audit of De Hoeve is verified by a general certifying company called CGD. Together with the slaughterhouse, Westfort, De Hoeve assists farmers in making use of new techniques and insights to improve animal wellbeing. Within KDV modern technology like RFID chips provided by LeeO are currently mostly used for the antibiotics free meat concept of Westfort, management information and research on improvement animal wellbeing and sustainability, however information from this technology might be used to improve the auditing as well. The IoF2020 project uses the pork value chain of KDV as a use case to research increased transparency and traceability, where EECC develops the dashboard to be used by auditors. Within this thesis, the scope of the case study will be on the interactions between the slaughterhouse, auditing company, farmers and technology providers.

### SCIENTIFIC LITERATURE AND PRODUCT DOCUMENTATIONS

A literature review has been done on the different business model concepts, the standards used in the Value Management Platform and on the functioning of dashboards. Information on the application of the Value Management Platform for our case will be gathered from available literature, product information, expert interviews, and training videos on the use of the tool provided by VDMBee. The training videos are a step by step guide explaining the generation of a structured model in VMP.

### EXPERTS INTERVIEWS

Since scientific literature on the Value Management Platform is scarce, information on the functioning and application of the tool has therefore partly been obtained from expert interviews with co-founder Henk de Man. An overview of planned meetings can be found in the table below. An expert interview will also be done with Georg Schwering of EECC, who is involved with the development of the dashboard for the IoF2020 project, to evaluate the dashboard design.

*Table 1: Expert interview overview*

| Date | Who | Topics |
|---|---|---|
| 03/04/19 | H. de Man | Introduction to VDMBee, VMP and making agreements |
| 01/05/19 | H. de Man | Progress discussion after discovery of context and ecosystem |
| 20/05/19 | H. de Man | Progress discussion after mapping ecosystem and discovery Value Streams |
| 27/05/19 | G. Schwering | Demonstration dashboard and feedback from EECC |
| 02/07/19 | H. de Man | Process meeting about new modeling attempt. |

## OBSERVATIONS

The demands and needs of different actors regarding the auditing dashboard will mainly be obtained from observation at meetings with different involved actors and document analysis on notes of previous meetings. Information on the current practice of auditing will be obtained from observation at the auditing company 'De Hoeve'.

*Table 2: Observations overview*

| Date | Location | Topics |
|---|---|---|
| 11/04/19 | Westfort | Observation of meeting about dashboard between stakeholders in KDV |
| 10/05/19 | De Hoeve BV | Observation of preparation process for auditing of De Hoeve |

## MODELING

### Business process models

To describe the process of auditing, two Business Process Models supported by a textual description will be made to describe the current process of auditing of De Hoeve in the KDV chain and the proposed new method with the dashboard.

### Mock-up and feature diagram

Since the dashboard within the IoF2020 project is still in development during the course of this thesis, it's important to have clarity on the dashboard's functioning before value creation can be calculated. Firstly, a feature diagram is prepared to describe the wishes of the auditing company and involved stakeholders. Secondly, a mock-up was created from the existing prototype and the feature diagram to have a clear image on what information the dashboard will provide.

### Modelling in VMP

To model the value creation and exchange in the KDV chain, VMP will be used to give insight in the value creation of the dashboard for auditors within this chain with a focus on De Hoeve, Westfort, farmers and the dashboard developer (EECC). 21 hours of training videos as provided by VDMBee were watched and applied on the case. The goal of the model is to show relationships between companies in the KDV chain, not exactly predict future value exchange, so the level of detail is kept low.

The (final) model has been made with the following constraints.

**Scope:**

The model is meant to understand the exchange of value in a simplified business ecosystem of the KDV value chain. Of the KDV participants only De Hoeve, Westfort and the farmers will be included in the model. The model will therefore not include all information on businesses, like some costs or profit, but only on values that relate with the dashboard.

**Assumptions**

There are a lot of factors influencing value in the KDV value chain, some of which external. Not all these factors are relevant for the scope of this thesis and have been left out of the model to keep the model simple. The assumptions that are used in the models are:

- There is one type of farmer that produces meat pigs from piglets (closed farm).
- The pork market imposes no limit on the KDV meat consumption.
- De Hoeve audits once a year and is paid a fixed amount of money for the audit
- With the dashboard De Hoeve will do an assessment of performance daily or every three months
- Loss percentage, meat quality and emissions are influenced by the time between problems occurring and interference.
- For De Hoeve, preparation time and audit revenue are important values
- For Westfort and farmers the revenue is important
- For all KDV members loss percentages and emissions are important
- Pig price for farmers is only influenced by meat quality
- EECC is paid an annual fee of 10 Euro by De Hoeve per farm for developing and maintaining the dashboard.
- One day less between problems occurring and interference reduces emissions with 0.025% and pig loss with 0.001%
- The KDV label and the activity of slaughtering both increase the value of meat on the pork market with 1 Euro per kilo.
- On each farm 100 piglets per week are born
- The number of farms stays equal between the As-Is and To-Be phase

## COOPERATION

The generation of the business models in VMP is done in cooperation with Jon van der Meer, who writes his thesis about the Value Management Platform, albeit with a different focus. In this thesis VMP is used to model the auditing preparation of the KDV case, in Jon's thesis the KDV case is used to evaluate the process of creating business models in VMP. The training of the tool and interviews with Henk de Man are done together. Because of the overlap in content the background sections 2.1-2.3 and section 4.3 that describes the generation of the model are written in cooperation with Jon and will appear in both theses.

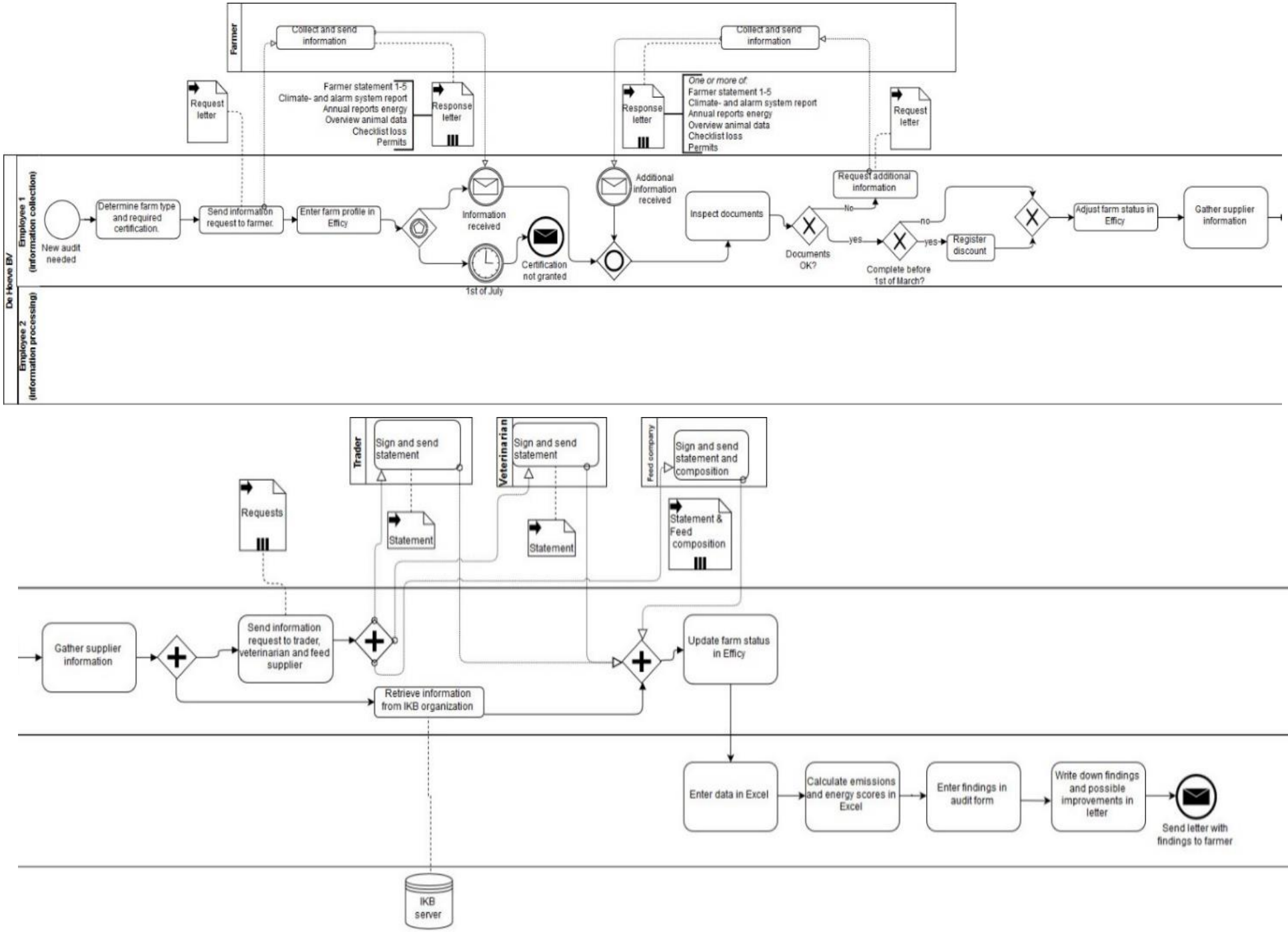
# 3 RESULTS

This results chapter consists of four sections. In the first part, the current method of auditing is explained with a BPM. Secondly, a mockup design of the dashboard is presented and the use of this dashboard by the auditors is explained. The third section shows the process of generating the models in VMP for the audit preparation with and without the dashboard. Finally, a comparison is made between values between both business models.

## BPM OF CURRENT AUDITING PREPARATION

As can be seen the Business Process Model in figure 5, the current method of audit preparation starts with a De Hoeve employee sending out letters to farmers with an information request to the farmer. The farmer collects several documents and signs statements, that can be seen in the table in **Appendix B:.** The farmer sends this information to De Hoeve for approval. An employee inspects the documents and requests additional information if needed. The information sent by the farmer is used to send out information requests to the suppliers and partners of the farmer. When all this information is complete, a second employee of De Hoeve enters relevant data in an excel file where emissions and energy performance is calculated. These scores, as well as information from the forms sent by the farmer, IKB organization, vet and trader are filled in in the audit form which is used as input for the on-site visit and a basis for an improvement plan for the farmer if needed. A report of the observation at De Hoeve on which the Business Process Model is based can be found in **Appendix C:**.

*Figure 5 (on next page): BPM of current audit preparation*


Farmer
Collect and send information
Collect and send information
Request letter
Farmer statement 1-5
Climate- and alarm system report
Annual reports energy
Overview animal data
Checklist loss
Permits
Response letter
Response letter
One or more of:
Farmer statement 1-5
Climate- and alarm system report
Annual reports energy
Overview animal data
Checklist loss
Permits
Request letter
De Hoeve BV
Employee 1 (information collection)
Employee 2 (information processing)
New audit needed
Determine farm type and required certification.
Send information request to farmer.
Enter farm profile in Effcy
Information received
1st of July
Certification not granted
Additional information received
Inspect documents
Request additional information
No
Documents OK?
yes
Complete before 1st of March?
no
yes
Register discount
Adjust farm status in Effcy
Gather supplier information
Trader
Sign and send statement
Veterinarian
Sign and send statement
Feed company
Sign and send statement and composition
Requests
Statement
Statement
Statement & Feed composition
Gather supplier information
Send information request to trader, veterinarian and feed supplier
Retrieve information from IKB organization
Update farm status in Effcy
Enter data in Excel
Calculate emissions and energy scores in Excel
Enter findings in audit form
Write down findings and possible improvements in letter
Send letter with findings to farmer
IKB server

## DASHBOARD DESIGN FOR FUTURE AUDITING PREPARATION

### Requirements

From the stakeholder meeting at Westfort (of which the minutes can be found in **Appendix D:**, where a demonstration of a dashboard proposal by EECC was given, as well as from the visit at De Hoeve, several requirements for the dashboard were collected as can be seen in Table 3.

*Table 3: Dashboard requirements*

| **The dashboard should satisfy these needs:** | Priority |
|---|---|
| View performance of last 12 months | Must |
| View performance of last 3 months | Could |
| Automated processing of data from different sources. | Must |
| Improve communication with farmer during farm visit. | Must |
| Reduce preparation time | Must |
| Reduce cost of auditing by half | Should |
| Real time data of last period (12 months/more recent) | Should |
| Benchmarking and comparing with other farms | Should |
| All farm types (closed, breeding and meat pig) should be included | Must |

Since the criteria of KDV are central in the auditing process, an overview of the different criteria as published in by KDV (KDV, 2018) was made with the current sources of the information and the usefulness of having this data in the dashboard.

Reasons for not taking a criterium up in the dashboard are: **OFS** = Only farmer statement, so no recent data to include, **NU** – No use, this information is not fit for a dashboard or not wanted by De Hoeve.

*Table 4: KDV requirements*

| **KDV criterium** | **Current source of information** | **Fit for dashboard** |
|---|---|---|
| **General** | | |
| Channeling, identification and traceability | Statement farmer | No, OFS |
| Registration | Statement farmer, overview animal data, Environmental permits | No, NU |
| Business expansion | Independent audit CGK | No, NU |
| Animal health | - | No, NU |
| Calamities plan | Statement farmer | No, OFS |
| Certification | IKB registration | Yes |
| **Mother and Piglet** | | |
| Nest-Building materials | Statement farmer | No, OFS |
| Weaning age | Statement farmer, Overview animal data | Yes |

| KDV criterium | Current source of information | Fit for dashboard |
|---|---|---|
| Clipping teeth | Statement farmer | No, OFS |
| Castration | Statement farmer | No, OFS |
| Long tails | Statement farmer | No, OFS |
| Sick bay | Statement farmer | No, OFS |
| **Living environment** | | |
| Fixed groups | Statement farmer | No, OFS |
| Living space | Statement farmer | No, OFS |
| Day/night rhythm | Statement farmer | No, OFS |
| Climate in the sty | Statement farmer, Report climate system check | No, NU |
| High quality feed | Statement farmer, statement feed supplier | No, NU |
| Pest repellant and control | Statement feed supplier | No, OFS |
| **Health** | | |
| Regular vet | Statement veterinarian | No, OFS |
| Salmonella | IKB provider, statement veterinarian | Yes |
| Loss and euthanasia | Statement animal data and euthanasia, overview animal data | Yes |
| Antibiotics use | IKB provider, statement veterinarian | Yes |
| Findings when pigs are slaughtered | Westfort/myKDV | Yes |
| Blood samples | Statement farmer | No, OFS |
| **Environment** | | |
| Energy | Statement explanation energy, annual reports energy (+ overview animal data) | Yes |
| Phosphate | Statement feed supplier, Composition compound feed, Composition wet feed | Yes |
| Nitrogen | | Yes |
| Copper | | Yes |
| Zinc | | Yes |
| Ammonia (no requirement) | Environmental permits | Yes |
| **Animal treatment** | | |
| Transport | Statement trader | No, NU |
| Delivery | Westfort | No, NU |
| Training | Westfort | No, NU |
| Supervision | Westfort | No, NU |

With the collected information a feature model has been created that includes the different features the dashboard should have to be satisfactory for the auditors. In the feature model it is indicated what features must be in the dashboard and what features are optional.

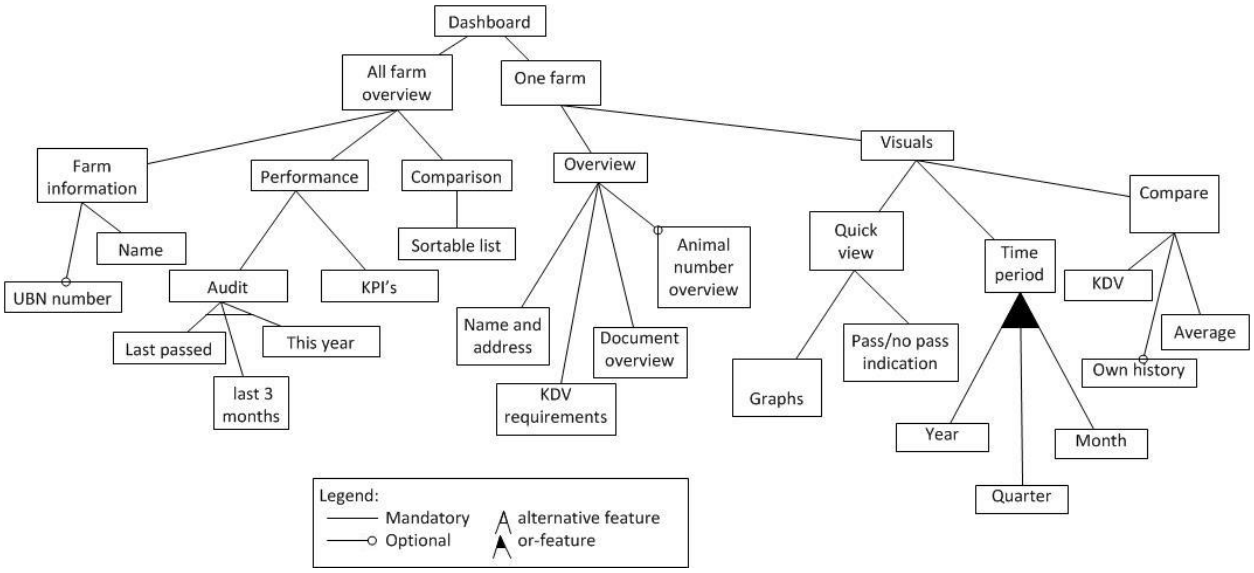



*Figure 6: Feature model*

## Proposal for dashboard

Using a prototype dashboard that was developed for the IoF2020 project as basis, a new mock-up of the dashboard was designed. The requirements as explained in the previous paragraph as well as the criteria list of KDV were used for the generation of this mock-up. After the first design comments of Georg Schwering of EECC and De Hoeve (see **Appendix E:**) were processed leading to the mock-up. The mock-up will first be explained in general, after that the different pages will be explained.

