MASTER THESIS

Possible critical factors for the implementation of the Infection Manager in healthcare

F.E. Veldhuis

Supervisors:
Dr. J.E.W.C. van Gemert – Pijnen
Dr. J. Karreman

University of Twente
Health Science
School of Management and Governance

UNIVERSITY OF TWENTE.

2012

Title:

Possible critical Possible critical factors for the implementation of the Infection Manager in healthcare

Name:	F.E. Veldhuis
Student number	s0103268
Supervisors	Dr. J.E.W.C. van Gemert – Pijnen Dr. J. Karreman
Daily supervisors	M.J. Wentzel, MSc A.H.M. van Limburg, MSc
Institute	University of Twente Health Sciences School of Management and Governance
Postal address	P.O. Box 271 7500 AE Enschede The Netherlands
Date	2 November, 2012

Abstract

Purpose: Antibiotics have become one of the most important treatments of sometimes life-threatening infectious diseases. However, excessive use of antibiotics has led to (multi-) resistant bacteria. With the development of the Infection Manager – a digital platform – where stakeholders can provide and collect information about infection control and infection prevention. Until now, only a small group of stakeholders were involved in development of the Infection Manager. To make sure the Infection Manager will be implemented successfully, it is essential to determine who all the stakeholders are, what their needs are, and, following from the needs, what the possible critical factors are for the implementation of the Infection Manager. The objective of this study is to develop a checklist to identify possible critical factors for the Implementation of the Infection Manager.

Method: To come to a checklist with possible critical factors, first a literature study was done to investigate which method fits best for analysing stakeholders in eHealth. Subsequently, a questionnaire to identify possible stakeholders of the Infection Manager was sent to stakeholders who were classified as 'definitive' stakeholders – based on power, legitimacy and urgency – after a brainstorm session. Thereafter, semi-structured interviews with six possible stakeholders were held to investigate the stakeholders' needs in relation to the Infection Manager. The answers of the interviews were used to determine the values that drive the needs of the stakeholders. By filling in the needs and values into a business model canvas, possible critical factors for the implementation of the Infection Manager were identified, which led to a checklist with possible critical factors for the implementation of the Infection Manager.

Results: The literature study showed that there was as yet no method that fulfilled the criteria for analysing stakeholders for the Infection Manager. Accordingly, a new, combined method for stakeholder analysis was developed. The outcomes of the questionnaire and the interviews were used to investigate the stakeholders needs and requirements for the implementation of the Infection Manager. From these needs and requirements the covering values – 'functionality', 'compatibility', 'security', 'usability', and 'attitude' – were determined. By translating these values and needs into the business model canvas, the possible critical factors for implementation could be investigated.

Conclusion: The possible critical factors for the implementation of the Infection Manager could be derived from all parts of the business model canvas. In case of the Infection Manager the most critical factors for implementation can be found in the block that represents the 'key activity' of the business model canvas.

Preface

This master thesis is the final project in obtaining a Master of Science degree in Health Sciences, track Health Technology Assessment, of the University of Twente. This study is performed as part of the EurSafety Health-net project, to create a checklist for possible critical factors for the implementation of the Infection Manager.

First of all I would like to thank my supervisors dr. Lisette van Gemert-Pijnen and dr. Joyce Karreman of the University of Twente for their enthusiasm and helpful advices. Special thanks go to my 'daily' supervisors Jobke Wentzel, MSc, and Maarten van Limburg, MSc, for their support and our conversations which were very helpful in guiding me through this study. Furthermore, I would like to thank all participants of the questionnaire and especially the participants of the interviews. Finally I would like to thank my family and friends for their support during my studies.

Table of contents

1 Introduction

Over the past three decades, antibiotics have become one of the most important treatments of sometimes life-threatening infectious diseases (World Health Organization [WHO], 2012). However, due to an excessive use of antibiotics, chromosomal changes have occurred in bacteria, which has led to bacterial resistance (Neu, 1992). Annually, more than 400.000 European citizens have to deal with infections caused by resistant microorganisms. At least 25.000 people per year die of antimicrobial resistance in the European Union, Norway and Iceland (Poudelet, 2010).

Antibiotic resistance is the resistance of a microorganism caused by the adaptation to an antibiotic to which it was previously sensitive. Because of this adaptation the resistant microorganisms are able to withstand an attack by an antibiotic, and many infectious diseases become difficult to treat, which is a problem in, for example, hospitals, nursing homes, and general practices (WHO, 2012; Academisch Ziekenhuis Maastricht [AZM], 2010). The microorganisms persist and may spread to other people (WHO, 2012). Since the same classes of antibiotics are used in humans and animals, the concerns about transmitting drug-resistant pathogens to humans via the food chain have increased (WHO, 2007). The Health Council of the Netherlands (Gezondheidsraad) stated in a report in 2011 that there are three groups of resistant bacteria that are most problematic for public health which are possibly related to the usage of antibiotics in livestock (Health Council of the Netherlands, 2011).

To confine the antibiotic resistance, the World Health Organization stated in a report in 2012 that collaboration between governments and non-governmental organizations is necessary to establish networks for a better surveillance of antibiotic resistance, the use of antibiotics, and to provide information on the optimal containment of resistance (WHO, 2012). This may be done via computer software, as Fishman (2006) already showed that computer-assisted software programs may be useful in implementing programs that incorporate multiple strategies and that collaborate among various specialties within a given healthcare institution to reduce the antimicrobial resistance (Fishman, 2006).

One of the initiatives of the European Union and the regional governments is the EurSafety Health-net project. The main goal of this project is to increase patients' safety by infection management in border regions of the Netherlands and Germany. The definition used in this thesis of infection management will be the informed co-operation of parties (stakeholders) in decreasing the dangers caused by (multi-) resistant micro-organisms both in healthcare institutions and in society as a whole. Since it is possible for people to profit from healthcare in other countries, it is important to reduce the differences in usage of antibiotics between different countries. One of the steps taken now to decrease differences in usage of antibiotics in the Netherlands and Germany, was to create a

cross border network with as many people involved in infection management as possible, with an internet platform as a basis. This platform is called the Infection Manager. It can function as a place where healthcare professionals and other people interested in infection management can collect and exchange information about infections and infection prevention. This way, the knowledge of healthcare professionals and the safety of patients can be improved. The dashboard of the Infection Manager, as it is currently available on the internet, is shown in Figure 1.

Figure 1: *Dashboard of the Infection Manager (Infection Manager, 2012)*

1.1 Problem statement

To improve the quality of healthcare in different countries and to increase patients' safety, it is necessary that various stakeholders co-operate and exchange knowledge in the field of infection control and infection prevention. Literature shows that a positive attitude of users towards a new technology, and the adaptation and acceptation by its users, are most important factors for a successful implementation (Broens 2007; Hu, Chau, Liu Sheng & Yan Tam, 1999). Regarding the Infection Manager, until now, only a small group of stakeholders were involved in its development. To make sure the Infection Manager will be accepted by users, the needs of all users have to be explored. Hence, it is essential for a successful implementation to determine who all the stakeholders are, what their needs are, and, following from the needs, what the critical factors or critical moments are for the implementation of the Infection Manager.

1.2 Research aim

The objective of this thesis is to develop a checklist for the EurSafety Health-net project, to identify possible critical factors for a successful implementation of the Infection Manager. The checklist will be part of an implementation guideline for the Infection Manager.

1.3 Research relevance

The results of this thesis can be useful for the implementation of the Infection Manager, but they can also be helpful for the implementation of other digital portals, as they will specify what possible critical factors for implementing a new technology are. The checklist presented in this thesis will be based on findings from the Netherlands only. These could in a later stadium be related to findings from Germany, for the most profitable implementation of the Infection Manager in the cross border area.

1.4 Research questions

The main research question of this thesis is: *What are the possible critical factors for the implementation of the Infection Manager in healthcare?*

In order to answer this question, the following sub-questions will be addressed in this thesis:

- *Which method of stakeholder analysis can be used for the Infection Manager?*
- *Which stakeholders are involved in infection management in the Netherlands?*
- *What are the stakeholders' needs in relation to infection management?*
- *What values drive these needs?*

1.5 Structure of this thesis

The following chapter contains background information about the use of antibiotics in humans and animals. Chapter three describes the methods used for the literature search and field research. This chapter is followed by the theoretical framework of this research. The fifth chapter contains the results of the stakeholder identification and results from the questionnaire and interviews, which give insights into to the stakeholders' needs and the values of those needs. The sixth chapter gives an answer on the main questions, as posed above. It is followed by the conclusion, discussion and recommendations for further research.

2 Background

This part of the thesis contains a brief overview of general information about the usage of antibiotics. As written in the introduction, antimicrobial resistance occurs in humans as well as animals. Hence, this chapter is divided into two main parts:

- The use of antibiotics in humans
- The use of antibiotics in animals

2.1 The use of antibiotics in humans

Compared to other European countries, the antimicrobial resistance rate is one of the lowest in the Netherlands. The mean percentage of Methicillin-resistant Staphylococcus Aureus (MRSA) in Europe is about 20-25%, while it is only 1-2% in the Netherlands. This difference can be explained by the restraint of using antibiotics in the Netherlands (Roede & Post, 2010). Results from a study of the Foundation for Pharmaceutical Statistics (Stichting Farmaceutische Kengetallen) in 2011 showed that about 4.3 million inhabitants of the Netherlands use antibiotics at least once a year (Stichting Farmaceutische Kengetallen, 2012). In Figure 2, an overview is given of the Defined Daily Dose (DDD) of antibiotics in the Netherlands per region per 1000 persons.

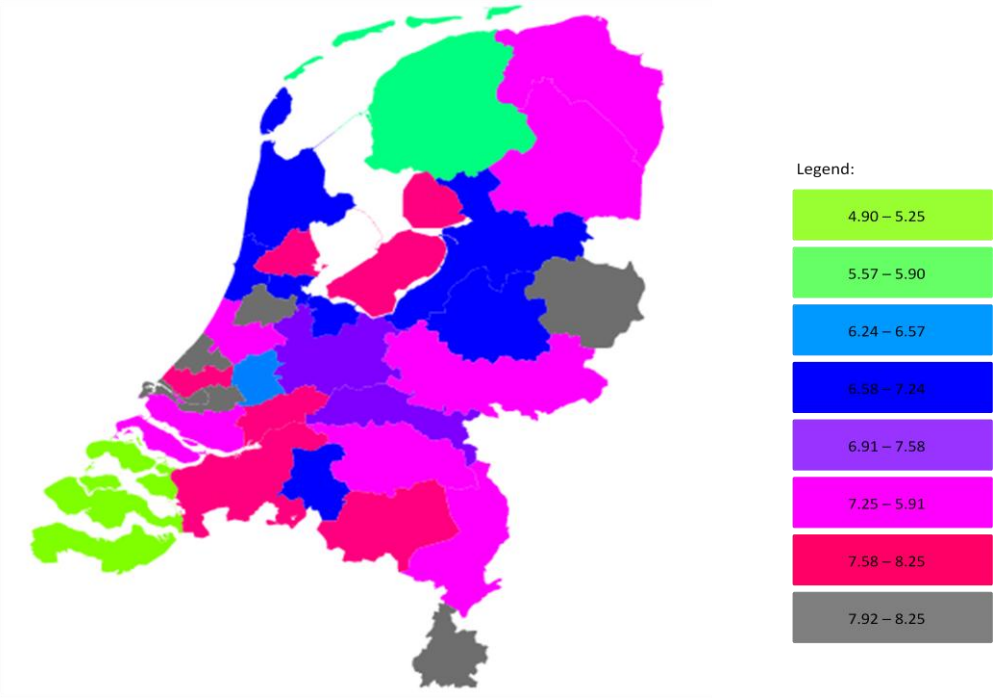


Figure 2: *DDD of antibiotics in the Netherlands per region per 1000 persons. Based on www.sfk.nl (2012)*

As can be seen in Figure 2, the highest DDD per 1000 persons can be found in areas around the three biggest cities of the Netherlands (Amsterdam, Rotterdam and The Hague), and in Twente and South Limburg. Reasons for this might be the density of the population (Mulder, 2010) and the amount of

hospitals in a specific area and the location of relative big hospitals near the boundary (Deuning, C.M., 2008).