Because the auditing of the KDV farms is done by De Hoeve based on the criteria of KDV, these criteria were taken as the basis of the design. The preparation for the audits by De Hoeve relies heavily on the farmer statements. A lot of criteria could not be included in the dashboard in a way that real time or very recent data could be used. The dashboard is designed to have 3 tabs, so the auditor can navigate to a tab with the information he wants to see. The dashboard needs to be connected to different databases and systems to automatically process new data and update the dashboard. In the context diagram in Figure 7 the relationships of the dashboard system with outside entities is shown. The dashboard mainly uses the LeeO database where information of the RFID chips of pigs is stored according to EPCIS standards as is already happening now. Also documents that have been received by De Hoeve will be entered into the LeeO server. Farmers can enter energy use via MijnKDV after which the information is available in the dashboard. The dashboard pulls data from the IKB provider concerning certificates and salmonella categories. From the feed provider transactional data is collected and stored in EPCIS format to be used by the dashboard.

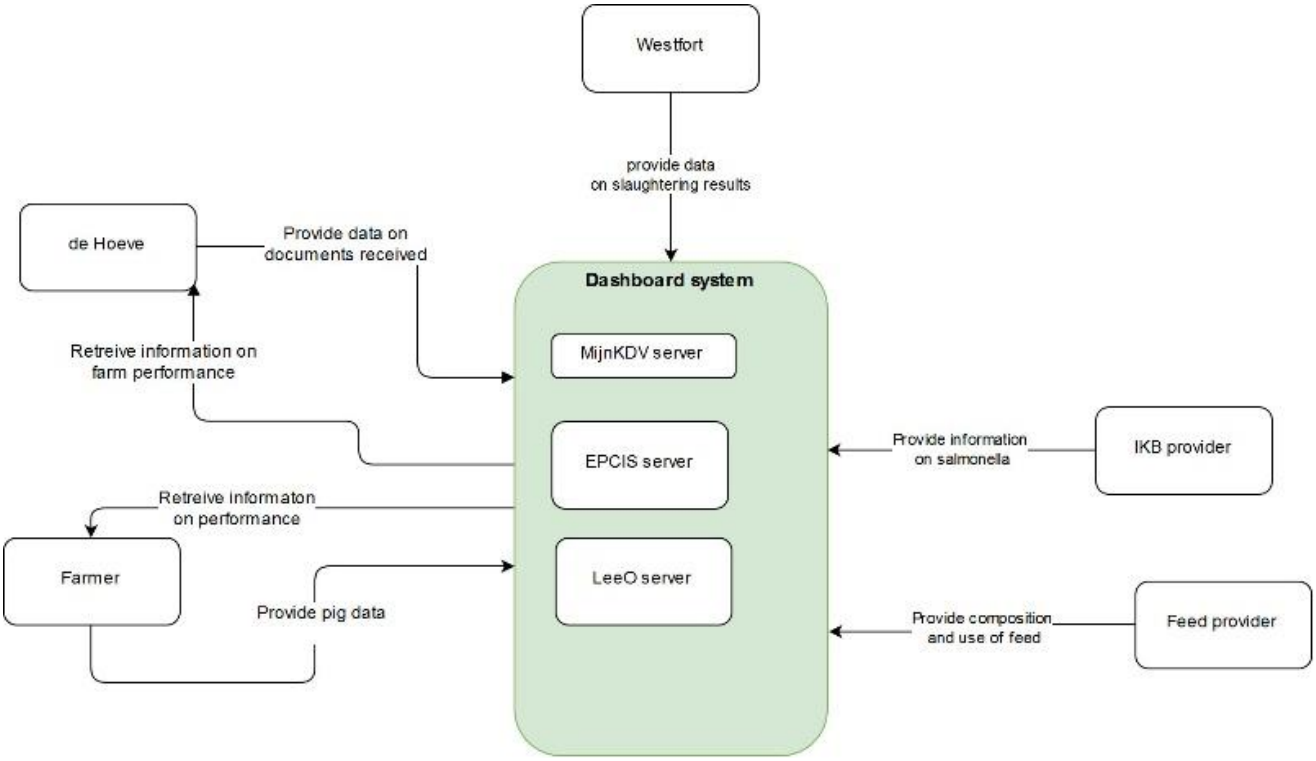



*Figure 7: Context diagram of the dashboard*

As can be seen in the mock-up in Figure 8 the first tab offers an overview of all the farms within the KDV concept. The auditor can use this page to select the farm he wants to audit. This can be based on the last two columns, where the last column represents a hypothetical pass of audit in the last 3 months, indicating whether a farm's performance is on track. On this tab the auditor can sort the farms on KPI's to select the worst performing farms on that specific field.

All farms | Overview farm | Visual farm

| UBN | Farmer name | Energy | Loss weaned piglets (%) | Loss meat pigs | DDD sows | DDD weaned piglets | DDD Fattening pigs | Healthy at farm | Healthy at slaughter | last passed audit | 3 months |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 123456 | Jan Janssen | 2032 | 1.26 | 1.26 | 0.7 | 0.3 | 0.3 | 80 | 88 | 2018 | ⊙ |
| 123457 | Jan Janssen | 1594 | 1.02 | 1.02 | 0.2 | 0.5 | 0.6 | 82 | 95 | 2018 | ⊙ |
| 123458 | Jan Janssen | 2049 | 1.28 | 1.51 | 0.1 | 2.4 | 1 | 81 | 89 | 2018 | ⊙ |
| 123459 | Jan Janssen | 2307 | 1.08 | 1.97 | 0.6 | 1 | 0.7 | 86 | 97 | 2018 | ⊙ |
| 123460 | Jan Janssen | 1978 | 1.35 | 2.00 | 0 | 1.1 | 0.8 | 80 | 83 | 2018 | ⊙ |
| 123461 | Jan Janssen | 2235 | 1.36 | 1.66 | 1 | 2.9 | 0.9 | 86 | 84 | 2018 | ⊙ |
| 123462 | Jan Janssen | 2481 | 1.71 | 1.58 | 0.2 | 0.5 | 0 | 90 | 82 | 2018 | ⊙ |
| 123463 | Jan Janssen | 1654 | 1.99 | 1.95 | 0.4 | 1.4 | 0.1 | 82 | 82 | 2018 | ⊙ |
| 123464 | Jan Janssen | 1842 | 1.66 | 1.21 | 0.5 | 1.8 | 0.4 | 89 | 82 | 2018 | ⊙ |
| 123465 | Jan Janssen | 1950 | 1.71 | 1.96 | 0 | 1.3 | 0.5 | 90 | 83 | 2018 | ⊙ |
| 123466 | Jan Janssen | 2000 | 1.99 | 1.76 | 0.1 | 1 | 0.5 | 81 | 82 | 2018 | ⊙ |
| 123467 | Jan Janssen | 1895 | 1.59 | 1.69 | 0.1 | 1.3 | 0 | 89 | 93 | 2018 | ⊙ |
| 123468 | Jan Janssen | 1581 | 1.60 | 1.32 | 0.2 | 2.2 | 0.8 | 81 | 93 | 2018 | ⊙ |
| 123469 | Jan Janssen | 1837 | 1.84 | 1.64 | 0.8 | 1 | 0.2 | 86 | 85 | 2018 | ⊙ |
| 123470 | Jan Janssen | 1898 | 1.18 | 1.00 | 0.9 | 0.1 | 0.6 | 86 | 91 | 2018 | ⊙ |
| 123471 | Jan Janssen | 2078 | 1.91 | 1.30 | 1 | 2.5 | 0.9 | 90 | 88 | 2018 | ⊙ |
| 123472 | Jan Janssen | 2209 | 1.81 | 1.82 | 0.8 | 2 | 0.7 | 84 | 97 | 2018 | ⊙ |
| 123473 | Jan Janssen | 2255 | 1.68 | 1.88 | 0 | 2.2 | 0.7 | 90 | 96 | 2018 | ⊙ |
| 123474 | Jan Janssen | 1539 | 1.04 | 1.87 | 0.6 | 2.4 | 0.6 | 80 | 93 | 2018 | ⊙ |

*Figure 8: first tab - overview of all farms*

The second tab shows the overview of a single farm as can be seen in Figure 9. On top, the general information about the farm is given and below that, an overview of all KDV criteria is given with a simple indication on the compliance to KDV criteria within the last 12 and 3 months. The auditor can expand the overview to also show the KDV criteria of which recent data is not available to see the overall performance, this can be seen in **Appendix F**. At the bottom of the tab, an overview of all documents that are needed for the audit preparation is given with an indication of the status. Finally, a simple overview of the animal numbers currently at the farm is available on the second tab of the dashboard.

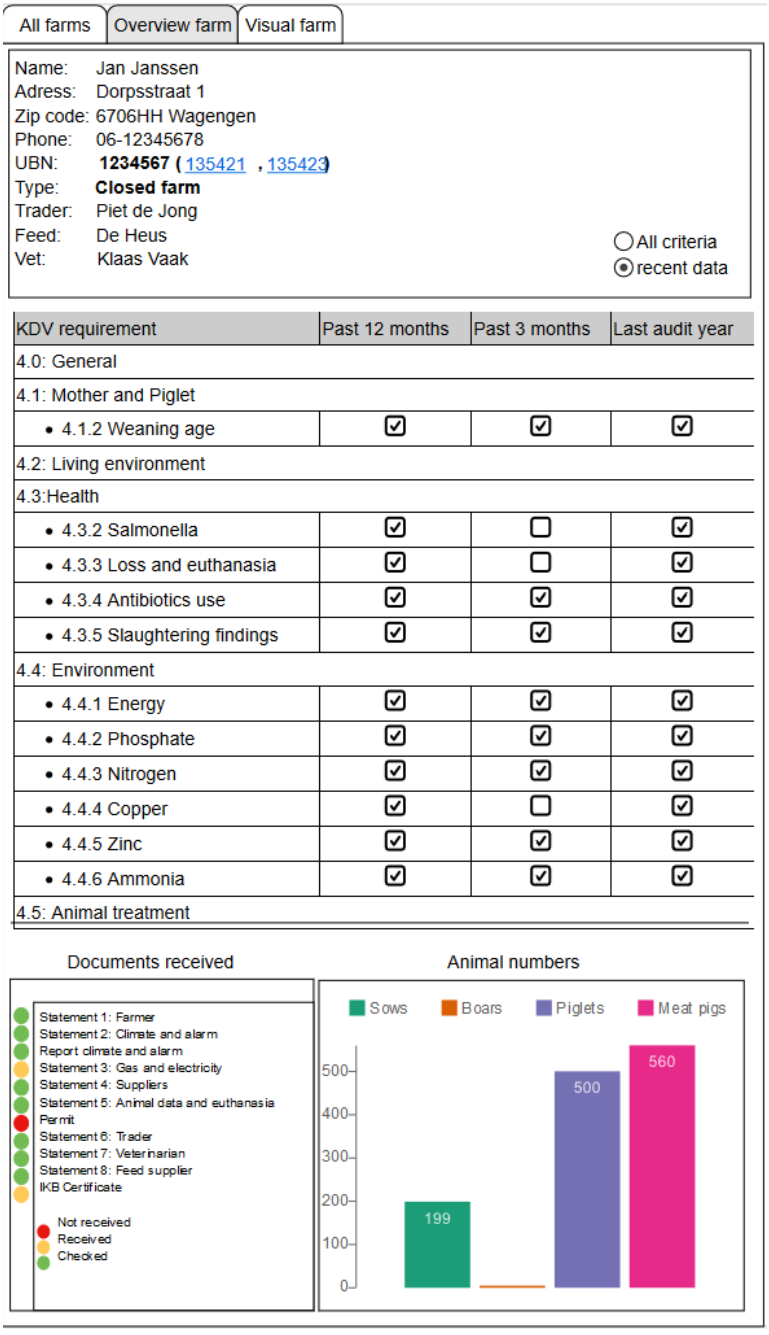



*Figure 9: Second tab - Overview single farm*

The last tab, as can be seen in figure 10, shows all visuals for the KDV criteria of which recent data is available and useful to the auditor. In this tab, the auditor can select different time periods to be able to use the dashboard in interviews with farmers as well and show progress or decline of performances over different years for example. All the visuals have a simple checkbox that shows whether the performance on the aspect the visual is about is passed for the time period that is selected. The first visual is the weaning age of the piglets, this is a simple bar chart that shows the amount of pigs weaned before and after 4 weeks.

The second visual shows emissions for the farm, the criterium of KDV and the average of KDV. This way, the performance of the farm can be put into perspective. The third visual shows a simple overview of the energy consumption per 1000kg growth for the farm, KDV criteria and average. Also included is a chart with the energy mix of the farm for extra information for the auditors.

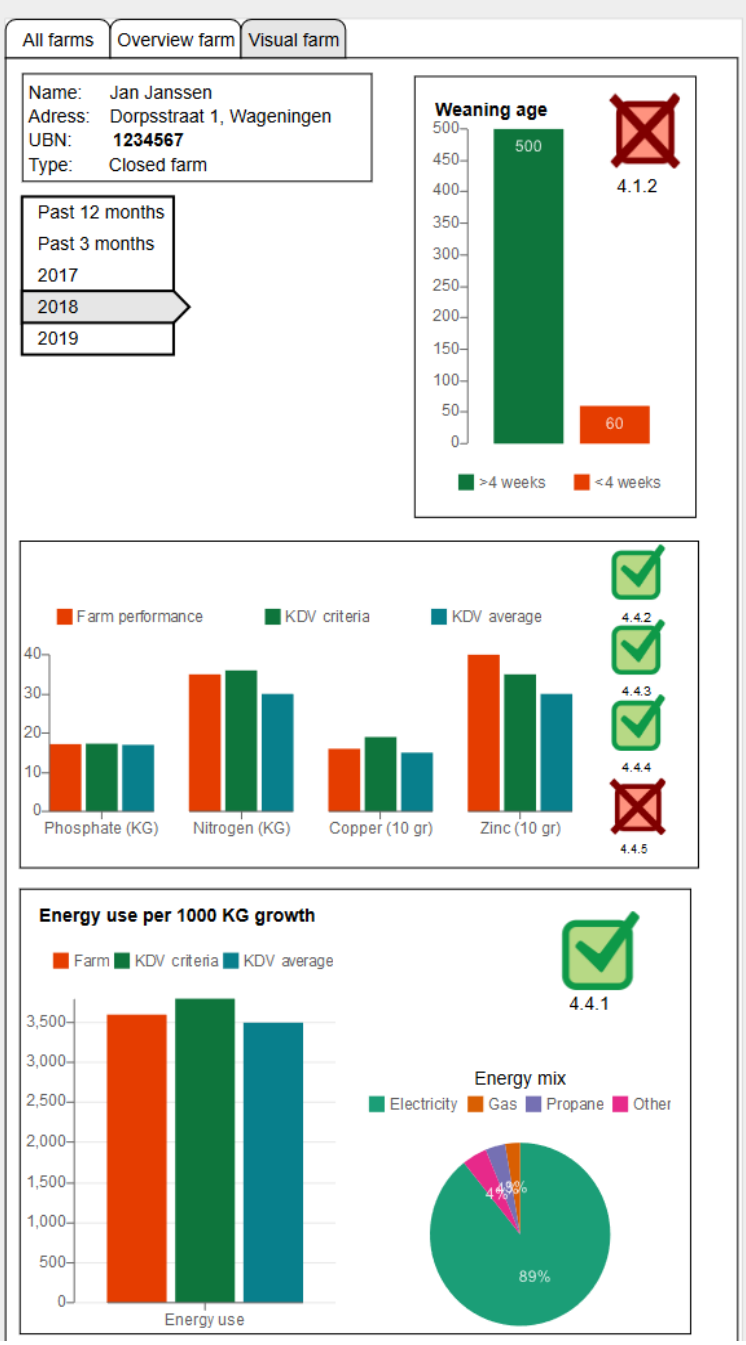



*Figure 10: Third tab - Visuals of single farm (first part)*

Then the slaughter findings are shown with first an overview of the KDV criteria and the farm performance on the criteria. Also, a chart with the numbers of deviations per type are compared between the farm and the average of KDV to be able to see farm specific deviations. The last overview is of antibiotics use with again a simple overview of the farm performance compared to KDV requirements and average. Also included is an overview that shows the development in antibiotics use over time and a risk assessment based on the difference compared with the previous month. As can be seen in the business Process Model of the auditing with this dashboard implemented in figure 12 there are no big changes in the audit preparation process except for the changed number of documents that need to be sent by the farmer and the easier assessment of the farms.