In the Netherlands, antibiotics belong to the medicines that are available on prescription only. Article 57 of the Dutch Medicines Act (Geneesmiddelenwet) describes that such medicines can only be prescribed by medical specialists or dentists who are included in the register of medical or dental specialists (Geneesmiddelenwet, 2012). From this group, general practitioners (GPs) prescribe most antibiotics, about 85%. The remaining 15% is prescribed by dentists and specialists. Although the Dutch GP-Society (huisartsenvereniging) developed guidelines for prescribing antibiotics, and GPs endorse the use of those guidelines, research showed that they do not always act according the guidelines, which can result in incorrect use of antibiotics (Grol, 2001 in Braspenning, Schellevis & Grol, 2004). The incorrect use of antibiotics can also be found in the use of antibiotics in hospitals. The highest percentages of an incorrect use of antibiotics is found when there is too little diagnostic information available about the presence of an infection, and in cases where the wrong type of antibiotics is used if the infection is present (Prezies, 2011). The incorrect use of antibiotics is a problem, because it can accelerate the development of resistant bacteria (Rijksoverheid, 2012)

To manage, limit, and prevent the emergence of resistance to antibiotics and to counteract the increase of antibiotic resistance, it is important that specialists consider carefully whether or not they prescribe a specific type of antibiotics (Casparie, 1989 in Braspenning, et al., 2004). In 1996, this idea was embraced in the Netherlands by the development of the Dutch Working Group on Antibiotic Policy (Stichting Werkgroep Antibiotica Beleid, SWAB). The main tasks of the SWAB is to develop national guidelines about the use of antibiotics in humans (Hoogkamp-Korstanje et al., 2012).

2.2 The use of antibiotics in animals

As mentioned above, the use of antibiotics in humans in the Netherlands is low compared to other European countries. However, the use of antibiotics in animals is the highest of all European countries in the Netherlands (Mevius, 2012). And although the MARAN report (Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals in the Netherlands) showed a 40% decrease in the usage of antibiotics between 2007 and 2011, according to the MARAN report 2012, the usage of antibiotics in animals is still high compared to other European countries (Mevius, Koene, Wit, Van Pelt & Bondt, 2012)

Just like the SWAB which is focused on the use of antibiotics in humans, there is a Working Group on Veterinary Antibiotic Policy (Werkgroep Veterinair Antibiotica Beleid, WVAB). This working group was established in 1990 and it is part of the Royal Dutch Society for Veterinary Medicine (Koninklijke

Nederlandse Maatschappij voor Diergeneeskunde, KNMvD). One of the main tasks of the WVAB is to develop guidelines to reduce the usage of antibiotics in animals (wvab.nl). In 2009, there was also a project called View on Healthy Animals (Zicht op Gezonde Dieren) initiated by the Dutch Federation of Agriculture and Horticulture (Land- en Tuinbouw Organisatie Nederland, LTO) and KNMvD to reduce the usage of, among others, antibiotics. The aim of this project was to investigate which method fits best to decrease resistance. This project was fulfilled on March 1st 2012. Results from this project are, however, not available as yet (Koninklijke Nederlandse Maatschappij voor Diergeneeskunde, 2012; Land- en Tuinbouw Organisatie Nederland, 2009).

2.3 Summary

As can be seen from these two sections, many different groups are involved in the use of antibiotics or are concerned with antibiotics' policies. The Infection Manager is developed to bring the different groups together, to come to an increase in infection prevention and infection control.

3 Theoretical framework

In this section, the Center for eHealth Research Roadmap and the business model canvas will be described. The roadmap is a framework that can be used during the development of new eHealth technologies, e.g. the Infection Manager. The business model canvas can be used to translate the stakeholders' needs into a business model, to determine the values – things that are beneficially and desirable for a stakeholders (Center for eHealth Research and Disease Management, 2012) – and to identify possible critical factors for the implementation of the Infection Manager from the values.

3.1 CeHRes roadmap

The Center for eHealth Research (CeHRes) roadmap is a holistic eHealth framework which can be followed during the development of new eHealth technologies. By integrating human centered design strategies with business modelling strategies, the roadmap combines the goals of creating a fit between human and technology with stakeholders and strategic management that assesses innovations (Nijland, 2011). The roadmap contains five main phases and four evaluation cycles. These phases and cycles are presented in Figure 3 and described below.

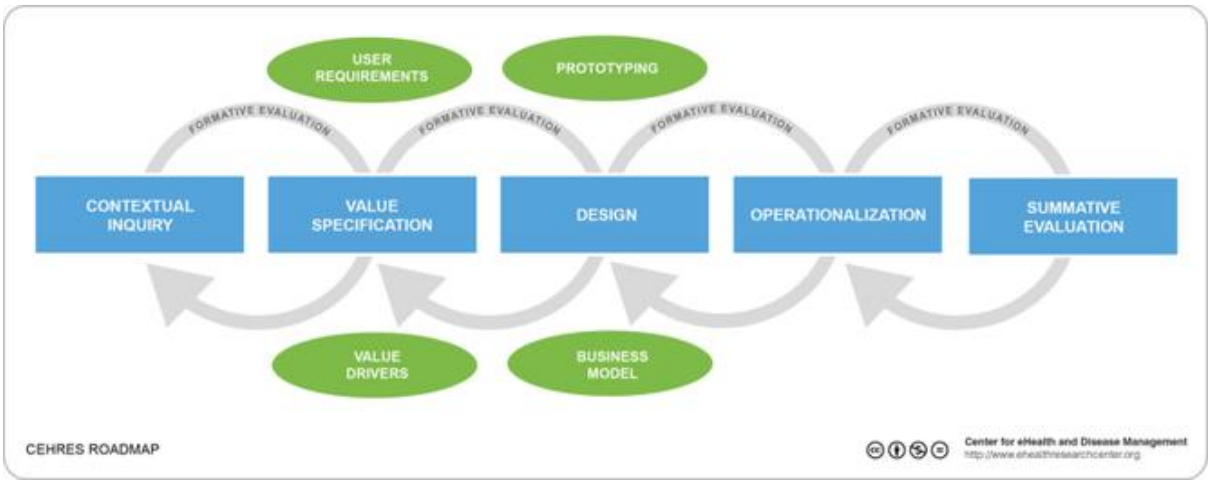


Figure 3: *CeHRes Roadmap (Gemert-Pijnen et al.,2011)*

Contextual inquiry: The goal of this first phase is to examine the problems, needs and benefits of a new technology for different stakeholders. Activities related to this phase are, among others, defining a project strategy, analysing problems and mapping stakeholders.

Value Specification: During this second phase, the values of the stakeholders are determined and ranked. The value specification makes different goals, and functional and organizational requirements clear. Activities related to value specification are, e.g., stakeholder salience analysis, making a role division and setting critical success factors.

Design: In the design phase the visualization of the goals and the functional and organizational requirements takes place. A first design is refined after discussing prototypes with the stakeholders involved. Making a value-function-cost matrix and creating a business model are examples of activities related to the design phase.

Operationalization: During the operationalization phase, activities for adoption and diffusion have to be planned. Based on the outcomes of the earlier phases, the business model made during the design phase can be operationalized and specified in a business case in this operationalization phase. In the business case, the quantification of costs and/or revenues are described and discussed.

Summative evaluation: During the summative evaluation phase, the use of the new technology and the effects on performance criteria are assessed. Other related activities during the summative evaluation phase are redesigning and changing management.

Formative Evaluation cycles: There are formative evaluation cycles between every phase of the roadmap. Each cycle makes it possible for stakeholders to give feedback and/or feed forward comments. Giving feedback and feed forward comments is an ongoing activity during the whole development of the new technology (Gemert-Pijnen et al., 2011)

This thesis mainly focuses on the first and second phases of the roadmap: the contextual inquiry and the value specification phase, as it is focused on investigating possible critical factors for a successful implementation of the Infection Manager.

3.2 Business modelling

As mentioned above, the CeHRes roadmap combines development of persuasive technology with business modelling. Because of this combination, the new technology can be developed according to the stakeholders' needs, and it is possible to add value on these needs. In this part of the chapter, the business model that was used in this thesis, and its corresponding values will be explained.

A business model is defined by Osterwalder as "The rationale of how an organization creates, delivers, and captures value" (Osterwalder, 2004). Such a model can help to identify critical factors, to come to a good working system for the implementation of a new technology (Van Limburg et al., 2011). As mentioned in the explanation of the CeHRes Roadmap, the business model has to be developed during the design phase, and is based on the outcomes of the contextual inquiry and value specification phases (Figure 3). While there is no scientific, globally accepted method for developing business models for eHealth, the commonly used business model canvas of Osterwalder

(Figure 4) is also used in this thesis. This model is in this thesis used to translate the needs and requirements of possible stakeholders into values.

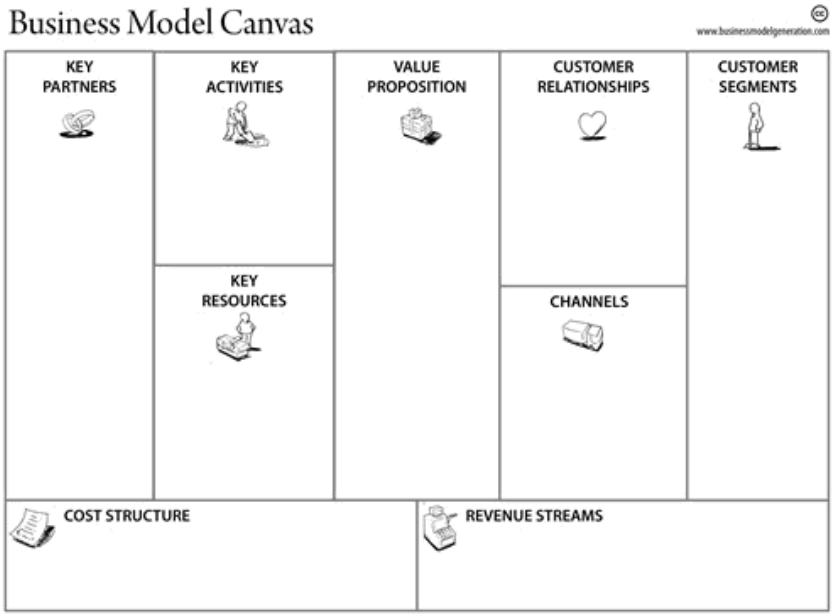


Figure 4: *Osterwalder's (2004) business model canvas*

The business model canvas of Osterwalder (2004) contains nine blocks. The first block on the left named 'key partners' represents the stakeholders of a new proposition. The second block 'key activities' represents what activities have to be performed to come to a collaboration with the stakeholders. The assets that are necessary to create value for the customer are represented by the third block 'key resources' (Osterwalder, 2004). These three blocks deal with organizational aspects of the new technology and can be seen as value creation (Van Limburg et al., 2011). The 'value proposition' block in the middle of the canvas stands for the new technology. It also contains the problem that needs to be solved (Osterwalder, 2004). On the right sight of the business model canvas, the three blocks on top – 'customer relationship', 'customer segments', and 'channels' – represent the value delivery (Van Limburg et al., 2011). The 'customer relationship' represents the interaction between the owner of the technology and the customer. The most important customers are described in 'customer segments'. The 'channels' represent how the technology can be accessed by the customers (Osterwalder, 2004). The last two blocks – cost structure and revenue streams – deal with financial aspects of the technology, and can be seen as value capture (Osterwalder, 2004; Van Limburg et al., 2011). Analysing these four value types – value creation, value proposition, value delivery, and value capture – will show what is really important and what is less/not important for the implementation of the proposition at stake. From these outcomes, possible critical factors for the implementation of a new technology can be identified (Van Limburg et al., 2011).

4 Methods

This chapter provides a description of the methods used for the literature study and the field research. The literature study was done to collect information about identifying stakeholders, stakeholder analyses and business modelling in eHealth. Information about stakeholder analyses was collected in order to be able to compare them, and to come to a method for stakeholder analysis that could be applied in this study (see chapter 5).

In order to collect opinions of people about the Infection Manager, and to come to a list of critical factors for the implementation of the Infection Manager, a questionnaire and questions for an interview were prepared. The questionnaire was mainly focused on identifying possible stakeholders in the development of the Infection Manager. The interview was hold with several possible stakeholders to investigate their opinion on various aspects of the Infection Manager and its implementation.

By translating the outcomes of the questionnaires and interviews into the business model, the stakeholders' values and possible critical factors could be defined.

Below, more detailed information will be given with respect to the literature study and the field work.

4.1 Literature study

For the literature search the online databases Medline (via PubMed), ScienceDirect, Google Scholar and Cochrane library were used. In addition to the search in these databases, a forward-backward search was used to find relevant articles. The information was skimmed or, in case of an article, the abstract was read.

The following combinations of terms were searched in the title or abstract of published papers: *Stakeholder analysis* OR *mapping* OR *needs assessment* OR *value* AND (*methods* OR *theory*). After skimming the articles that were thus found, 15 relevant articles on stakeholder identification and analyses were selected for further analysis.

For the business modelling part, the following terms were used in the literature search: *Business model* AND *eHealth* AND *value*. The keywords are also translated into Dutch. Only recently published studies – not before 1995 – written in English or Dutch, were included in this study. Besides the search in these databases, the search engine Google was also used to collect information from specific organizations like the European Centre for Disease Prevention and Control (ECDC), the Foundation for Pharmaceutical Statistics (Stichting Farmaceutische Kengetallen) (SFK), the Health Care Inspectorate (Inspectie voor de Gezondheidszorg) (IGZ), the Health Council (Gezondheidsraad),

the National Institute for Public Health (Rijksinstituut voor Volksgezondheid en Milieu) (RIVM), the Royal Dutch Society dor Veterinary Medicine (Koninklijke Nederlandse Maatschappij voor Diergeneeskunde) (KNMvD), SWAB, the Working Group on Infection Prevention (Stichting Werkgroep Infectiepreventie) (WIP), the Working Group Veterinary Antibiotic Policy (Werkgroep Veterinair Antibioticabeleid) (WVAB) and the World Health Organization (WHO).