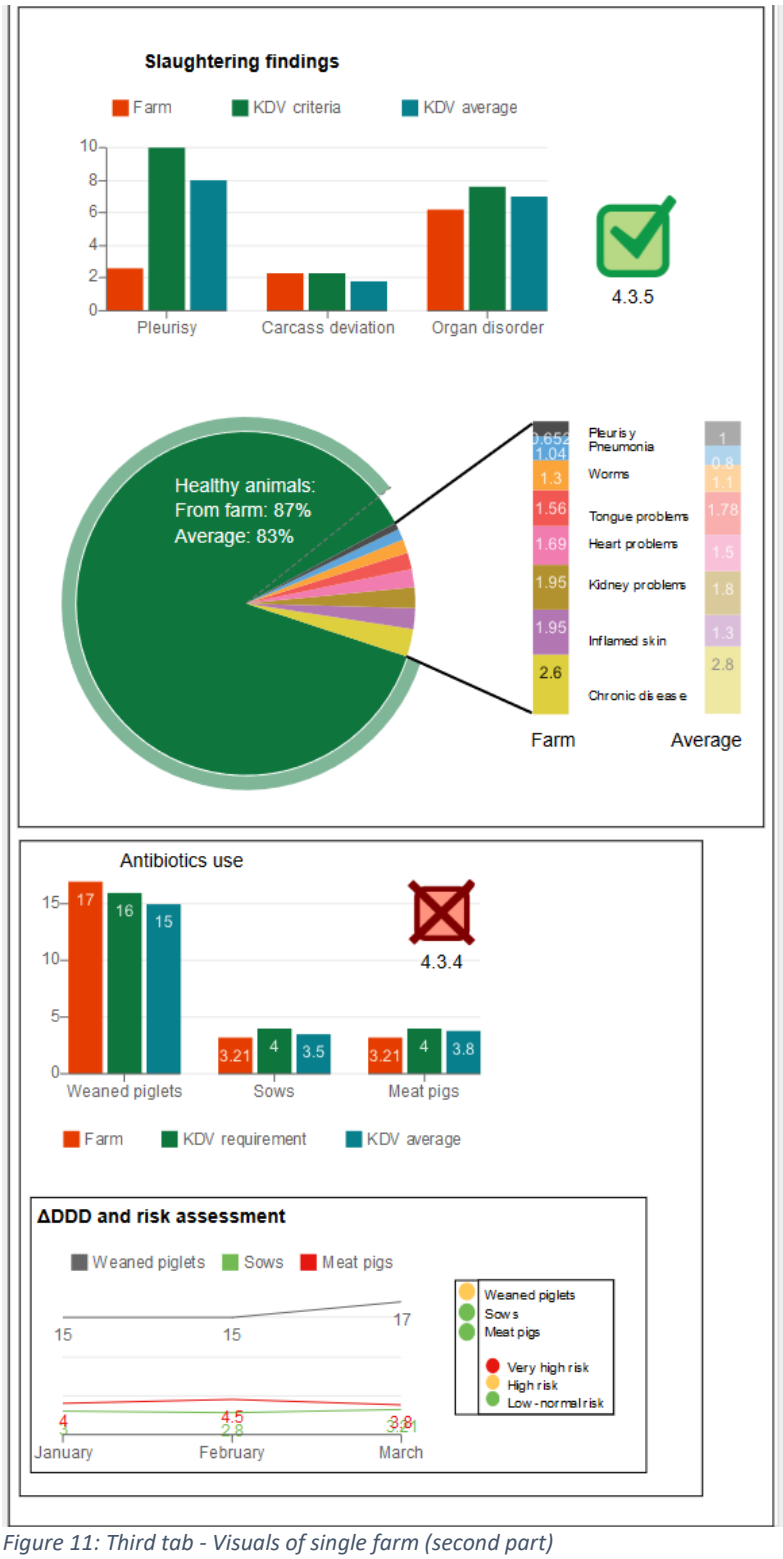



*Figure 11: Third tab - Visuals of single farm (second part)*

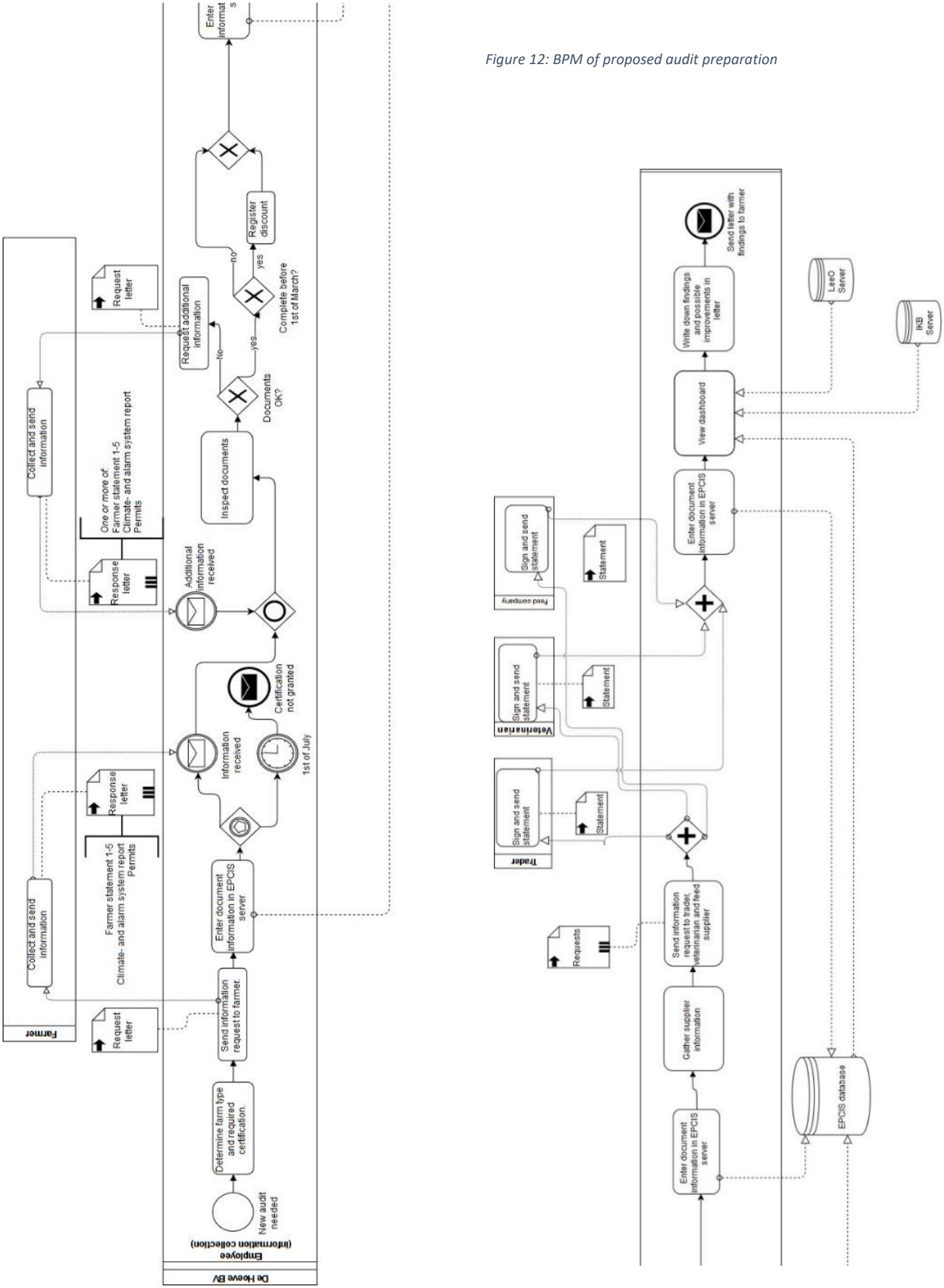



*Figure 12: BPM of proposed audit preparation*

## VMP MODEL

The development of the model in VMP is included in the results section of this thesis because VMP is not only used to model ready knowledge, but also to create understanding of the modeled value chain. In the first section the development of an aborted first model is presented. The second model is used for the quantitative results.

### First model

In the first attempt to model the KDV chain, training videos as provided by VDMBee were viewed and after each video the newly learned theory was applied to the case. This model is not finished, but the knowledge created during the generation of this model is used for the new version, therefore the process of development is still included in this report. It's important to realize that this model was not made with the assumptions as stated in the background section, but without clearly defined assumptions.

To compare the models of the current way of auditing and the future way of auditing, first a structured model is created for the current auditing method in KDV. Within VMP this is regarded as the As-Is phase. As focal companies for this phase De Hoeve, LeeO and Westfort are chosen since these companies have power in the value chain and can be modeled within VMP. This means these companies get a structured business model within VMP. Farmers, which are modeled as suppliers of Westfort and customers of De Hoeve are seen as a market segment, not as individual companies and will therefore not get a structured business model. This is done because all KDV farms are unique in processes, animal numbers, performances and KDV concept. In the discovery phase of the application of the VMP tool, this means that an ecosystem map for the KDV chain will be made with a focus on auditing and meat production.

In the drawing of the ecosystem map (see Figure 13) the scope was kept broad, since the goal of drawing is to create a story to generate understanding of interactions between companies. After drawing the ecosystem, the ecosystem is mapped to structured data. Information about enterprises, market segments, networks and value propositions is now entered in the VDML repository. At the time of the mapping it was decided to simplify the ecosystem to keep the model understandable and leave irrelevant information out of the model. Customers of Westfort are modeled as one market segment, since Westfort offers them, in our model, the same value proposition. Certification of Westfort by De Hoeve is kept out of scope, since there is limited insight on this process and certification of the slaughterhouse is not in the scope of this thesis. Since the pig breeders and fatteners are modeled as market segments the feed company is not mapped to the model, since it is neither a customer, nor a supplier of one of the three focal companies.

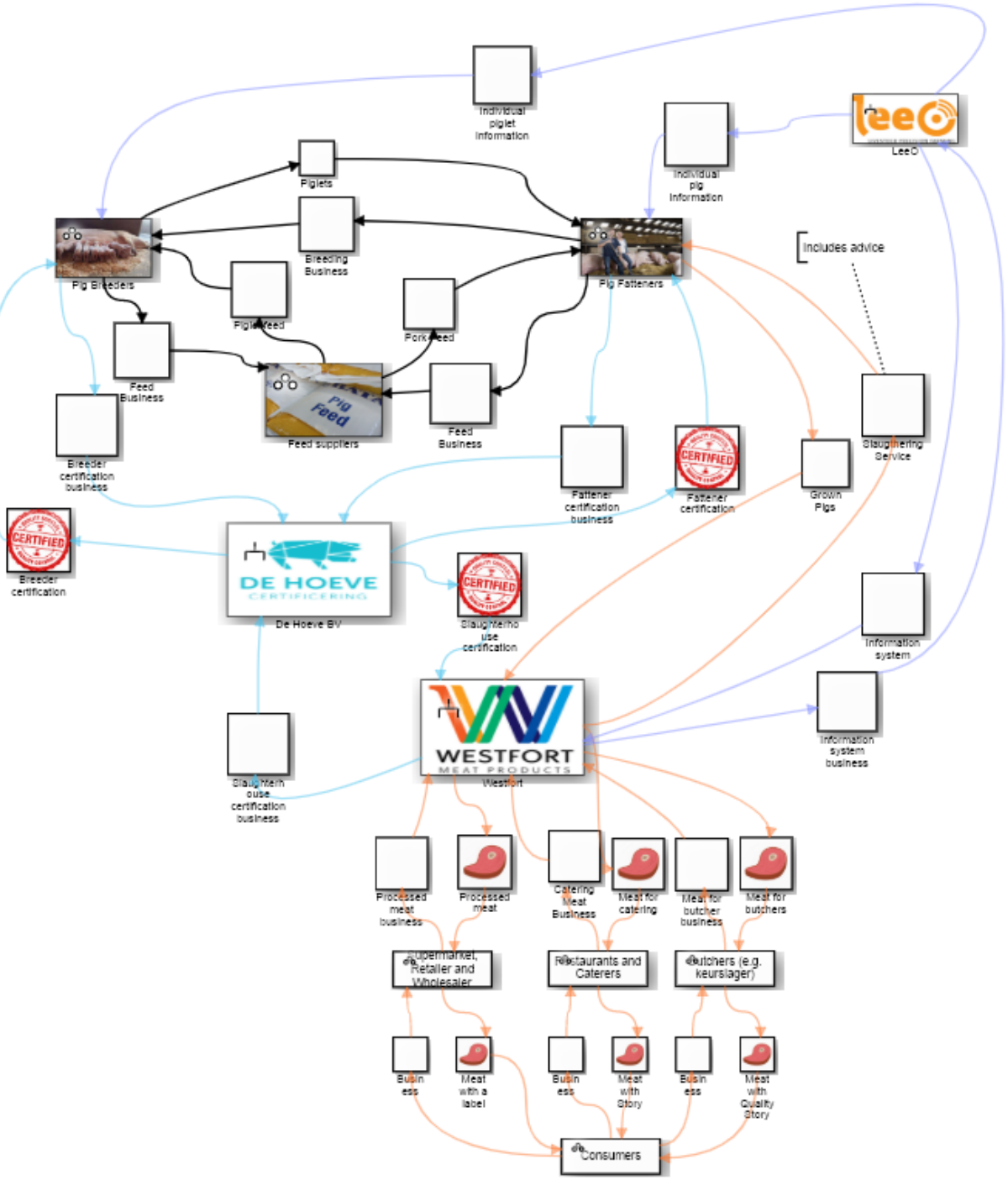



*Figure 13: Ecosystem map, first modelling attempt*

After mapping the ecosystem, value stream maps are made of 5 value propositions: breeder and fattener certification from De Hoeve, information system provision by LeeO to breeders and fatteners, and the slaughtering service by Westfort. In these maps, resources and capabilities were linked to value-adding activities by the focal companies of that value proposition. The information on the value stream maps was mapped to structured data and linked to the value proposition it originated from.
Strategy maps are created for De Hoeve, LeeO and Westfort where the story of value creation is told. Elements that were entered in the structured business model before, values activities, competencies, are reused and new values are entered. In this model, plan values are regarded as values that are important for KDV and society, like emissions and loss percentage. After mapping the strategy maps, the discovery stage is finished, and the prototyping stage should start.

During prototyping, however, it was discovered that assumptions made at start of the model were not correct and limiting the possibilities of having a useful model that could be built further into a "to-be" phase. The reason for these wrong assumptions was the fact that the model was being built while doing the training, so it was not clear which constraints of the program would limit the model later and how certain information would be used later in the generation of the model. It was decided to restart the modeling completely. This way the better understanding of both the case and the program could be used to build a better model, making it easier to add a new phase. The biggest issue with the first model was the fact that LeeO was modeled as an enterprise, while having very limited influence in the model. Farmers were modeled as market segment, limiting the insight in farmers in the model. The last problem in the first model is that the scope of the model became too broad, too many irrelevant values were entered in the model, while not every of these factors could be quantified, making the model imprecise.

## Second model – As-Is

In the generation of the new model the same steps are taken as before, however this time there is a clear view of what the end result should be like. For the ecosystem the choice has been made to have three enterprises, Westfort, De Hoeve and the farmers. This means that these enterprises will get a structured business model in VMP. All KDV farmers are now modeled as one "company" to give insights in the values generated for farmers. By modeling all farmers as one enterprise, information about different types of farmers is lost in the model, but the production of meat pigs is now regarded as a cooperative effort of all farmers involved. In the new model only two networks are indicated, a certification network with a simple value proposition exchange between De Hoeve and the farmers and a more complicated slaughtering network. In the slaughtering network farmers offer Westfort pigs and get slaughtering business in return. De Hoeve offers the premium that the label gives to Westfort. Westfort delivers meat to the pork market and receives business in return from the pork market. The pork market is modeled as a market segment and is included in the model to model the sales of Westfort. After drawing the ecosystem map, the networks, participants and value propositions are mapped as structured data. This ecosystem map can be found in figure 14 on the next page.

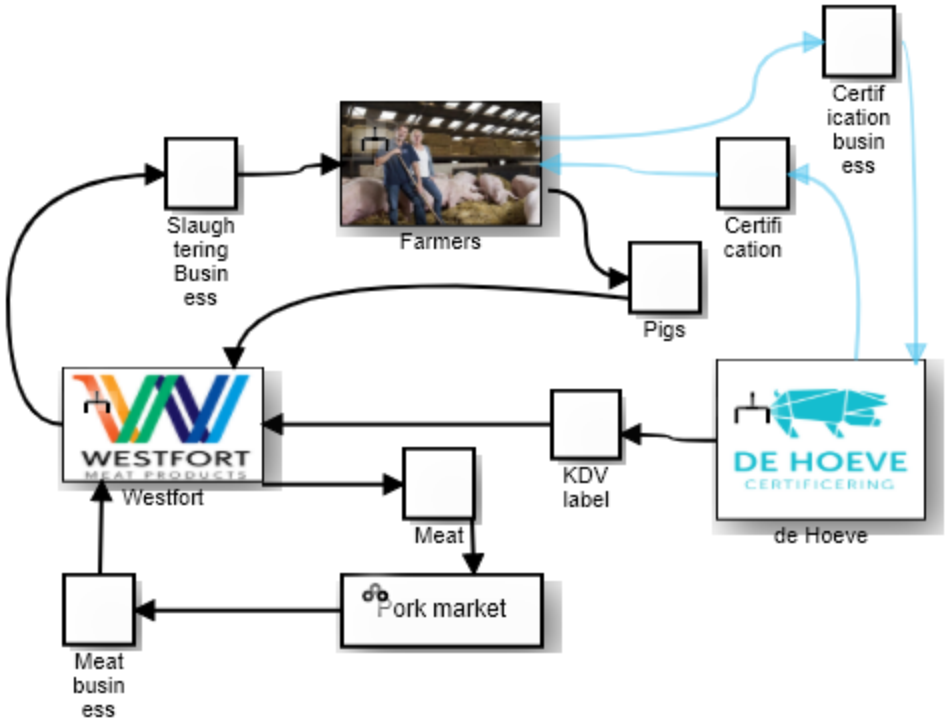



*Figure 14: Ecosystem map KDV, As-Is phase (Screenshot from VMP)*

Three value stream maps have been created for the most important value propositions of De Hoeve, the farmers and Westfort. For De Hoeve the activities organizing documents, that uses CRM software as a resource in the model, and performance assessment, that uses the audit form, pig expertise and the criteria list as resources, are drawn and mapped. For the farmer one activity is drawn on the value stream map of the value proposition “Pigs”. The activity production uses an animal friendly sty as a resource. Also, for Westfort only one activity is drawn and mapped. Slaughtering is created as activity using the resources stress-free environment and modern slaughtering facility. After all activities and resources have been mapped into structured data, activity values are added onto the activities. For organizing documents, the value is preparation time, for performance assessment the value is assessment time, for production this is number of pigs and for the activity slaughtering the slaughter value.