4.2 Field research

The field research consisted of a questionnaire and interviews.

4.2.1 Questionnaire

To identify possible stakeholders, a web-based questionnaire was composed. This questionnaire was based on a brainstorm session and on earlier questionnaires used within the EurSafety Health-net project. The purpose of the questionnaire was to collect information about stakeholders´ thoughts and attitudes towards the Infection Manager and to check whether or not they agreed who the stakeholders of the Infection Manager would be. To come to as much information as possible, open ended questions were used. In addition, some multiple choice questions were prepared to obtain specific information about the identification of stakeholders.

To define which possible stakeholders had to be invited to participate in a questionnaire, the stakeholders of the list with possible stakeholders, made up during the brainstorm session, was assessed on the basis of the stakeholders' influence, according Mitchell's method for assessing salience, described in the next chapter. The outcomes of this assessment were discussed by experts of the EurSafety Health-net project. It was decided to send the questionnaire to a 'definitive' group of stakeholders, consisting of five clinicians, five GP's, five dentists, five microbiologists, five pharmacists, five veterinarians, two members of the Health Care Inspectorate (Inspectie voor de Gezondheidszorg) (IGZ), to the SWAB, the WIP, the WVAB, and to the hospital board of the Medical Spectrum Twente (MST). The questionnaire was sent by E-mail and after two weeks a reminder was sent. Examples of the E-mail and the questionnaire are enclosed in Appendix A and B. Of the stakeholders who were selected in the definitive group, sixteen people completed the questionnaire. Their answers were taken as a basis for this study.

4.2.2 Interviews

For this qualitative research, semi-structured face-to-face interviews were used to collect more information about the needs of different stakeholders. In preparation of the semi-structured interviews, a list with questions was made, based on the critical dynamics of Cain & Mittmann (2002). These dynamics are focused on an easy acceptation of an innovation. All interviews were recorded with a voice recorder, with consent from the interviewee.

The questions prepared for the interview were divided into 6 categories, namely current situation, interest in a digital portal, content of information, design of the dashboard, use of the portal, and willingness to pay. To answer questions about the dashboard of the Infection Manager, all participants obtained a print screen of the dashboard.

For each question, the time needed to answer was estimated. In Appendix C, an overview of the questions thus prepared is provided. The interviews lasted in total about 30 minutes (varying from 30 to 60 minutes). A paraphrasing technique was used to make sure the interviewer understood the answers of the interviewee.

The participants for the interviews were selected after the results of the questionnaires had been investigated, as the results from the questionnaires had given information about which stakeholders were considered to be important by the participants in the questionnaire. From those important stakeholders, eleven people had given permission to contact them in a later phase of the research. They were asked, via E-mail or telephone, to participate in the interview. In the end, six people, a microbiologist, a dentist, a veterinarian, a pharmacist in a hospital and two pneumonologists, were interviewed.

4.3 Data analysis

The literature search resulted in 15 methods for stakeholder analysis. These methods were compared to each other by the aims of the methods – identifying stakeholders and/or categorizing and/or differentiating stakeholders and/or investigating the relation between stakeholders. The reason behind this comparison was that the first criterion of a useful method for analysing stakeholders in eHealth was considered to be the fact that the method allowed for identifying stakeholders and categorizing and/or differentiating them. Secondly, a useful method for analysing stakeholders in eHealth should be described: i.e., it should be written as a research tool that can directly be copied and applied by outsiders. The third criterion was that the definitions of the core principles must be given.

To investigate whether or not a method fulfilled the criteria, all 15 methods were evaluated in a flowchart (Figure 5).

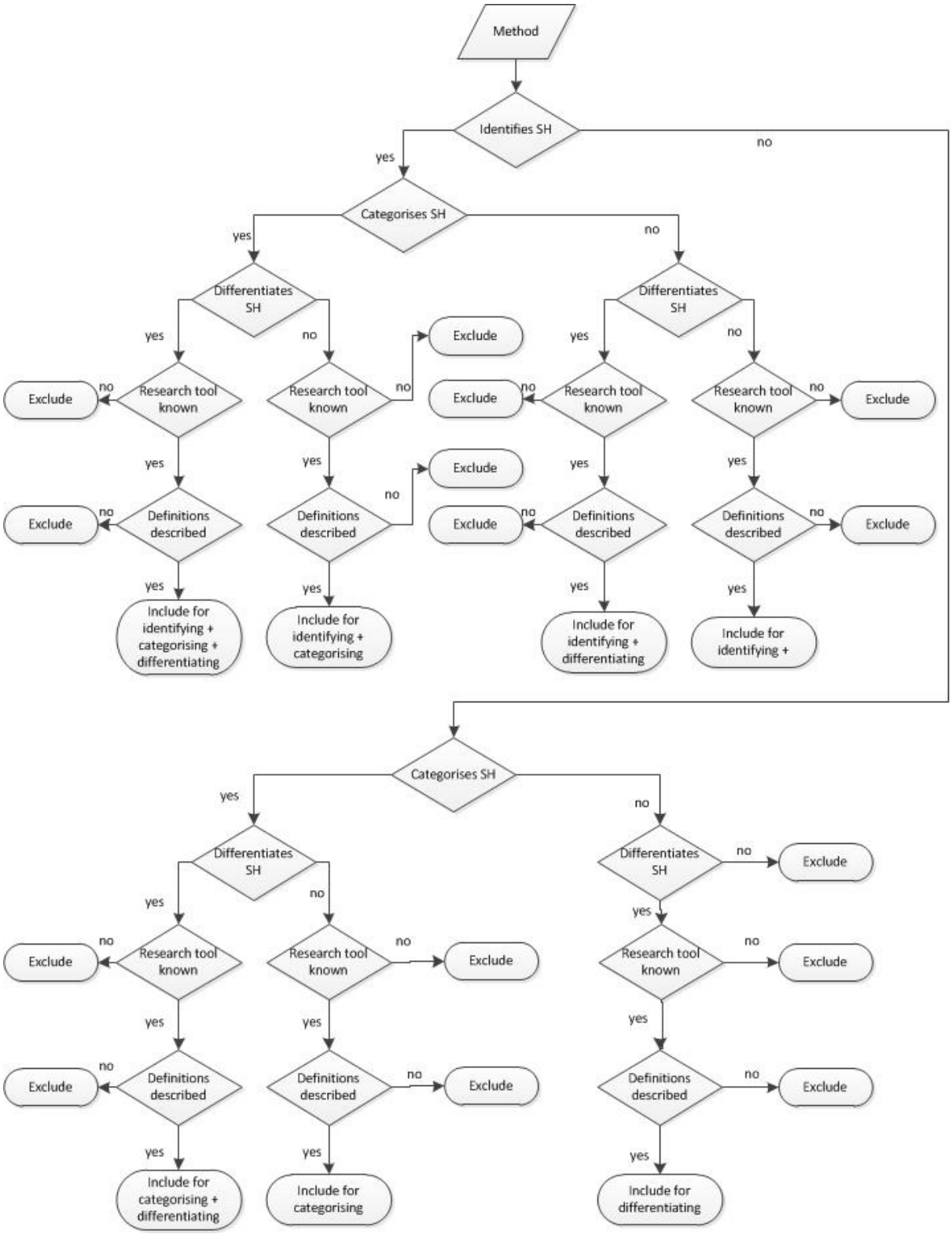


Figure 5: *Flowchart for evaluating stakeholder analysis methods*

The data obtained from the questionnaire and interviews were used to answer the three sub questions 'Which stakeholders are involved in infection management?', 'What are the stakeholders' needs according to infection management of the stakeholders?' and 'What values drive these needs?'.

For the analysis of the questionnaire, the answers were sorted per question. The audio recordings of interviews were transcribed. Hereafter, two independent coders selected relevant information – regarding stakeholders' roles and needs – from the transcriptions of two recorded interviews. Since the selected information of the two coders largely corresponded, the other interviews were only fragmented by one researcher. These fragments were further used for the evaluation of stakeholders' needs and values, and in the business model canvas (Osterwalder, 2004), from which the critical factors for the implementation of the Infection Manager then derived.

5 Results

This chapter provides answers on the four sub questions 'Which method of stakeholder analysis can be used for the Infection Manager?', 'Which stakeholders are involved in infection management?', 'What are the stakeholders' needs in relation to infection management?' and 'What values drive these needs?'. In order to answer these questions, a comparison of 15 relevant methods for stakeholder analyses will be given first. In chapter 5.1, the methods will be compared on their identification of stakeholders, and in 5.2-5.4 the categorization and differentiation of, and the relation between stakeholders in different methods will be discussed. A brief summary of these sections will be provided in 5.5. Hereafter, a proposal will be made for a new, combined method of stakeholder analysis for the Infection Manager in 5.6. The application of this method will be discussed in chapter 5.7., which provides an answer to the question 'Which stakeholders are involved in infection management'. In section 5.8 an answer to the question 'What are the stakeholders' needs in relation to infection management?' will be given. In chapter 5.9, the last question, 'What values drive stakeholders' needs in relation to infection management?', will be discussed on the basis of the business model.

5.1 Identifying stakeholders

Since the publication of Freeman's "Strategic management: a stakeholder approach" in 1984, interest in stakeholder theories has increased. Many of the theories have focused on how to find and identify stakeholders – in Freeman's terms "any group or individual who can affect or is affected by the achievement by the organisation's objective" (Freeman, 1984). Freeman himself, for instance, raised the question who the current and potential stakeholders of an organisation are, what their interest/rights are, how they affect the organisation, and how the organisation affects the stakeholders. Despite the fact that Freeman's definition of stakeholders has often been used in later stakeholder analyses, he does not describe in detail how exactly current and potential stakeholders can be found.

Sharp et al. (1999) did mention four groups of people – users, regulators, developers, and others involved – who can be distinguished as stakeholders and whose roles in relation to a particular project should be defined to come to a complete overview of stakeholders and the relationships between them and the organisation. Sharp et al. differentiate between a baseline stakeholder group, a client stakeholder group, supplier group, and satellite groups.

Like Sharp et al. (1999), Blair et al. (unknown, in Wolper, 2004) also mention different groups of possible stakeholders. In contrast to Sharp et al., Blair et al. identify their possible stakeholders on the basis of their relation to the organisation – which was in their study a hospital. The groups that

Blair et al. discriminate are external, interface and internal stakeholders. Stakeholders with different roles are then represented in these three groups (e.g., both physicians and pharmacists belong to the internal stakeholders).

Hyder et al. (2010) systematically consider 11 categories of key stakeholders in their Future Health System (FHS). In their study, focused on public health, these 11 categories included, for instance, central government agencies, health governing boards, and health workers.

Volere does not have an in advance prepared list with categories from which possible stakeholders can be selected. The Volere Stakeholder Analysis Template instead contains a checklist with many stakeholder roles, on which a user or researcher can simply mark whether or not they are involved. The aim of this list is to reduce the likelihood of omitting stakeholders (Volere.com, 2002).

In contrast to the methods for identifying stakeholders mentioned above, Bryson (2004) developed a basic stakeholder analysis technique that is not just based on categories of possible stakeholders. Instead, Bryson (2004) came up with a technique that contained eight steps. Bryson stated that these steps have to be taken to identify stakeholders and their interests, and to clarify stakeholders' view of the organisation. The first step of this technique is brainstorming to develop a to list potential stakeholders. Hereafter, Bryson mentions that a flip chart sheet has to be prepared for each stakeholder to clarify his interests and expectations of the organisation.

5.2 Categorising stakeholders

The method mentioned above of Sharp et al. (1999) does not only identify stakeholders, but also categorises the different stakeholders in a baseline stakeholder group, a client stakeholder group, supplier group, and satellite groups. The products of this baseline group are processed or inspected by the client stakeholder group. Providing information and performing supporting tasks belongs to the supplier group. The last group consists of stakeholders who interact or support the baseline stakeholders, the so called satellite group (Sharp 1999).

The FHS of Hyder et al. (2010) categorises the identified stakeholders, in contrast to Sharp et al., in five groups. After having articulated the stakeholders' power, influence and level of agreement with the proposal, the stakeholders are divided into drivers, blockers, supporters, bystanders, or abstainers.