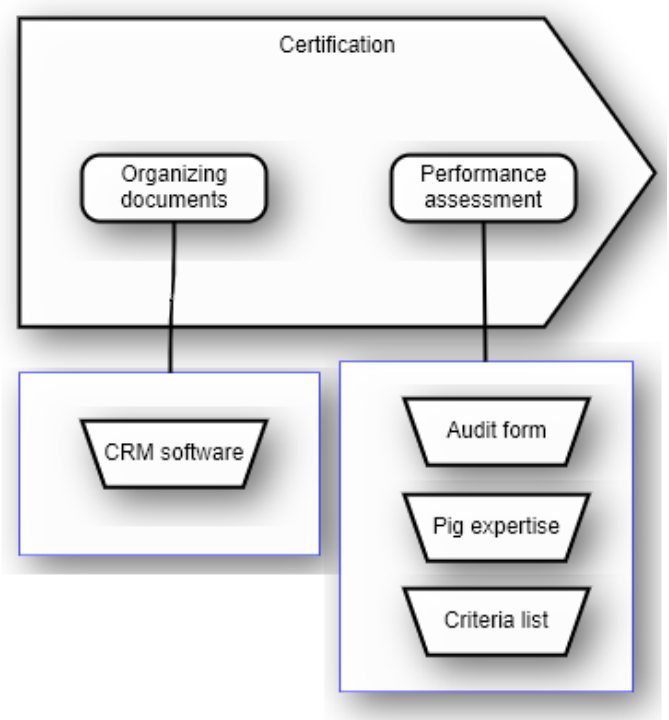



*Figure 15: Value Stream Map Certification, As-Is phase (Screenshot from VMP)*

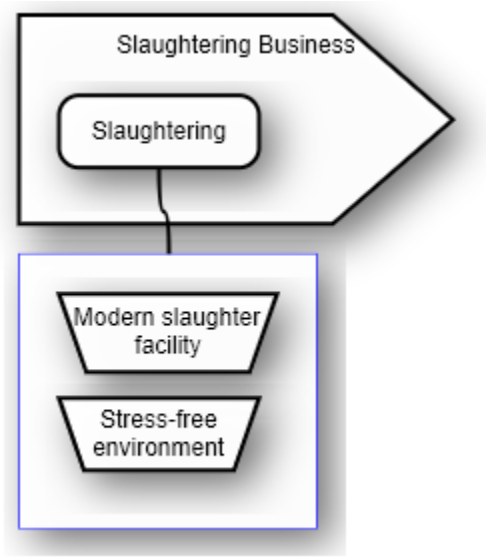



*Figure 16: Value Stream Map Slaughtering Business, As-Is phase (Screenshot from VMP)*

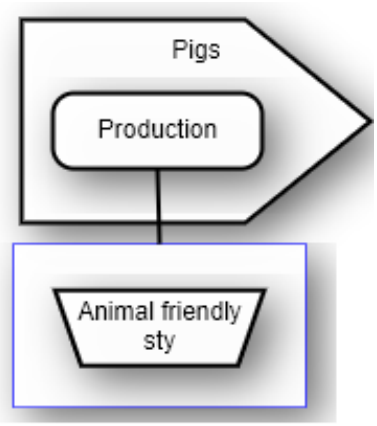



*Figure 17: Value Stream Map Pigs, As-Is phase (Screenshot from VMP)*

After the value stream maps the Strategy maps are created for the three focal companies. For De Hoeve the strategy map shows how audit revenue is created for De Hoeve by the audits and how the preparation and response time influence emissions and loss percentage. The time investment of De Hoeve is a big part of costs of De Hoeve in the preparation of audits and is therefore an important business value.

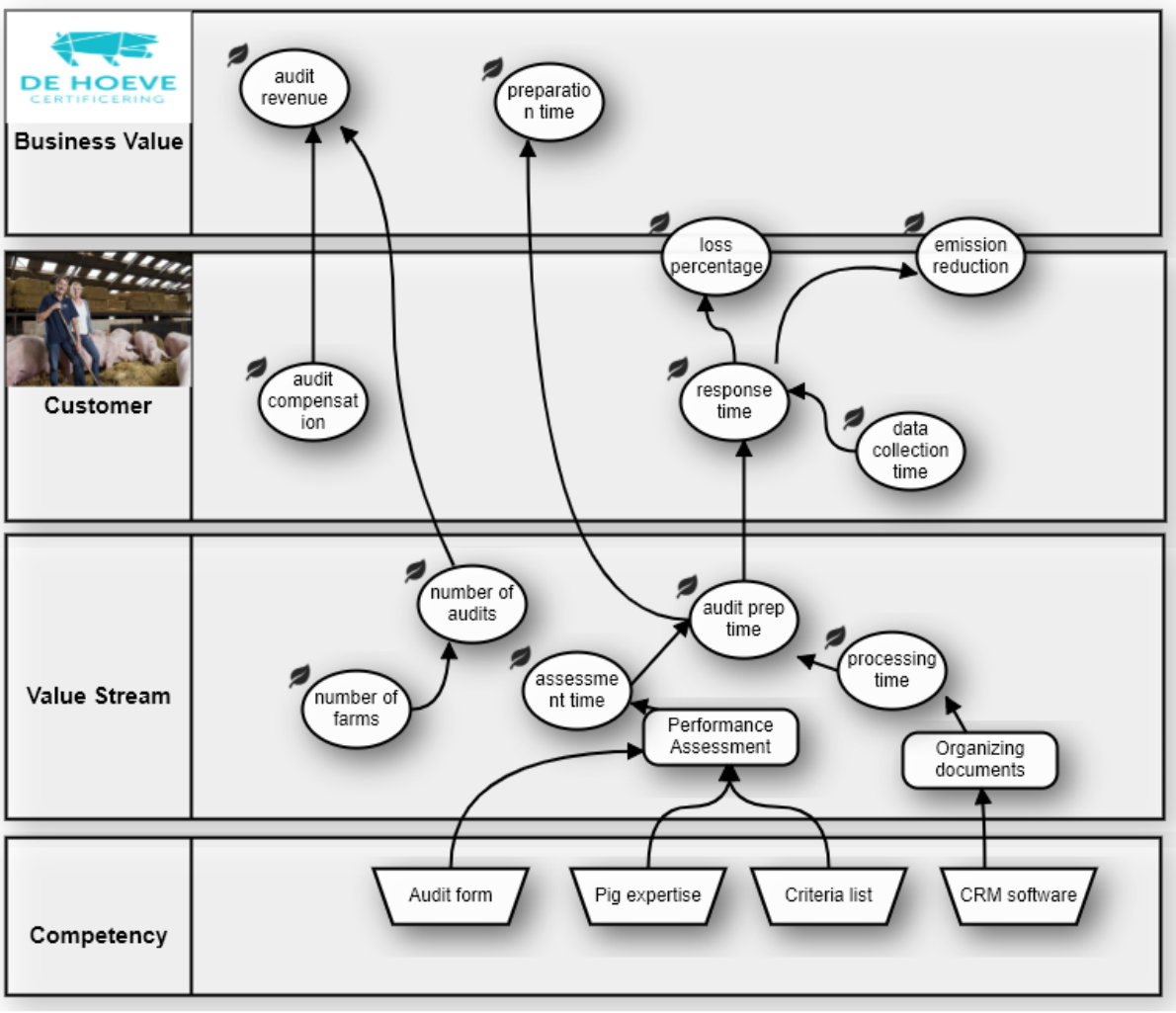



*Figure 18: Strategy Map de Hoeve, As-Is phase (Screenshot from VMP)*

For Westfort, the customer of the farmers the number of pigs and the quality are important values as well as the pig price. These values are therefore put in the customer lane of the strategy map. For Westfort the strategy map tells the story of the price of meat for selling by Westfort to the retail. This leads to the important business value of Westfort. The business value that Westfort wants to create in the model is revenue.

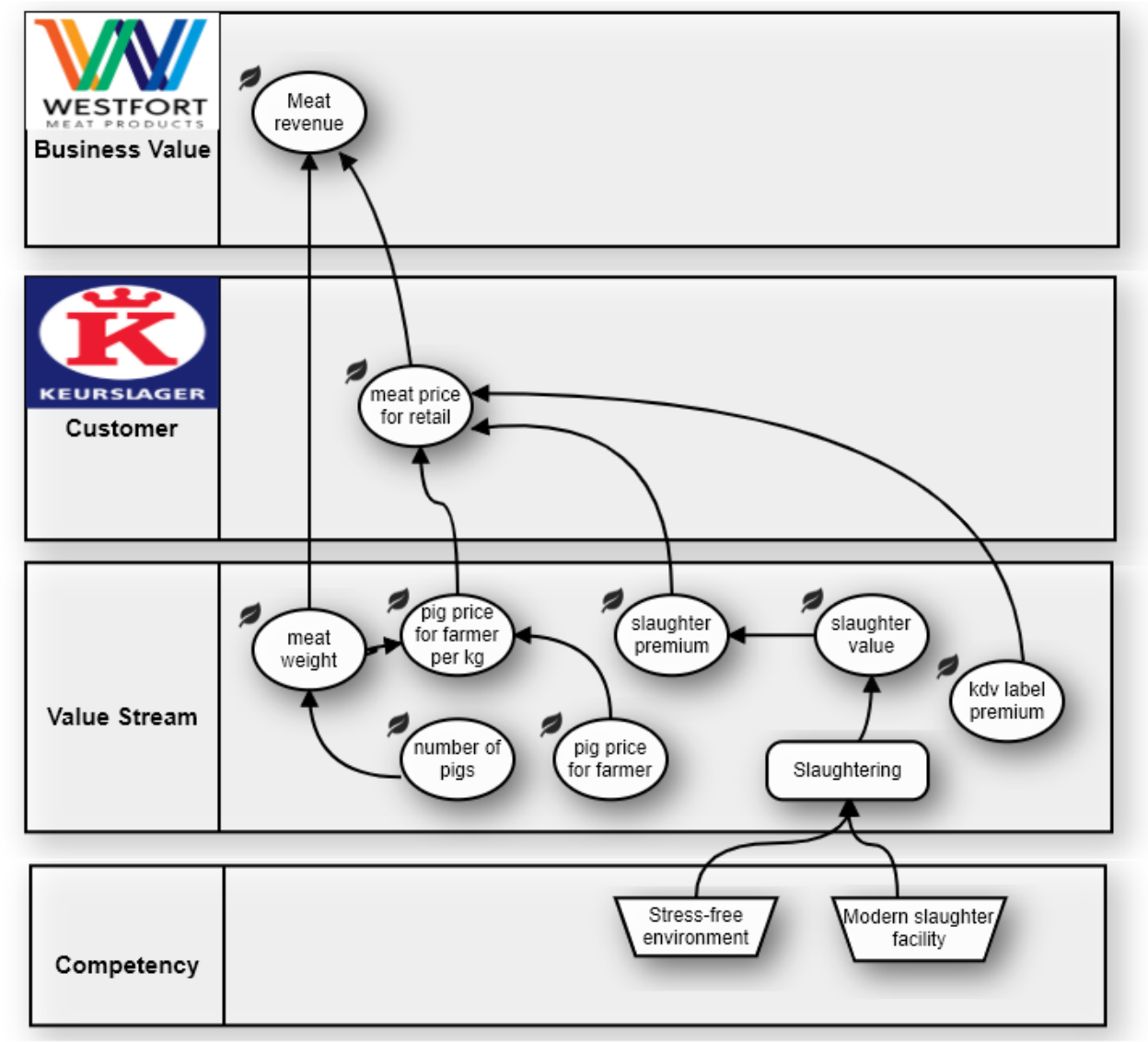



*Figure 19: Strategy Map Westfort, As-Is phase (Screenshot from VMP)*

For the farmer, the transition from piglets to grown pigs and the quality of meat, as determined by the certification and response time in the model, are the basis of the income for farmers.

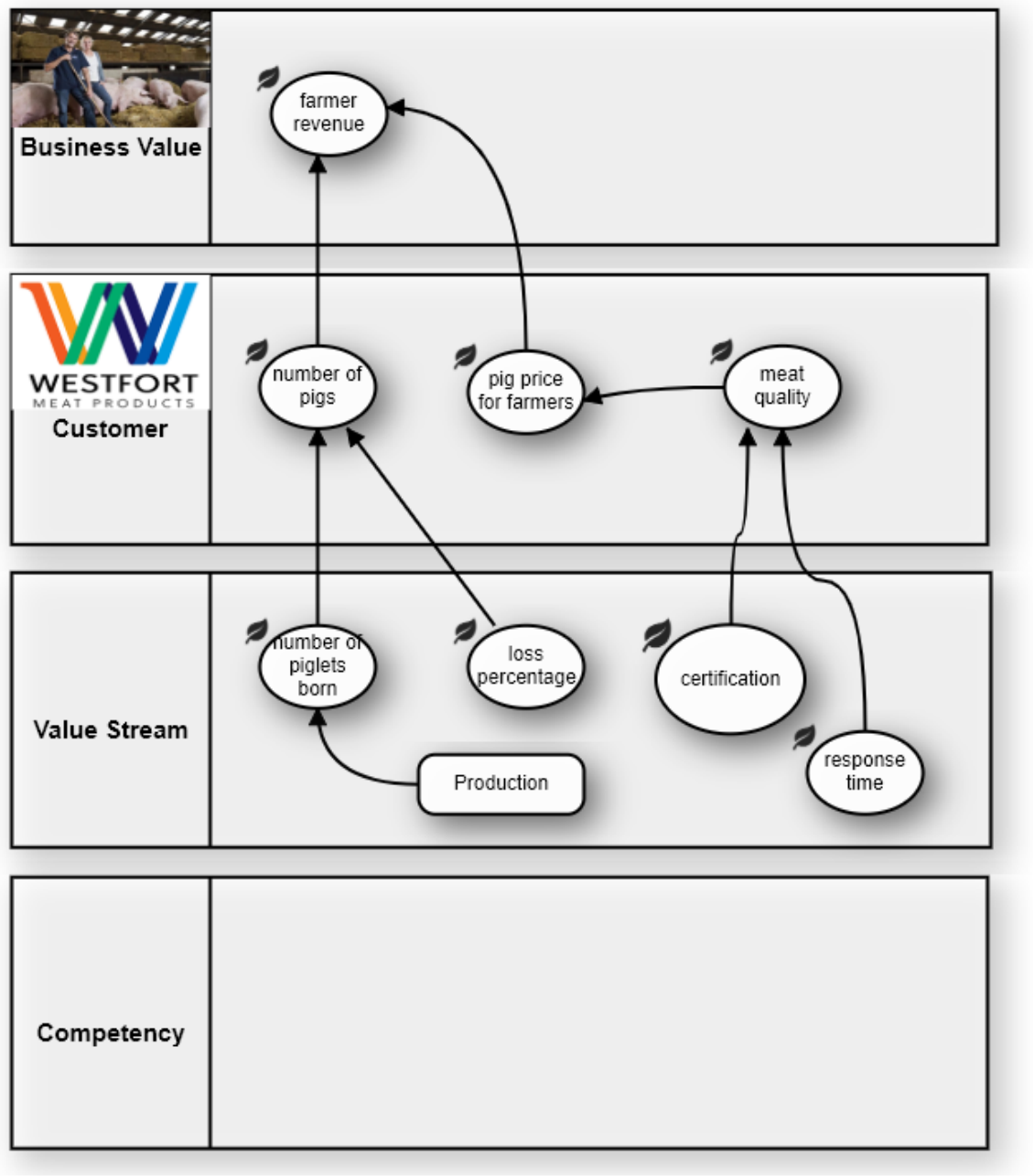



*Figure 20: Strategy Map Farmers, As-Is phase (Screenshot from VMP)*

The last step of modelling this phase is to map all the values and aggregate values using formulas. The value formulas have been based on basic economic principles, interpretation of the KDV chain and estimations of final values. In **Appendix G:** an overview of all values in the model can be found as well as the aggregation relationships and the value formulas. Explanation on the source of the values and formulas is also included in this appendix.

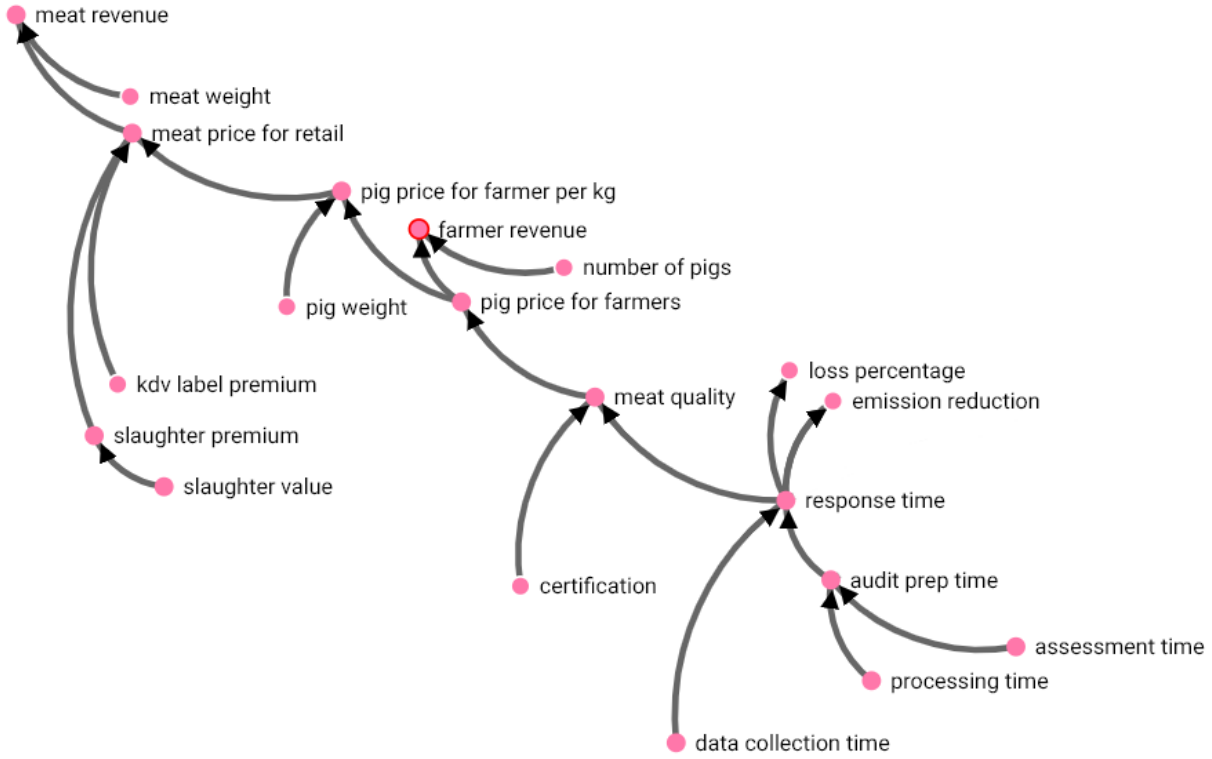



*Figure 21: Aggregation of important values (Screenshot from VMP, edited)*

## Second model – To Be

After the current situation for KDV has been modeled and checked by Henk de Man of VDMBee (see the meeting notes in **Appendix H**:) the model for the To-Be phase is made. For this model the model of the As-Is phase is taken, and changes are made where necessary. The first change is made in the ecosystem map, instead of 3 focal companies, in the new phase EECC is added as forth business model owning enterprise. The new ecosystem map and other new and changed maps can be found in the figures on the next page**.** EECC has a value proposition for De Hoeve called dashboard and receives for that the value proposition dashboard compensation. These propositions are mapped to structured data in the certification network where EECC takes the role of dashboard developer. This mapping is done for the Business models of De Hoeve and the new business model of EECC.

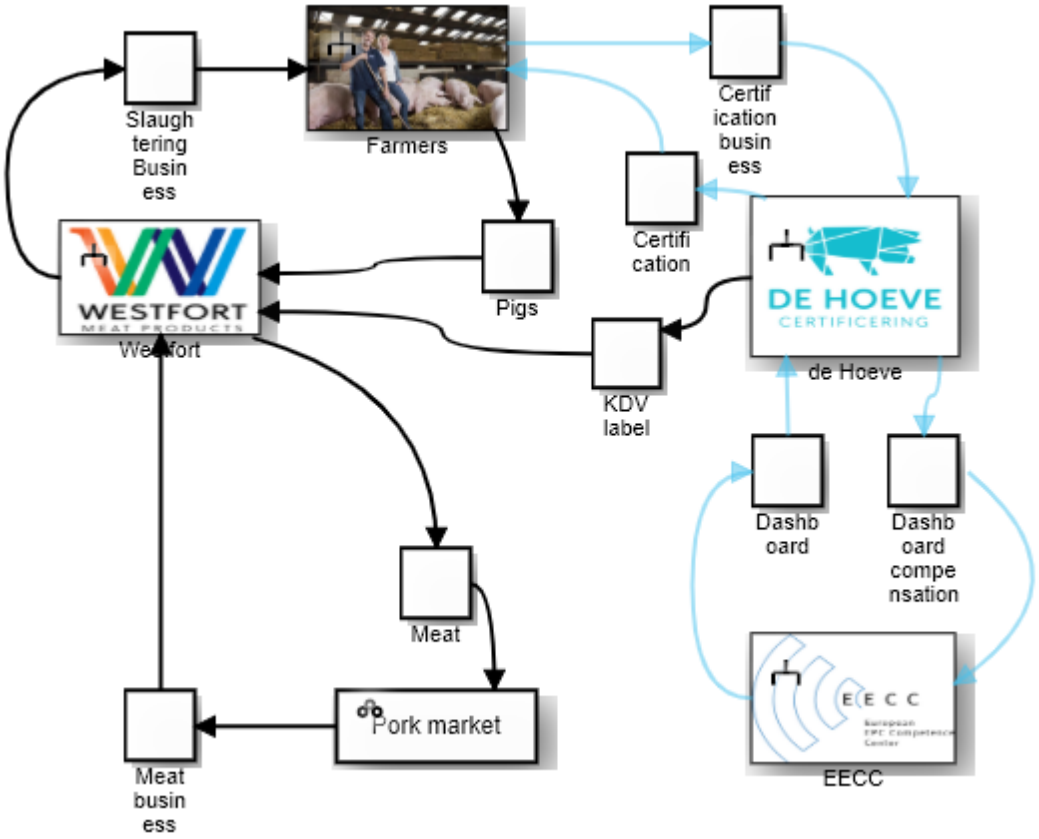



*Figure 22: Ecosystem Map KDV, To-Be phase (Screenshot from VMP)*

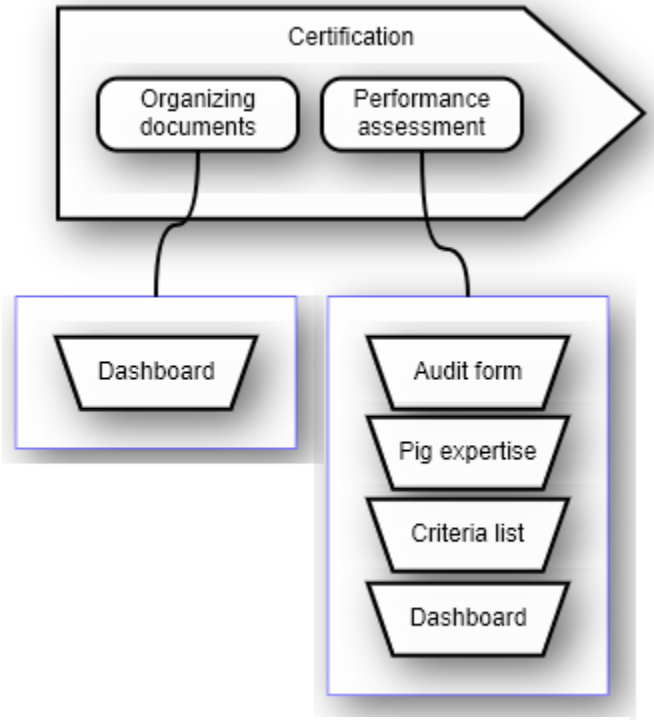



*Figure 23: Value Stream Map Certification, To-Be phase (Screenshot from VMP)*

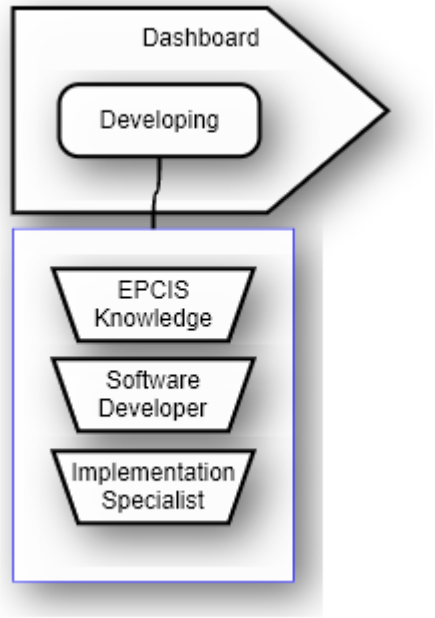



*Figure 24: Value Stream Map Dashboard, To-Be phase (Screenshot from VMP)*

A new value stream is made for EECC for the value proposition “Dashboard” with development of the dashboard as activity using EPCIS knowledge, a software developer and implementation specialist as competencies in the model. In the value stream of De Hoeve CRM software is replaced with Dashboard as competency for the activity “organizing documents” and added for the activity “performance assessment”.

For EECC a strategy map is created where a license fee creates revenue. The strategy map of De Hoeve is adjusted to reflect the new auditing process. After this all new values that are mapped and can be found at the end of **Appendix G:**.

In the To Be model an extra scenario is included with a response time of 3 months instead of 3 days to reflect a scenario where De Hoeve doesn’t use the dashboard for pro-active auditing, but for checking farm performances twice a year.

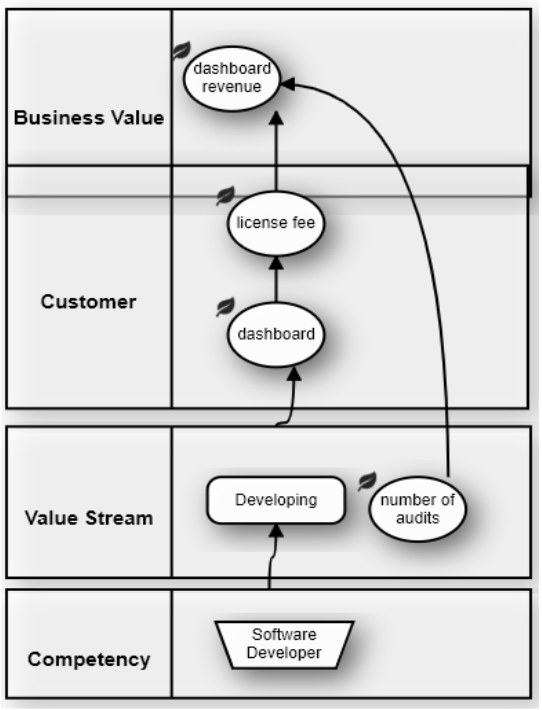



*Figure 25: Strategy Map EECC, To-Be phase (Screenshot from VMP)*

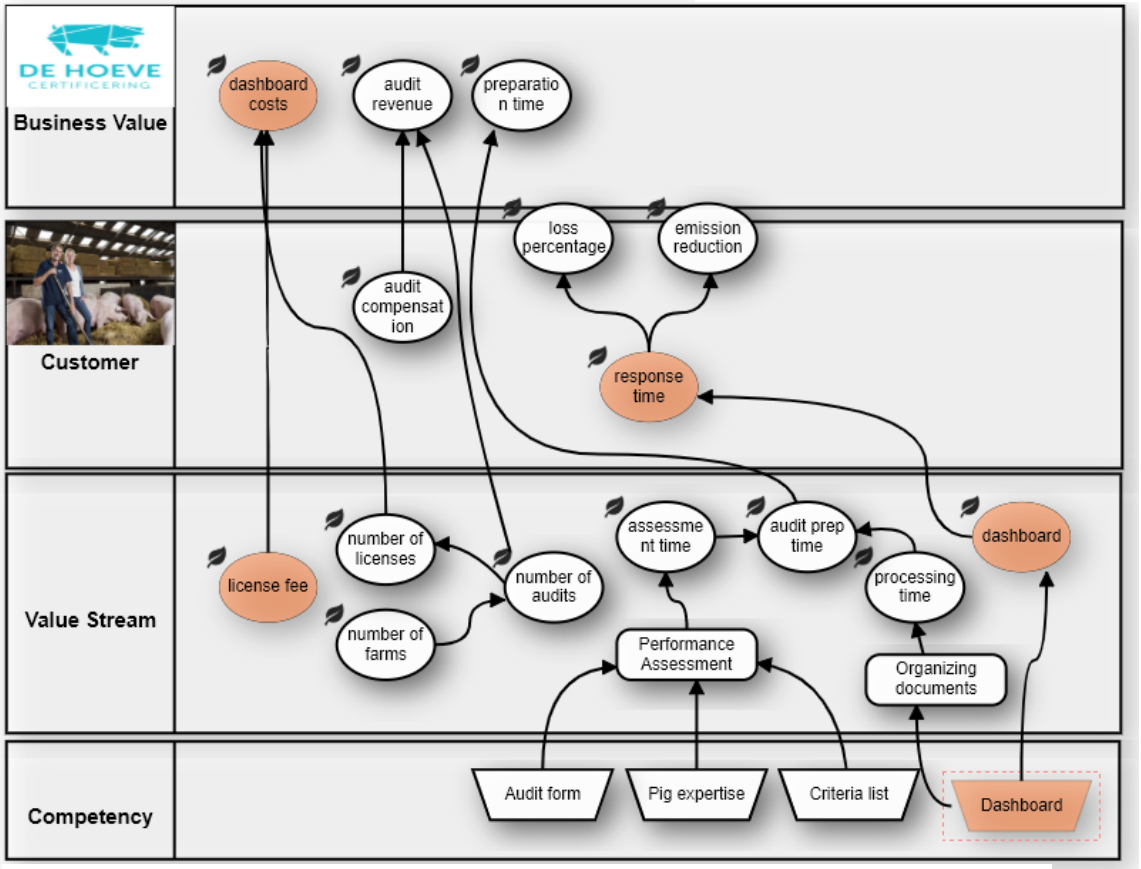



*Figure 26: Strategy Map de Hoeve, To-Be phase (Screenshot from VMP)*

## VMP RESULTS

After all the necessary data has been entered in VMP, graphs and tables have been created to see the impact of the change. As described earlier the biggest difference between the phases in the model mainly are the new involvement of EECC and the dashboard they provide. The main implication of this change is that the response time for interference in case of non-compliance with KDV requirements goes down from 245 days on average to three.

| Values | Without Dashboard | With Dashboard | |
|---|---|---|---|
| | No response time reduction | Response time low | Response time very low |
| Main values | | | |
| 1. Response time (days) | 245 | 94 | 3 |
| 2. Emission reduction (%) | 0.00 | 3.77 | 6.05 |
| 3. Loss percentage (%) | 1.90 | 1.74 | 1.65 |
| 4. Meat quality (%) | 100 | 106 | 110 |
| 5. Revenue Farmer (€/week) | 9668725.52 | 10280171.48 | 10649543.72 |
| 6. Revenue Westfort (€/week) | 15618381.96 | 16239205.51 | 16613900.19 |

*Figure 27: Main values in VMP (Screenshot from VMP)*

As can be seen from the table in figure 27, using the dashboard would decrease the percentage of animal loss and increase of emissions reduction, meaning a reduction of both these unwanted consequences of producing pork meat. This is due to the fact that in the model the emissions and loss percentage are reduced in case of a lower response time.

The lower number of loss increases the meat production and the lower response time provides a higher quality of meat that increases the price for retail as can be seen in figure 28. Having a higher price for the increased meat production results in a higher revenue for both the farmers and Westfort.


*Figure 28: Relation between meat price and response time (Screenshot from VMP)*

In table 5, on the next page, an overview can be found with all values that are present in VMP.

*Table 5: Comparison of values in VMP (edited export from VMP)*

| Value Name | Without dashboard | | With Dashboard | | | |
|---|---|---|---|---|---|---|
| phase | | | Response time low | | Response time very low | |
| emission reduction | 0 | % | 3.775 | % | 6.05 | % |
| loss percentage | 1.895 | % | 1.744 | % | 1.653 | % |
| number of piglets | 31600 | piglets/week | 31600 | piglets/week | 31600 | piglets/week |
| farmer revenue | 9668725 | €/week | 10280171 | €/week | 10649544 | €/week |
| number of pigs | 31001.18 | pigs/week | 31048.9 | pigs/week | 31077.65 | pigs/week |
| meat quality | 100.004 | % | 106.1648 | % | 109.8776 | % |
| pig price for farmers | 311.8825 | €/pig | 331.0962 | €/pig | 342.6753 | €/pig |
| KDV label premium | 1 | €/kg | 1 | €/kg | 1 | €/kg |
| meat weight | 2974873 | kg/week | 2979452 | kg/week | 2982211 | kg/week |
| meat revenue | 15618381 | €/week | 16239206 | €/week | 16613900 | €/week |
| slaughter value | 1 | €/kg | 1 | €/kg | 1 | €/kg |
| slaughter premium | 1 | €/kg | 1 | €/kg | 1 | €/kg |
| meat price for retail | 5.2501 | €/kg | 5.4504 | €/kg | 5.571 | €/kg |
| pig price for farmer per kg | 3.2501 | € | 3.4504 | € | 3.571 | € |
| pig weight | 95.96 | kg/pig | 95.96 | kg/pig | 95.96 | kg/pig |
| processing time | 2 | days | 1 | days | 1 | days |
| assessment time | 1 | days | 1 | days | 1 | days |
| audit revenue | 79000 | €/year | 79000 | €/year | 79000 | €/year |
| audit compensation | 250 | € | 250 | € | 250 | € |
| number of audits | 316 | audits/year | 316 | audits/year | 316 | audits/year |
| response time | 245 | days | 94 | days | 3 | days |
| preparation time | 3 | days | 2 | days | 2 | days |
| data collection time | 60 | days | | | | |
| certification | 1 | certificate | 1 | certificate | 1 | certificate |
| audit prep time | 3 | days | 2 | days | 2 | days |
| number of farms | 316 | farms | 316 | farms | 316 | farms |
| dashboard | | | 1 | dashboard | 1 | dashboard |
| license fee | | | 10 | €/year | 10 | €/year |
| response time reduction | | | 151 | days | 242 | days |
| number of licenses | | | 316 | licenses | 316 | licenses |
| dashboard revenue | | | 3160 | €/year | 3160 | €/year |
| dashboard costs | | | 3160 | €/year | 3160 | €/year |

# 4 DISCUSSION

In this discussion section, first the key findings of this thesis are explained. After that, a reflection is given on the dashboard design as it was used in this thesis and the accuracy of the VMP model. These sections also show opportunities for future research. Lastly, the use of VMP as a tool for this thesis is evaluated.