Alexander (2005) came up with his Onion model to categorise stakeholders. The Onion model, shown in Figure 6, consists of three circles. The most inner ring is not counted as a circle, while it points out the equipment or product under development, so called 'The Kit'. The first real circle on the inner side of the model is called the 'The System'. 'The System' contains 'The Kit' and its human operators and operating procedures. A circle more to the outside is 'The Containing System'. This circle consists of 'The System' complemented with human beneficiaries of 'The System'. This circle is followed up by 'The Wider Environment' circle, which contains 'The System' and other stakeholders (Alexander, 2005). Just like Sharp et al. (1999), the division of stakeholders is made on the basis of their roles or possible roles – whether or not they are directly involved in the system .

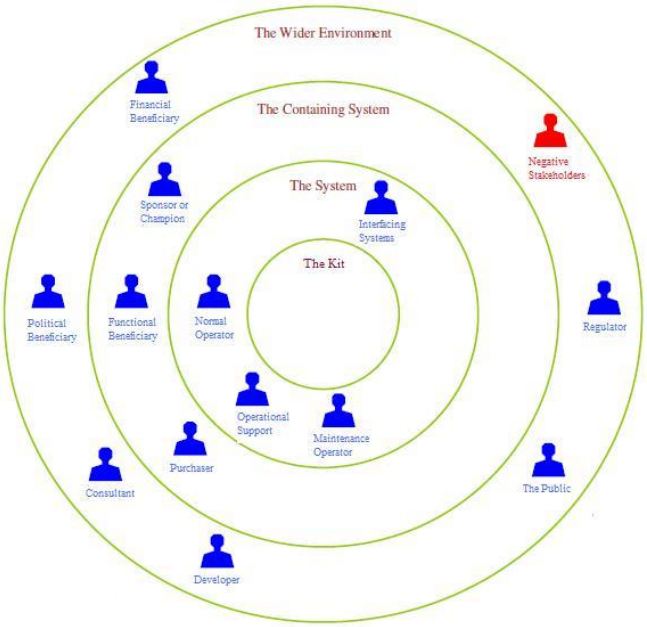


Figure 6: *Onion Model of Alexander (2005)*

Freeman (1984) mentioned that coalitions can arise when stakeholders have, for instance, similar interests, believes, or objectives. This can result into supportive groups, non supportive groups, a mixed blessing group, or a marginal group. This division is largely the same as in the FHS of Hyder et al. (2010), in which stakeholders were also grouped on the basis of their support.

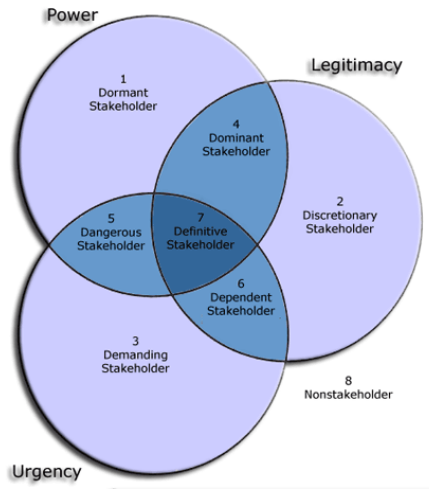
The same categories mentioned by Freeman (1984) are used by Blair et al. (unknown, in Wolper 2004), to categorise stakeholders. Besides this classification, Blair et al. also indentify the management style of the organization in relation to the stakeholders depending on their feeling about it – varying from very keen on the relation to very negative about it – as a Relationship Eagle, Relationship Optimist, Relationship Pessimist, or Relationship Ostrich.

Savage, Nix, Whitehead, and Blair (1991) base their categorisation of stakeholders on their capacity and willingness to threaten or cooperate with corporations. In this model, the resource dependence determines the power of threat. The greater the dependence, the greater the willingness to cooperate. Affection by the business environment can also influence the willingness to cooperate (Savage et al. 1991). This way, Savage et al. also take stakeholders' support as a basis for their model.

Mitchell, Angle, and Wood (1997) categorises stakeholders based on salience. Salience can be seen as "the degree to which managers give priority to competing stakeholder claims". The degree of salience is derived from a combination of three aspects, namely: power, urgency and legitimacy. Mitchell et al. define these three aspects as follows (1997):

> **Power:** "A relationship among social actors in which one social actor, A, can get another social actor, B, to do something that B would not have otherwise done"
>
> **Legitimacy:** "A generalized perception or assumption that the actors of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, definitions"
>
> **Urgency:** "The degree to which stakeholder claims call for immediate attention"

On the basis of whether or not stakeholders have power, legitimacy and/or urgency, eight classes of stakeholders can be distinguished: dormant, discretionary, demanding, dominant, dangerous, dependent, definitive, and non stakeholders.



Stakeholder classes:

1. Dormant (Power)
2. Discretionary (Legitimacy)
3. Demanding (Urgency)
4. Dominant (Power + Legitimacy)
5. Dangerous (Power + Urgency)
6. Dependent (Legitimacy + Urgency)
7. Definitive (Power + Legitimacy + Urgency)
8. Non stakeholder

Figure 7: *Stakeholder theory of Mitchell et al. (1997)*

Instead of using already established categories, Hare and Pahl-Wostl (2002) used card sorting to investigate categories by corresponding criteria of stakeholders. The – in this case 15 – stakeholders had 30 minutes to divide 15 cards to as many different criteria as possible. After the 30 minutes, each stakeholder had to explain what the criteria were and to sort a card in a specific category. Hereafter, the categories were compared by two independent researchers, to see whether or not the criteria matched with each other (Hare & Pahl-Wostl, 2002).

Just like Hare and Pahl-Wostl, Bryson involves stakeholders to determine categories. In Bryson's Basic Stakeholder Analysis Technique a flip chart sheet is used to let stakeholders judge the organisation's performance or expectations of the organisation, by listing criteria.

In contrast with the determination of categories by investigating criteria, Dale & Lane (1994) identify categories by the stakeholders' goals on basis of interviews. The information collected from the interviews can also be used in discussions with conflicting groups (Dale & Lane 1994 in Reed et al. 2009).

5.3 Differentiating stakeholders

Besides the categorisation of stakeholders, some methods also differentiate the stakeholders. According to Freeman, differentiating stakeholders gives an insight in the relative power of stakeholders' groups or categories, and their potential to co-operate or threaten corporate strategy (1984, in Fontaine, Haarman & Schmid, 2006).

Sharp et al. (1999) calculate the weight of a stakeholder's view in relation to the complete network of stakeholders. This calculation is based on inter-stakeholder relationships, which can be represented in a figure with nodes representing the stakeholders and lines representing the relationship between them.

Hyder et al. (2010) do not regard the relationship between stakeholders, but they do mention that the power or influence of a stakeholder must be articulated, on a 5-point-scale. This way, Hyder et al. differentiate between important and less important stakeholders, but they do not define what power and influence is.