## KEY FINDINGS

This thesis shows that a dashboard to be used by quality auditors in the pork chain generates value for the different stakeholders in the pork value chain. The observation at the Hoeve and the meeting at Westfort showed that the dashboard should reduce the preparation time of the auditors. The BPMs of the auditing process before and after implementation of the dashboard show a reduction of documents that have to be prepared and sent by the farmer and checked by the Hoeve. Using VMP the important stakeholders were identified, and models were created that show value exchange between these stakeholders with and without the dashboard. With the quantifiable business models made in VMP it was shown that the reduction in time between problems happening and the auditors noticing generated value for the different stakeholders. For de Hoeve this value is the reduced preparation time, for Westfort and the farmers increased revenue. Within the KDV concept the dashboard can lead to a reduction in emissions and animal loss.

## REFLECTION ON THE MOCKUP DASHBOARD

The dashboard mock-up that was made has been presented to De Hoeve and agreed upon in broad terms. Since the IoF2020-project is still running, the final dashboard design might still change, but more importantly the use of the dashboard can still change. In the mockup it is assumed that the model will be used for the yearly audits as well as for pro-active auditing, but between members of the project there is not a clear agreement on whether De Hoeve should use the dashboard to actively look for farms that can improve in an early state. The model in VMP was made with the assumption that the dashboard would be used as proposed, so the model does not reflect other uses of the dashboard.

Another possible issue is that the dashboard is made for the current KDV requirements. The availability of a dashboard, however, might open up opportunities for improved or new requirements. In meetings, De Hoeve however indicated they first wanted to see a working dashboard for the current situation, so this is something that might be looked at in a later stage of the IoF2020 project.

## EFFECTS OF ASSUMPTIONS ON VMP RESULTS

On top of the factors described in the previous paragraphs, another factor influences the accuracy of the results of VMP: the input data. The quality of the input data in the model is imperfect, several assumptions have been made, some values are estimations and interactions had to be simplified. This means that the quantitative values that are calculated in VMP are also imprecise. Looking back at the scope definition in the methodology chapter and the research question in the introduction, the results of the model can still be useful. For the different stakeholders, it is clear whether or not they can benefit from the dashboard as well as the mechanics that create this value, however the extent to which they benefit cannot be concluded with these results. It's hard to say whether all stakeholders will indeed benefit from the dashboard, since the extra revenue for the farmers and Westfort might not exceed the costs of the dashboard and the allocation of extra benefits within KDV is not predictable.

Because the results of this model rely heavily on the assumptions made in the beginning, extra research can be very useful. Most importantly, more scenarios could be included to reflect the different possible outcomes of including the dashboard. For example, the compensation for EECC for development of the dashboard is now modeled as a yearly license fee by De Hoeve, but this might for example also be a one-time investment or a fee to be paid by the farmers.

## REFLECTION ON THE USE OF VMP

In this thesis VMP was used to model the auditing process of the KDV chain. By using VMP business models were generated for the different scenarios and compared to each other. Because of the design of VMP these business models are generated from maps drawn in the discovery phase. The fact that the drawn maps were easy to adjust made it possible to create ideas while drawing. This feature of VMP has made it easier to build the model step by step and keep track of decisions made in the process.

Compared with Osterwalder's BMC the models created in VMP are more detailed and quantifiable, so the effects of scenarios can be calculated instead of argued. Generating the business models in VMP is more complex and time consuming compared to the Osterwalder's BMC, but for the research question of this thesis more useful.

The use of VMP for this thesis was experimental, the tool is relatively new and had not been used before by the author of this thesis. Because of the versatile methods of using VMP this resulted in the development of a first model without a clear idea of the end result and the time needed to develop a model. In combination with the fact that before every step training videos had to be watched led to the very time consuming and disorderly first modelling attempt.
Another attention point in the use of VMP is that for this thesis VMP is used to tell something about a network of companies that the author is not part of and without close cooperation with said companies. This is not the intended way of using VMP and limits the validity of the model, however keeping in mind the scope of this thesis and the available time the created model is the best representation that could be made with VMP at the moment.

For future research, it might be better to first have a clear understanding on the tool and the process of building a model in VMP before starting the modelling. Also reserving more time for the modeling will result in a more structured process. Finally, it is recommended to substantially increase consultation moments with stakeholders, for example by organizing workshop sessions as proposed by VDMBee.

A more extensive analysis on the complexity of VMP can be found in the thesis of Jon van der Meer with whom I worked together in the generation of the structured business models.

# 5 CONCLUSION

The goal of this thesis was to find out whether an analytical dashboard for quality auditors would add value for the different actors in the pork value chain. From the comparison of values between the different models in VMP it can be concluded that, with this set of assumptions, value will be added by implementing a dashboard for auditors in the KDV value chain. For de Hoeve reduced preparation time will be the main benefit, for the farmers and Westfort the increased revenue. For the KDV concept in general, a lower loss percentage and emissions can be positive outcomes of implementing the dashboard. The utilization of the dashboard, cost structure and distribution of benefits will determine the actual benefits after the dashboard has been implemented. Even though it was difficult to get started, VMP proved to be a good tool to apply on the KDV case because of the quantifiable business models that were created. The comparison between models created in VMP revealed the value creation and exchange related to the dashboard.

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# Appendix A: GLOSSARY OF TERMS USED IN VMP

| VMP term | Explanation |
|---|---|
| **Activity** | An Activity represents work performed by a Participant |
| **Analyst** | Generates structured model data based on the visual maps created in workshops |
| **Business Model (Structured)** | Business model based on the VDML metamodel, visually represented in VMP by cube and UI |
| **Capabilities** | The ability to perform a type of work |
| **Change agent** | Builds dashboards to communicate results and implications. |
| **Competency** | Ability or means that Business has and applies in order to perform work as represented as Activity |
| **Connectors (in maps)** | One-way arrow in a map that connects two items, cannot be mapped. |
| **Customer** | Receiver of value created by enterprise and not regarded as Partner. |
| **Drawing** | Placing shapes and connectors on a Map, creating a visual representation. |
| **Ecosystem** | Network of Participants, their Roles and Value Propositions between them |
| **Ecosystem Map** | Visual representation of Network of Participants, their Roles and Value Propositions between them |
| **Enterprise** | Named Participant or prototypical one in the form of an enterprise |
| **Mapping (general)** | Transforming visual representations into structured model data |
| **Mapping (to create)** | Mapping where new data is entered in structured model data from a shape in a visual representation |
| **Mapping (to re-use)** | Mapping from existing data in structured model to a shape in a visual interpretation |
| **Mapping (Add values)** | Adding a value in the structured business model linked to a value proposition or activity |
| **Market Segment** | Anonymous group of customers or suppliers |

| | |
|---|---|
| **My proposition** | Value created by enterprise that benefits itself |
| **Network** | Island of collaboration shared by participants that binds them together. |
| **Participant** | Enterprises, Market Segments or Individuals (rarely used) |
| **Partner** | Supplier within network. |
| **Phase** | Succession of steps (time-bound) |
| **Resources** | System, patent, human resource, skills etc. needed to perform a type of work. |
| **Role** | Role of enterprise in Network |
| **Strategy Map** | Visual representation to define the story on how Value is created for customer and yourself |
| **Value Proposition** | Proposed value from one participant to another. |
| **Value Stream** | A Value Stream defines the Activities needed to deliver a Value Proposition |
| **Value Stream (in Strategy Map)** | One of the swimlanes in Strategy Map that represents values and activities that lead to business and customer value |
| **Value Stream Map** | Visual representation of Value Streams of Value Propositions as exchanged in the Business Ecosystem |
| **Values (Activity values)** | Value created by activity |
| **Values (General)** | A measurable benefit for a recipient. Value is created, delivered, received, exchanged and captured. |
| **Values (Ghost value)** | Value that is not representing real value but needed within VMP because of constraints. Can be all type of other values. |
| **Values (Plan Values)** | Values interesting for whole network or society, not just for Customers or enterprise |
| **Values (Proposition Values)** | Value proposed by an enterprise to another participant and linked to value proposition in model. |
| **Workshop leader** | Facilitator of workshops used to create visual maps in collaboration with stakeholders. |

# Appendix B: DOCUMENTS OVERVIEW

Documents needed by De Hoeve for audit preparation and provider of said documents.

| **Documents name** | **Provider information** |
|---|---|
| Statement 1: Farmer | Farmer |
| Statement 2: climate- and alarm system | Farmer |
| Most recent report of climate- and alarm system check | Farmer |
| Statement 3: Explanation energy | Farmer |
| Most recent annual reports gas and electricity | Farmer |
| Statement 4: suppliers of farmer | Farmer |
| Statement 5: Animal data and euthanasia | Farmer |
| Overview animal data and technical data meat pigs and weaned piglets | Farmer |
| Checklist loss meat pigs/ weaned piglets | Farmer |
| Permits:<br>• Environmental permit with table animal categories and emission factors.<br>• Floor plan<br>• Signed cover page with date and place of issue | Farmer |
| Statement 6: Trader | Trader |
| Statement 7: Veterinarian | Veterinarian |
| Statement 8: Feed Supplier | Compound feed supplier |
| Composition compound feed | Compound feed supplier |
| Composition wet feed | Farmer |
| IKB Certificate, salmonella and antibiotics DDD | Producert/Verin (IKB certificate providers) |

# Appendix C: OBSERVATION DE HOEVE

10th of May 2019 – 11:00 - 13:00, De Hoeve BV office, Valkenswaard

*In this visit the audit preparation by two employees is observed and discussed.*

**Jeroen van de Burgt - Employee certification – Responsible for contact with farmers.**

**Entrance check**

Often, it's not the farmer himself, but the trader who enrolls the farmer into the KDV program. First Westfort and De Hoeve discuss whether they want this farm to join the concept, afterwards the first visit is planned to form a first impression of the firm. After this all farm data is checked, also at the entrance check this is for the whole year, like the yearly checks that will be held afterwards.

**Yearly check**

De Hoeve has different checks for the 3 different concepts, KDV, KDV+ and antibiotics free. De Hoeve is "chain director" for the "beter leven 1 ster" concept, so will also include these requirements in the audit if needed.

First De Hoeve sends a letter to the farmer with information about KDV (new developments, information on farm coaches etc.). Also, the costs of the audit are communicated in this letter: €250 general, €50 per Business Unit, €100 discount for returning documents before 1st of March. The final date to return documents is the 1st of July. The main documents that are needed are statements of the farmer, veterinarian, feed companies and the inspectors of alarm and climate systems.

The table below contains a list of the documents that are needed back from the farmers

| | |
|---|---|
| Attachment 1 | Statement farmer (farmer is asked whether he follows criteria) |
| Attachment 2 | Statement farmer on inspection climate- and alarm systems. |
| Attachment 3 | Energy statement |
| Attachment 4 | Suppliers (information veterinarian, feed supplier and trader) |
| Attachment 5 | Statement Animal data and euthanasia |
| Attachment 6 | Statement trader (for information) |
| Attachment 7 | Statement veterinarian (for information) |
| Attachment 8 | Statement feed (for information) |

Attachment 4 is used to contact suppliers, who need to sign attachment 6-8

Attachment 5 is used to check the animal numbers and technical data on the farm. This information is taken from the farm management system of the farmer. Jeroen indicates that because farmers use many different systems, the way of processing this data is different between them.

If a farmer doesn't keep to the KDV criteria, an action plan needs to be provided by the farmer and to be discussed with De Hoeve. In case of severe violations or repeated violations a discussion between De Hoeve and the farmer takes place where possible termination of participation is discussed. Another option is to let farm coaches from Westfort help the farmer.

All information on contact with the farmers is recorded in Efficy. The following information is being kept by de Hove:

| | |
|---|---|
| Contacts | Contact information of persons with whom De Hoeve is in contact |
| Companies | Contact information of farmers, veterinarians and traders |
| Actions | Actions to be taken by De Hoeve. |
| Email | Overview of all mail contact with farmer. |
| Documents | Overview of all incoming and outgoing documents of farmer. |

If all required documents, that are needed from the farmer, are received by De Hoeve, the farmer receives a confirmation and the discount will be processed if needed. The farm status is changed in Efficy, the CRM software, to show other employees the progress.

The different profiles that can be selected for farms by De Hoeve in Efficy are:

- VH1: Requests have been sent to the farmer by De Hoeve
- VH2: Not all documents are received yet
- VH2a: all documents received from farmer on time → discount
- VH3: All information received, can be processed.

Incoming documents of feed suppliers, the statement and yearly overview of feed, are often sent quickly without big problems. Feed suppliers that supply a lot of farms often send their statements in bulk. These documents are usually for with numbers for a full calendar year.

**Rosalie Schakenraad – employee certification – responsible for processing data and conclusions for farmers.**

Rosalie receives documents that have been collected before and processes it in Excel towards a "score" for the farmer. Not all data that is sent to De Hoeve is used, but important data is filtered out.

All data is put into excel by hand, since there are huge differences in the ways data is provided, mainly due to differences in management systems.

For the calculation the following data is entered in excel.

- Name and address of the farmer

- UBN (Unique Business Number) of the farm
- Type of the farm (pig fattener, pig breeder, closed farm)
- Animal numbers (*see image below that shows the way of processing, provided by De Hoeve)*

| Aantallen | Voorraad start | Aanvoer | | | Afvoer | | | Voorraad eind |
|---|---|---|---|---|---|---|---|---|
| | 1-1-2018 | Geboren | Gekocht | Interne aanvoer | Interne afvoer | Dood | Verkocht | 31-12-2018 |
| Zeugen | | | | | | | | 0 |
| Opfokzeugen | | | | | | | | 0 |
| Beren | | | | | | | | 0 |
| Biggen (zuigend) | | | | | | | | 0 |
| Biggen (gespeend) | | | | | | | | 0 |
| Vleesvarkens | | | | | | | | 0 |
| **Totaal** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |

- Farm specific animal weights (if these are not known, standard weights are used for calculations
- Feed data
    - Compound feed: Name of supplier, amount, kg phosphate, kg nitrogen, kg copper, kg zinc.
    - Wet feed: Name of supplier, amount, amount dry matter, kg phosphate, kg nitrogen.
- Energy use
    - Energy use
    - Energy restitution (if applicable)
    - Energy use natural gas, propane gas, fuel oil (if applicable)
    - Correction energy use (for example housing, other business activities like other animals or arable)
- Number of permitted animals and permitted emissions
- From the website of Verin or Producert data on antibiotics, salmonella and validity IKB certificate (De Hoeve gets authorized to access this data).
    - DDD meat pigs, sows and weaned piglets
    - Salmonella (scores are calculated towards categories and entered in the calculation tool)
    - Date of validity IKB certification

For the audit form Rosalie extracts data from the different statements, for example: the dates on the statements and the signer of the statement, the dates of the inspections of climate- and alarm system and name of inspector, the periods of entered energy use and the weaning age.

Letter with conclusions is sent to farmer, almost always an action plan is required. The farmer is responsible to provide this action plan.

Core numbers like emissions and animal numbers are also used for the yearly report of the KDV chain.

Central in the auditing of De Hoeve is the effort to have healthy animals, this lowers the loss numbers, but also increases the conversion of feed to meat. A better conversion implies lower emissions. Also, for Westfort healthier pigs are important, because of the increased amount of available meat.

**General points.**

Farmers send very different overviews with animal numbers because of different systems, most have some form of FMIS, but some work with “veesaldokaarten” (translation: cattle balance cards)

Some farmers are unable to deal with modern technology, some statements are filled out by hand and sent by mail to De Hoeve.

De Hoeve struggles with calculations with animal numbers, since numbers provided aren't always correct and vary between systems. To solve this a lot of calls, must be made to come up with the correct numbers.

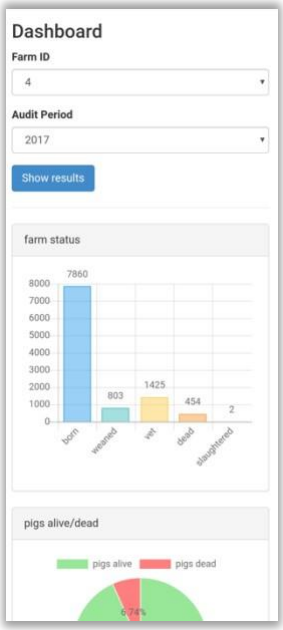
According to De Hoeve every year there are roughly 250 audits. Time per audit is difficult to say. All farms are different in size, type and concept, also small problems can take a lot of time to resolve.

# Appendix D: MINUTES OBSERVATION OF MEETING AT WESTFORT

| | | | |
|---|---|---|---|
| **Meeting name:** | The second demonstration of the UC5.3 product (UC5.3 Dashboard for Proactive Auditing) | | |
| **Meeting called by:** | UC5.3 coordinator–Ayalew Kassahun | | |
| **Date of meeting:** | April 11, 2019 | **Time:** | 11:00 – 13:00 |
| **Minutes prepared by:** | Ayalew Kassahun | **Pace:** | Kamerlingh Onneslaan 18, IJsselstein |
| **Facilitator:** | WUR | **No. of attendees:** | 11 |
| 1. Meeting objective | | | |
| **The objective of the meeting was to present the first version the dashboard to the stakeholders and 1) ask their feedback, 2) ask their acceptance of the approach, and 3) illicit more detailed and to-the-point requirements** | | | |
| 2. Attendance at meeting | | | |
| Ayalew Kassahun | WUR | Sabine Kläser | GS1 Germany |
| Mark van den Eijnden | De Hoeve | Tim Bartram | GS1 Germany |
| Jaap de Wit JR | Westfort | | |
| Frank Lunenburg | Westfort | Jan van de Pol | (WU, VDMbee) |
| Georg Schwering | EECC | Jon van der Meer | (WU, VDMbee) |
| Nicolas Becker | EECC | Mark de Langen | (WU, De Heus) |

**Agenda**

1. Short introduction (Ayalew: 10 min)
    a. Summary of what is done
    b. General aims of the meeting
2. Demonstration of the Dashboard for proactive auditing (Georg: 20 min)
3. Discussion on the Dashboard (All: 60min):
    a. Impressions and gathering improvement ideas, which includes:
        i. Who are going to use the dashboard? ○
        ii. What are their specific needs (both business and technical needs)?
        iii. What else do we need to improve our system?
4. Closing and planning next action (All: 20min)
    a. Needs for IoF2020 project reporting (user acceptance, business values realized, testimonials)
    b. Any data standardization needs
    c. What comes after April 11?




***Meeting notes***

Before the meeting 3 students of Wageningen University (Jan, Jon and Mark de Langen, all 3 doing thesis projects related to UC5.3) were given a tour of the slaughterhouse. At the start Ayalew summarized the previous meetings, in particular the meeting in November (with De Hoeve) and in December (with De Hoeve and AgroVision). He appreciated the stakeholders for providing access to data recently and introduced the three students he invited to the meeting.

**Demonstration**

Georg presented the current version of the dashboard. He explained that though EECC got access to the LeeO data recently through a webservice API, EECC was not able to use them for this demonstration (we got access to data just a few days ago and the developer responsible for implementing the access was also ill, unfortunately). The demonstration was therefore was based on the test data we got some months back.

George showed the dashboard …Upper part of dashboard shows general farm status,

(numbers of pigs born, weaned, slaughtered etc.). Auditing is done once a year, the

promise now is that auditors can have real time information.

In the current version the Auditor can select a farm (identified by an id) and the audit period. All data is aggregated in dashboard per farm and audit period. The dashboard provides farm status (born, weaned, vet, dead and slaughtered), ratios (alive, slaughtered, male/female), causes of death, etc. It also shows medication use, i.e. the total amount of medication and number of animals that received treatment. Total meat produce (in Kg) for the chosen audit period in also shown in the Dashboard. The graphics is interactive and allows selecting and unselecting a pie chart element. For further development of the dashboard EECC needs specific requirements, which must be determined during this meeting.

Deviations on death pigs can be seen in the dashboard using the information captured in the slaughterhouse. For real-time information the LeeO database connection must still to be established.

**Feed information**

Feed information (phosphorus, *etc.*) is important for environmental criteria (Mark v/d Eijnden). Currently feed information must be asked yearly by auditors and manually entered in the audit system. However, it is possible to get it automatically using EDI messaging from feed companies. Feed producers can send these messages, which is a standard procedure (Jaap). Now, the information is in farm information systems (FMS), but FMS used do not allow information transfer.

On farms different types of feed are stored on different silos. The silos are generally filled once a week by the feed supplier. Information on feed consumption (sows, piglets) can be determined if necessary. However, information on feed per farm and per year is what is needed, not per pig. How is feed supplied… as an example, for a farm with 250 sows and 2000 fattening pigs, a “bulkwagen” containing up to 5 different types of feed comes around every one-and-half week. Thus, one delivery can contain different feeds (2 to 3 mostly). For proactive auditing, a monthly information could be used, which is already 12x better than a yearly audit.

**Growth**

From sows to the nursing stable weight can be determined, also from nursing to fattening. Weight information can be interesting, but impossible for all the farms in the chain since they don't all have the equipment. Feed intake is used to calculate phosphate, nitrogen, etc. usage per year. In combination with yearly weight growth, it is possible to calculate the consumption of these minerals per animal. EECC believes it is interesting for the case study to have the growth information to implement the Growth Event. Last 12 months is a long time period, but with real time data it is an improvement compared with the older 12-month period that is used now.

EECC wants to know if it is interesting to see ratios of feed and pig growth for in between auditing (quarters might be most representative, shorter period will give incidents a big impact). But auditors want first to have the system working for the yearly audit and sees this as an expansion later. Feed is connected to growth of animals, but weight is known at slaughter, and thus very delayed in time, so conclusions might be difficult.

**KPIs for the dashboard**

Current goals of the dashboard: Reduce cost of auditing by half, realize proactive auditing (real time data for the last 12 months, or quarters). Therefore, Is the information shown on the dashboard helpful for auditor? (Ayalew). Mainly, the preparation of audit should be more efficient. So, the dashboard will mostly work in this stage, possibly not very useful during the on-site visit, since this is still about actually travelling to and looking the site. This system will reduce preparation time from 1 to 0.5day --50%. This might lower the costs of certifications. Checking data will still have to be done by the auditor, so there is a limit to the possible reduction of time.

**New requirements: benchmarking (comparing farms)**

Comparing/ranking/benchmarking can be a good next step; currently, the benchmarking of farms is made by De Hoeve. With the available data is its currently possible, for example, to compare which feed producers are better, but this information can't be publicly shared. Yes, for auditor it is interesting to compare all farms with each other.

In the "kitchen table talk" with farmers this comparative information (not public information, but for conversation with farmers only) is used to illustrate the farmer's performance. Also, differences between vets can be seen from comparative data, since they sometimes prescribe medication differently.

Next to the auditors themselves Westfort might use the information for their farmer coaches (Veterinarians that visit the farms). However, the dashboard should be mainly focused on auditing.

With the dashboard now it will be possible to proactively see farm performances when the dashboard relates to LeeO, but what would help in real auditing? Difficult to answer (Mark), because it is not in use. Preparing the numbers for audit using the Dashboard can help skip the manual preparation.

Extras might be: Animals going in and out of farm, feed going in (leads to use of phosphate etc.), energy use (gas electricity), environment information, antibiotic use, fat percentages at slaughter (Vetsys and LeeO). Currently vet information can be seen by De Hoeve already but must be typed into the excel. So, this needs to be automated

An important next step is to automate the information gathering from different systems like: Vetsys, electricity and gas company, LeeO (slaughter information, animal numbers, registration of weaning, etc.)

and feed supplies. Feed information could be obtained from AgroVision/AgriSys, but it is not automated. Information coming from different systems is now translated into reports by De Hoeve. After that a report is sent to the farmer beforehand for preparation of audit. Outlier detection in dashboard is useful for report shared with farmers. If information from different systems can be automatically captured, the dashboard can be interesting for Westfort farm couches too.

It's important to describe the current process of preparation at the auditor to see how the dashboard decreases preparation time. This fits well with the thesis assignment of Jan. **Jan will observe and document the current auditing process (AS-IS) and propose how the Dashboard can be used (TO-BE).** He will also propose how the dashboard can be improved.

For EECC the type of information the auditor needs are important: real time data, reports, comparative numbers. Auditor wants to skip the step of entering all the data in their own system, not especially interested in real time data before the basic system works. Efficiency for the auditor is not reducing 5 minutes in the audit but reducing the preparation time and collection of all the data from different systems and actors (Vetsys, feed, *etc.*). Integration with feed company information fits the thesis assignment of **Mark (de Langen). Mark will inquire which information is available and how it can be integrated with the Dashboard system.** In addition, **Mark v/d Eijnden and Ayalew will visit De Heus** to make agreement in obtaining feed data automatically.

Energy information can be captured with a simple web interface (EECC). It is possible and might be needed to have farmers enter information in the system via for example a web application. Currently farmers are asked 10x before they respond.

Medication data is now captured by farmers in the LeeO system. Vets use however Vetsys? Comparing these two data sets is important to detect irregularities. **Mark v/d eijnden and Ayalew will visit VetSys office.**

**Value delivering for Westfort.**

Vets of Westfort mainly visit the farms when there is a problem. Proactive auditing is useful for Westfort because its vets mainly visit farms where there are problems. These vets are known as farm coaches and are different from the vets in the production process.

Westfort delivers to retail a certificate with the meat, reliable auditing is therefore important for Westfort. The dashboard can be valuable for Westfort when different information sources (VetSys and Feed) is integrated. However, most of the information demonstrated now in the dashboard is available to Westfort.

**In conclusion**

Now linking different systems is most important, first feed data, then Vetsys and finally electricity and gas consumption. De Hoeve BV will help with introducing Vetsys in Houten to the project; Ayalew will help bring in De Heus to the use case.

# Appendix E: COMMENTS DE HOEVE DASHBOARD DESIGN

*The following is an email with comments on the dashboard design from De Hoeve. The original Dutch email is in the blue text, an English translation and commentary (by Ayalew Kassahun) in black and italic. The sheets that are referred to on the slides correspond with the graphs that can be seen in figure 10 and 11.*

Beste Jan,

*-> Dear Jan,*

Dank voor de schets van het dashboard voor realtime auditing. Het ziet er goed uit!

*-> Thanks for the draft design; it looks good*

Vanochtend heb ik het besproken met Marion en Mark. Naar aanleiding daarvan bijgaand onze opmerkingen:

*-> I talked with Marion and Mark this morning; the following is based on that conversation*

Je hebt Rosalie gevraagd om de millimeters antibiotica om te rekenen naar DDD. Dit omrekenen doen wij niet zelf maar deze kunnen wij online inzien. De DDD weergave per varkenshouder halen wij van Infovarken of Varkenspost. We kunnen deze voor de pilot handmatig aanleveren in excel van een x-aantal varkenshouders. Ik heb in elk geval aan Infovarken gevraagd op welke manier wij kunnen koppelen met de database.

*-> You (Jan) asked the Rosalie about the conversation of milliliter antibiotics to DDD. We don't convert them but look them up online. We fetch the DDD data per farmer from Infovarken or Varkenspost (which are websites).* ***We can get this information for you manually in Excel for x-number of farmers.*** *At any rate I have asked Infovarken (i.e VetSys) on how to integrate with [our] database*

Simpele website voor het doorgeven van meterstanden. Dat lijkt ons een prima idee. Echter zal de varkenshouder dit niet snel maandelijks doen. Wellicht kan door het inzicht wat de varkenshouder hierdoor krijgt, hij toch overtuigd worden om het maandelijks te doen. We hoeven hiervoor geen aparte website op te tuigen, we kunnen dit binnen MijnKDV oppakken. MijnKDV is het portaal waarin de varkenshouder zijn slachtinformatie kan inzien en kan vergelijken met KDV-gemiddelden

*-> Simple website for submitting meter readings [of Gas and Electricity] seems to us a fine idea. However, the farmers wouldn't do this monthly. But It is also possible that because of the insight the farmers will get from such data they may [later] be convinced to fill in the meter reading every month. We do not need to create a separate website though; we could do this in My KDV—****My KDV is a portal wherein the farmer can look at the slaughter data about his pigs and compare them with KDV average*** *(Apparently the farmers do this already. We need to clarify what is new in the dashboard and if the auditors have already access to the farmers raw info.)*

Sheet "Overzicht alle boerderijen": (*Sheet "Overview all farms" – slide 4*)

- Er staat een titel "Loss". Bedoel je hiermee het aantal sterfgevallen?

  *-> There is "loss" in the title. Do you mean here death? (In a telephone conversation we discussed the large rate of loss. Edwin will look at why we have such a big number of Death events. He will be using the Query interface of EPCAT)*

De DDD die er staat zegt ons niets. Pas als de varkenscategorie erbij staat zegt het pas iets. Kun je dit aanpassen?

*-> The DDD that is shown there is for us means nothing to us. Only when the pig category is there as well, can you change this?*

Sheet "Overzicht 1 boerderij": (*Sheet "Overview 1 farm" – slide 5*)

- Prima *(fine)*

Sheet "4.1.2 Speenleeftijd": (*Sheet "4.1.2 Weaning age" – slide 8*)

- Prima *(fine)*

Sheet "4.3.3 Uitval en euthanasie (*Sheet "4.3.3 Loss and euthanasia" – slide 9*)

- Overbodig. Met dit overzicht doen we niks, dus mag weggelaten worden.

  *-> Superfluous/redundant. We do nothing with this overview, it can be left out. (In a telephone conversation I pointed this and other points of the criteria. Edwin noted this and other discrepancies between his response—based on input from Mark and Marion and what is in the criteria)*

Sheet "4.3.4 Antibiotica": (*Sheet "4.3.4 Antibiotics use" – slide 10*)

- Wij willen naast het jaarlijkse gebruik graag een overzicht zien van het antibiotica verbruik van de laatste maand ten opzichte van de maand ervoor. Dus als het meerverbruik tov de maand ervoor boven een bepaalde norm komt willen we hiervan een melding ontvangen. Is dat mogelijk?

  *-> Besides the yearly use we also want to see an overview of the use of antibiotics of the last month in comparison to the month before.* ***Therefore, if the use of more antibiotics in comparison of the previous month (i.e. if the difference between the two consecutive months) is above a certain standard (see table below); we want to get a signal about it. Is that possible?***

  Zie bijgaand overzicht met de normen: (*see the associated overview of standards*)

| **Δ DDD diercategorie** (*Δ DDD animal category*) **Risico factor (***Risk factor***)** | **Zeugen** (*Sows*) | **Gespeende biggen** (*Weaned piglets*) | **Vleesvarkens** (*fattening pigs*) |
|---|---|---|---|
| **Zeer lag** (*very low*) | < 0,1 | < 0,5 | < 0,1 |
| **Laag (***low*) | < 0,25 | < 1,0 | < 0,25 |
| **Twijfel** (*uncertain*) | < 0,5 | < 2,0 | < 0,5 |
| **Hoog** (*high*) | < 1,0 | < 3,0 | < 1,0 |
| **Zeer hoog** (*very high*) | > 1,0 | > 3,0 | > 1,0 |

Sheet “4.3.5 Slachtbevindingen”: (*Sheet “4.3.5 Findings when pigs are slaughtered” – slide 11*)

- De normen die zichtbaar zijn, zijn verouderd. Wij hanteren de volgende normen:

  *-> The standards shown are old. We follow the following standards. (In a telephone conversation I showed Edwin that we picked the values from the standard, which is the KDV criteria. He wasn’t apparently unaware and will look into it.)*

  Pleuritis 10% (*Pleuritis 10%*)

  Pneumonie 3% (*Pneumonia 3%*)

  Leverafwijkingen 3,5% (*Liver disorders 3.5%*)

Sheet “4.4.1 Energie”: (*Sheet “4.4.1 Energy” – slide 12*)

- Prima. (*Fine*)

Sheet “4.4.2-4.4.5 Phosphate, nitrogen, copper & zinc (4.4.6 Ammonia) (*Sheet “4.4.2-4.4.5 Phosphate, nitrogen, copper & zinc (4.4.6 Ammonia)” – slide 13*)

- Prima (*Fine*)
- Ammonia is niet nodig in het dashboard

  *-> Ammonia is not required in the dashboard—in a phone conversation Edwin suggested this could be a statement/document a farmer has to submit. He will look into this and other differences.*

Sheet “4.4.2 Leefruimte, 4.3.1. Vaste dierenarts, 4.3.2. Salomonella”:

(*Sheet “4.4.2 Living space, 4.3.1 Regular vet, 4.3.2 Salmonella” – slide 14*)

- We begrijpen niet wat er met deze sheet bedoeld wordt

  *-> We don’t understand what is meant by this sheet. (In a telephone conversation Edwin explained that this is not a value but a statement/document a farmer has to submit)*

Ik hoop je hiermee voldoende te hebben geïnformeerd en zie je reactie tegemoet. Mocht je vragen hebben dat hoor ik dat graag.

*-> With the above I hope I have informed you with sufficient detail and look forward to receiving your reactions. If you have questions, please let me know.*

Met vriendelijke groet,

Edwin Velema

# Appendix F: MOCK-UP DASHBOARD – EXPANDED OVERVIEW SINGLE FARM

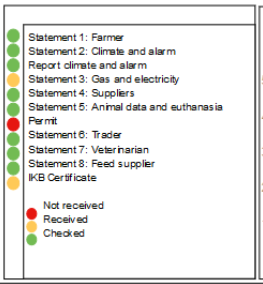
All farms | Overview farm | Visual farm

Name: Jan Janssen
Adress: Dorpsstraat 1
Zip code: 6706HH Wagengen
Phone: 06-12345678
UBN: **1234567** (135421 135423 )
Type: **Closed farm**
Trader: Piet de Jong
Feed: De Heus
Vet: Klaas Vaak

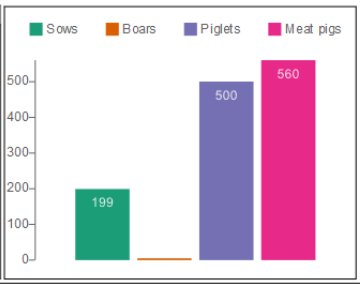
◉ All criteria
○ recent data

| KDV requiremenm | Past 12 months | Past 3 months | Last audit year |
|---|---|---|---|
| 4.0: General | | | |
| 4.0.1 Channeling; identification and traceability | - | - | ☑ |
| 4.0.2 Registration | - | - | ☑ |
| 4.0.3 Business expansion | - | - | ☑ |
| 4.0.4 Animal health | - | - | ☑ |
| 4.0.5 Calamities plan | - | - | ☑ |
| 4.0.6 Certification | - | - | ☑ |
| 4.1: Mother and Piglet | | | |
| 4.1.1 Nest-Building materials | - | - | ☑ |
| 4.1.2 Weaning age | ☑ | ☑ | ☑ |
| 4.1.3 Clipping teeth | - | - | ☑ |
| 4.1.4 Castration | - | - | ☑ |
| 4.1.5 Long tails | - | - | ☑ |
| 4.1.6 Sick bay | - | - | ☑ |
| 4.2: Living environment | | | |
| 4.2.1 Fixed groups | - | - | ☑ |
| 4.2.2 Living space | - | - | ☑ |
| 4.2.3 Day/night rhythm | - | - | ☑ |
| 4.2.4 Climate in the sty | - | - | ☑ |
| 4.2.5 High quality feed | - | - | ☑ |
| 4.2.6 Pest repellant and control | - | - | ☑ |
| 4.3:Health | | | |
| 4.3.1 Regular vet | - | - | ☑ |
| 4.3.2 Salmonella | - | - | ☑ |
| 4.3.3 Loss and euthanasia | ☑ | ☐ | ☑ |
| 4.3.4 Antibiotics use | ☑ | ☑ | ☑ |
| 4.3.5 Findings when pigs are slaughtered | ☑ | ☑ | ☑ |
| 4.3.6 Blood samples | - | - | ☑ |
| 4.4: Environment | | | |
| 4.4.1 Energy | ☑ | ☑ | ☑ |
| 4.4.2 Phosphate | ☑ | ☑ | ☑ |
| 4.4.3 Nitrogen | ☑ | ☑ | ☑ |
| 4.4.4 Copper | ☑ | ☐ | ☑ |
| 4.4.5 Zinc | ☑ | ☑ | ☑ |
| 4.4.6 Ammonia | - | - | ☑ |
| 4.5: Animal treatment | | | |
| 4.5.1 Transport | - | - | ☑ |
| 4.5.2 Delivery | - | - | ☑ |
| 4.5.3 Training | - | - | ☑ |
| 4.5.4 Supervision | - | - | ☑ |

Documents received




Animal numbers



# Appendix G: OVERVIEW OF INPUT VALUES AND FORMULAS

| **Without dashboard** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Value name** | **Value type** | **Unit** | **Aggregated to** | **Aggregated from** | **Value formula** | **Linked to ...** | **In which BM** | **Value input** | **Source of value/formula or explanation** |
| assessment time | Activity value | days | audit prep time | | | Performance assessment | De Hoeve | 1 | visit De Hoeve (educated guess based on average) |
| audit compensation | Value proposition | € | audit revenue | | | Certification business | Farmers, De Hoeve | 250 | visit De Hoeve |
| audit prep time | Value proposition | days | response time, preparation time | assessment time, processing time | assessment time + processing time | Certification | De Hoeve, farmers | | |
| audit revenue | My proposition | € | | Number of audits, audit compensation | number of audits * audit compensation | Revenue | De Hoeve | | |
| certification | Value proposition | certificate | meat quality | | | certification | De Hoeve, farmers | 1 | Binary value |
| data collection time | Value proposition | days | response time | | | Certification business | Farmers, De Hoeve | 60 | visit De Hoeve |
| emission reduction | Plan value | % | | response time old and new | -0.025*response time new + 0.025*response time old | | | | Assumption |
| farmer revenue per week | My proposition | € | | pig price for farmers, number of pigs | pig price for farmers * number of pigs | Revenue | Farmers | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| KDV label premium | Value proposition | € | meat price for retail | | | KDV label | De Hoeve, Westfort | 1 | Assumption |
| loss percentage | Plan value | % | number of pigs | response time | 0.001*response time +1.65 | | | | Assumption |
| meat price for retail | Value proposition | € /kg | meat revenue | pig price for farmer per kg, slaughter premium, KDV label premium | pig price...per kg+ slaughter premium+ KDV premium | Meat business | Westfort | | |
| meat quality | Value proposition | % | pig price for farmers | certification, response time | (certification*110)-response time * 0.0408 | Pigs | Farmers, Westfort | | Assumption |
| meat revenue | My proposition | €/ week | | meat price for retail, meat weight | meat price for retail * meat weight | Revenue | Westfort | | |
| meat weight | Value proposition | kg/ week | meat revenue | number of pigs, pig weight | pig weight*number of pigs | Meat | Westfort | | |
| number of audits | Value proposition | audits / year | audit revenue | number of farms | =number of farms | Certification business | Farmers, De Hoeve | | |
| number of farms | Value proposition | farms | number of audits, number of piglets | | | Certification business | Farmers, De Hoeve | 316 | Yearly report KDV 2017 |
| number of piglets | Activity value | piglets / week | number of pigs | number of farms | number of farms * 100 | Production | Farmers | 31600 | Assumption |
| number of pigs | Value proposition | pigs/ week | farmer revenue, meat weight | number of piglets, loss percentage | number of piglets * (1-loss percentage)/100 | Pigs | Farmers, Westfort | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| pig price for farmer per kg | Value proposition | € | meat price for retail | pig price for farmers, pig weight | pig price for farmers/pig weight | Slaughtering Business | Westfort, Farmers | | |
| pig price for farmers | Value proposition | €/pig | farmer revenue, pig price for farmers per kg | meat quality | meat quality/100*311.87 | Slaughtering Business | Westfort, Farmers | | 3.25*96.96=311.87<br>Prices from Veluw (2017) |
| pig weight | Value proposition | kg/pig | pig price for farmers per kg, meat weight | | | Pigs | Farmers, Westfort | 95.96 | Average weight calculated from CBS 2017 data (CBS, 2019) |
| preparation time | My proposition | days | | audit prep time | =audit prep time | Time investment | De Hoeve | | |
| processing time | Activity value | days | audit prep time | | | Organizing documents | De Hoeve | 2 | Assumption |
| response time | Value proposition | days | meat quality, loss percentage, emission reduction | audit prep time, data collection time | audit prep time + data collection time +182 | Certification | De Hoeve, Farmers | | |
| slaughter premium | Value proposition | €/kg | meat price for retail | slaughter value | | | Westfort | | |
| slaughter value | Activity value | €/kg | slaughter premium | | | Slaughtering | Westfort | 1 | Assumption |
| | | | | | | | | | |
| **With dashboard (changes (marked with *) and new values only)** | | | | | | | | | |
| dashboard | Activity value | dashboard | response time reduction | | | Developing | EECC | 1 | Binary value |
| dashboard costs | My proposition | €/year | | license fee, number of licenses | license fee * number of licenses | Revenue | EECC | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| dashboard revenue | My proposition | €/year | | license fee, number of licenses | license fee * number of licenses | Dashboard costs | De Hoeve | | |
| data collection time | *REMOVED* | | | | | | | | |
| license fee | Value proposition | €/year | dashboard revenue, dashboard costs | | | Dashboard compensation | De Hoeve, EECC | 10 | Assumption |
| number of licenses | Value proposition | licenses | dashboard revenue, dashboard costs | number of audits | = number of audits | Dashboard compensation | De Hoeve, EECC | | |
| processing time * | Activity value | days | audit prep time | | | Organizing documents | De Hoeve | 1 | Assumption |
| response time reduction (low response time) | Value proposition | days | response time | dashboard | (91+60) *dashboard | Dashboard | EECC, De Hoeve | | 0.25 year+ old data collection time |
| response time reduction (very low response time) | Value proposition | days | response time | dashboard | (182+60) *dashboard | Dashboard | EECC, De Hoeve | | 0.5 year+ old data collection time |
| response time * | Value proposition | days | meat quality, loss percentage, emission reduction | response time (without dashboard), response time reduction | Response time-response time reduction | Certification | De Hoeve, Farmers | | |

# Appendix H: MEETING NOTES VDMBEE VISITS

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|---|---|
| Date and time | 03-04-2019, 17:30-18:30 |
| Location | VDMBee, Schietboom 2 Veenendaal |
| Attendees | Henk de Man, Ayalew Kasssahun, Jon van der Meer, Jan van de Pol |
| Goal: | Introduction to VDMBee, VMP and making agreements |

*At the beginning of this meeting attendees are introduced to each other and the context of the case and the reason for using VDMBee is explained. Henk demonstrates VMP and explains how it can be used in this case. This meeting is also used to discuss the financial aspect of using the tool.*

Two theses will be written, one by Jon that evaluates VMP and compares VMP with the Osterwalder Business Model Canvas using the KDV case as input and Jan will write about the case and use VMP for results. After discussing the case Henk indicates that he thinks the case is very fit to model using VMP.

**Planning:**

Henk believes that modeling the case will not be the biggest time investment, the modeling itself can be done within two weeks. The biggest time investment will be the thinking process of what to model and how the innovation changes interactions. In total Henk estimates the time investment would be 4 weeks of 40 hours.

During the process Jan and Jon will build the model in steps, based on the training videos as provided by Henk.

Henk urges to often export the .vpk files to be sure that going back is possible when things go wrong.

In the meeting it is concluded that Jon can work on summarizing the different roles in VMP and propose a new interface

Henk quickly introduces the first videos and urges Jan and Jon to start watching the first 4 and apply the last 2 on the case before planning a next meeting.

- Video 1 (in the workshop leader videos): Background of VMP and introduction of important terms
- Video 2: getting started with the application
- Video 3: First step in Discovery phase and the context of the model
- Video 4: Discovery of Ecosystem.

If there is time to watch video 5 this can also be useful.

Henk indicates that it is important to keep track of assumptions that are made when modeling, this can be done in the context.

Whenever we want to meet with Henk, we should send a message a few days in advance.

**General**

Henk will provide us with papers from Ben Roelens and a thesis of the Ghent University as well as example models.

If something crashes in the program, Henk asks for screen recordings and .vpk file so the Indian team can fix the tool.

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| | |
|---|---|
| Date and time | 01-05-2019, 17:30-18:30 |
| Location | VDMBee, Schietboom 2 Veenendaal |
| Attendees | Henk de Man, Jon van der Meer, Jan van de Pol |
| Goal: | Introduction to VDMBee, VMP and making agreements |

Purpose of the meeting is to discuss the progress of building the model and to see where improvements can be made. Also questions about the functioning of the tool will be asked.

**Application of the tool**
Context is made by Jan and Jon, the result is shown to Henk, but discussion is not really needed. Henk stresses once again the importance of keeping model assumptions in the context file.

Jon and Jan made a start with the Ecosystem map in VMP but found it difficult to implement KDV in the model since it is a cooperation of other companies in the chain. Henk thinks it is correct to model KDV as a separate enterprise, but currently the interests of KDV as a company are unclear in the Ecosystem Map. For KDV it needs to be clear what values created for KDV and given to the cooperatives.

Henk notes that he doesn't see a transport company in the ecosystem map, but this is a minor actor in the chain, so it is purposely left out of the model

Breeders and Farmers should be modeled as market segments, unless want to model all the breeders separately. This also applies to restaurants, supermarkets etc. because we don't focus on these actors.

Some values in the model are currently missing. Currently it is unclear how De Hoeve creates value for itself. It is currently unknown who pays De Hoeve for its time and work for certification. Especially values between KDV and De Hoeve must be established. A way of mapping value between KDV and LeeO might be the number of licenses KDV creates for LeeO. For Westfort and farmers value must be given back as well. Westfort for example gives advice and a slaughtering service to farmers. It is important to know how much advice is given and whether it is linked to the number of pigs the farms provide to Westfort.

Henk indicates that it is important to think in advance if the enterprises in this ecosystem are also in other ecosystems, because than it is important to only look at their characteristics and values in **this** ecosystem.

It is important for Jan and Jon to know what the goal is of the "improvement" in phase 2 and whether the current model will be able to capture that. J&J say De Hoeve wants to be more cost efficient, but Henk misses the cost part of De Hoeve in the model.

Henk believes the coloring in the Ecosystem map is not done correctly, business networks should have the same color, this makes modeling easier later.

It's important to already think of pains and gains of value propositions in the model. It is can already be added in the documentation to help later.

**UC4.3**
Henk will anonymize the confidential information in the use case before it can be sent to Jon. Henk hopes the model can also be used by VDMBee with anonymized data.

**Business cube**
For the theses it is important to understand the underlying principles of VMP and VDML.

Jan and Jon ask about the cube that is shown in VDMBee and how it is related to Lindgren's business cube. Henk explains that the model that will be built will be a VDML model, but to communicate this model a cube is used. The standard VDML is extended in VMP with clustering business models and plan context.

Jan and Jon must finalize the Ecosystem network and start the value mapping. When problems are encountered a new meeting with Henk can be made. Value Streams mapping should be started together with Henk.

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| | |
|---|---|
| Date and time | 20-05-2019, 17:30-18:30 |
| Location | VDMBee, Schietboom 2 Veenendaal |
| Attendees | Henk de Man, Jon van der Meer, Jan van de Pol |
| Goal: | Progress discussion after mapping ecosystem and discovery Value Streams |

Jan and Jon show that the ecosystem is updated and have started with mapping the ecosystem

Henk shows how to add values on value propositions in the ecosystem via the "Add value" option. These values can then be seen in VMP in the structured business models. Henk addresses that what is now called payment in the ecosystem could better be called business.

Jan and Jon indicate to be confused by the concept of value streams, when they are needed and to what level of detail they need to be. Henk shows that value streams are not always necessary but are useful when values cannot be attached to a value proposition but an activity it is useful. Also, it shows competencies that are useful to include in the model. Henk indicates that value streams need to be made for the parties we are interested in.

Strategy maps are going to help in understanding the creation of values. For now, it is important to only enter things that we are sure of, because in prototyping there is still room for improvements and changes. Henk shows how to link values that come from value propositions into the strategy map. Values in the customer lane are values that are created by the BM owning enterprise. For business values it is important to think about importance for the BM owning enterprise, this can also be mapped from the ecosystem. Henk advices to start mapping values in the ecosystem first.

*Henk gives a demonstration of the strategy map and how it helps understanding of values*

In the strategy map the different lanes represent different levels of value. In the business lane high level values for the company are shown. The consumer lane represents values important for consumers of the company. Value streams shows the internal values that are important for the process and the competency lane contains competencies that lead to these values.

For De Hoeve that offers a service to farmers, the high rate of mortality is a measurable value that changes with the new implementation of the dashboard. Also, up-to-dateness of information might be a value in the map. Successful certificate rate might be a nice plan value, because it increases profit for the whole chain, not just one company. In plan values overall investment might be included as well.

Strategy map tells a story, so explaining the map should explain the "story" of value creation.

**Planning**

Henk indicates that it might have been better to start with the To Be phase, however the way we work now might also work.

To finish the discovery stage, we must make 3 strategy maps, for the values streams we should include what we really need only.

Mapping of values can be done via ecosystem or value creation step, that's up to our preference.

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| | |
|---|---|
| Date and time | 02-07-2019, 17:30-18:30 |
| Location | VDMBee, Schietboom 2 Veenendaal |
| Attendees | Henk de Man, Jon van der Meer, Jan van de Pol |
| Goal: | Progress discussion after finished prototype for as is in new attempt |

Jan and Jon demonstrate a license problem when creating an additional BMC. When adding a new BMC object, the program gives a popup with a statement about having a community license. The problem cannot be fixed today but will be sent as soon as possible to India to get it fixed. No problem because no urgency from Jan & Jon. It is probably a licensing mistake; Henk thinks he knows where to fix it.

*Jan and Jon show the new and improved As-Is model to Henk and start with explaining Ecosystem map*

Henk advises to model the farmer as one farmer and multiply with the number of farmers when giving values to De Hoeve or Westfort. Jan and Jon will check if this is possible with the current model. Generally speaking, Henk agrees with starting over and understands what we have been doing.

*Jan and Jon show the new Business Models and explain some of the values in it.*

*Jan and Jon show the strategy maps*

Henk misses the quality of meat in the strategy map of Westfort, Jan and Jon show that this quality is used in the price for farmers that comes back to Westfort.

Henk also introduces the possibility to include customer satisfaction. Jan and Jon will check if this is implementable in our case.

***On planning for to-be phase***

Henk also thinks the payback time of the investment should be included in the model. Also licensing costs like a subscription should be in there in the To-Be phases. It's difficult to know the exact costs of the development and the usage costs of the dashboard, because it's fully or partially financed by the EU. This might actually help us, because this makes the model easier.

Important assumptions that are to be made in the to-be phase are keeping the number of farmers and piglets the same for comparison reasons. Also, the unlimited sales as are now in the model, is an important assumption that should be mentioned and explained in the thesis.

***Dashboard***

After the To-Be phase a dashboard can be made within VMP. Henk suggests including different scenarios in the dashboard. VMP is versatile in the dashboard functionality, with possibilities to group dashboards.

**Planning**

It is agreed on to keep contact when problems arise and discuss the possible improvements of VMP with Ayalew present in a final meeting.