Bryson (2004) ranks stakeholders on the basis of their salience. For this he considers stakeholders' power, legitimacy, attention-getting capacity as mentioned by Mitchell et al. (1997). Mitchell et al. (1997) regard those stakeholders who have both power, legitimacy and urgency as most important.

5.4 Stakeholders' relationships

To investigate how stakeholders are related to each other, can be shown in different ways. As mentioned, Sharp et al (1999) use a system with nodes and lines representing the stakeholders and the relations between them. This system is also used by Borgatti et al. (2009). For public health, this method of visualization is often used to stop the spread of infectious diseases and provide better health care (Borgatti et al. 2009). Figure 8 represents examples of different types of networks.

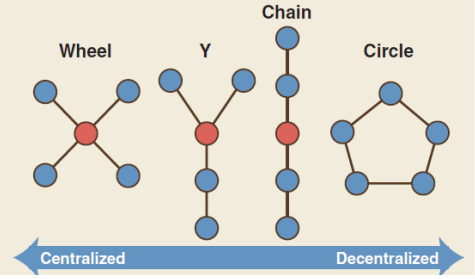


Figure 8: *Examples of social network analysis of Borgatti et al. (2009)*

Freeman (1984) does not focus on the relation between stakeholders, but on the relation between stakeholders and the organisation or company at stake, by asking the following questions:

- How does each stakeholder affect us?
- How do we affect each stakeholder?
- What assumption does our current strategy make about each important stakeholder?
- What are the current 'environmental variables' that affect us and our stakeholders?
- How do we measure each of these variables and their impact on us and our stakeholders?
- How do we keep score with our stakeholders?

Cameron et al. (2010) investigated both the relationships between stakeholders and the relation between stakeholders and an organisation. Their method is based on two principles of establishing and prioritizing needs of a given stakeholder based on importance to him and based on his importance to the organization. The first step of the method is to create a network which represents the environment of the stakeholder. Subsequently, the intensity of this stakeholder's needs is assessed and value is given to it. As a result, all goals can be ordered by the calculated value of the stakeholder's relations.

In the article "How to do (or not to do)… a stakeholder analysis", Varvasovszky and Brugha (2000) mention that different components of the policy issue or problem can be identified by interviewing stakeholders or performing a focus group discussion. To control for agreement between stakeholders, a Delphi-method can also be performed at a later stage. Matrices and tables can then be drawn to illustrate characteristics of each stakeholder, and to map the relationships between the different stakeholders.

Varvasovszky and Brugha (2000) do not describe in detail how the matrices and tables can be made. Biggs & Matsaert (1999), however, do describe in their Actor-Linkage matrix how a matrix can be created to show the relationships between key actors and an innovation. In both rows and columns of the matrix actors must be listed. The relation between the actors can be indicated by using different numbers of stars or described by key words (Biggs& Matsaert 1999). In Figure 9 an example is given of a Actor-Linkage matrix.

		1	2	3	4
	Actor	Poorer farmers	Richer farmers	Research in Public Sector	Research in Private Sector
A	Poorer farmers	A1			
B	Richer farmers			B3	
C	Research in Public Sector		C2		C4
D	Research in Private Sector				

Figure 9: *Actor-Linkage matrix (Biggs & Matsaert, 1999)*

5.5 Overview of stakeholder analysis methods

In table 1, an overview of the 15 described methods is given. In this table is, besides a short description, the type of research tool and aim of the method shown.

Table 1: *Overview of stakeholder analysis methods*

Author	Name	Method	Research tools	Aim
Alexander (2005)	Onion model	• Kit • System • Containing system • Wider environment	• Interviews • Workshops • Observation	• Categorising
Biggs & Matsaert (1999)	Actor-linkage matrices	• Descriptive relationship	• Document analysis • Interviews • Observation	• Investigating relationships
Blair, et al. (unknown, in Wolper 2004)	Strategic relationship management approach	• External stakeholders • Interface stakeholders • Internal stakeholders	Unknown	• Identifying • Categorising
Borgatti (2009)	Social network analysis	• Quantitative relationships	• Document analysis • Interviews • Surveys • Observation	• Investigating relationships
Varvasovszky and Brugha (2000)	Identification of different dimensions of analysis	• Interest in issue • Influence/power • Position • Impact of issue on actor	• Interviews • Surveys • workshops	• Investigating • Relationships
Bryson (2004)	Basic analysis technique	• Interest • Views • Key strategic issues • Identifying coalitions of support and opposition	• Brainstorm • Flip chart	• Identifying • Categorising • Differentiating
Cameron et al. (2010)	Needs and importance in network	• Ranking stakeholders on needs and importance of stakeholders to others in network	• Workshops • Interviews • Surveys	• Investigating relationships
Dale & Lane (1994)	Strategic perspective analysis	• Goals • Opportunities • Constraints	• Interviews • Workshops	• Categorising
Freeman (1984)	Cooperation & competition	• Cooperation • Obstruction	• Document analysis • Workshops	• Identifying • Categorising • Differentiating • Investigating relationships
Hare & Pahl-Wostl (2002)	Reconstructive card sorting	• Stakeholders' own criteria	• Interviews • Workshops • Card sorting	• Categorising
Hyder (2010)	Future Health system	• Identify SH • Categorize SH • Levels of agreement • Power/influence	• Document analysis • Interviews • Workshops	• Identifying • Categorising • Differentiating
Mitchell, et al. (1997)	A theory of identification and salience	• Power • Urgency • Legitimacy	• Document analysis • Workshops • Interviews • Surveys	• Categorising • Differentiating
Savage, et al. (1991)	Cooperation and threat	• Identify SH • SH pro or contra • Prioritize SH	Unknown	• Categorising
Sharp, et al. (1999)	Identifying stakeholders by considering relationships	• Users • Developers • Legislators • Decision makers	• Brainstorm	• Identifying • Categorising • Differentiating • Investigating relationships
Volere (2002)	Volere stakeholder template	• List with possible stakeholders	Unknown	• Identifying

5.6 Combined method for stakeholder analysis in eHealth

The above mentioned methods were compared and combined to attain to a method that is most fit for analyzing stakeholders in eHealth.

To make clear for each method discussed above whether it would be included or excluded in a combined method that would fit all the requirements as posed in chapter 4, all methods were put into the flowchart, also discussed in chapter 4. This flowchart does not include a question about the relationship between stakeholders or stakeholders and an organisation, because all stakeholders will only be connected to each other by the Infection Manager. The results of this analysis are presented in Figure 10.

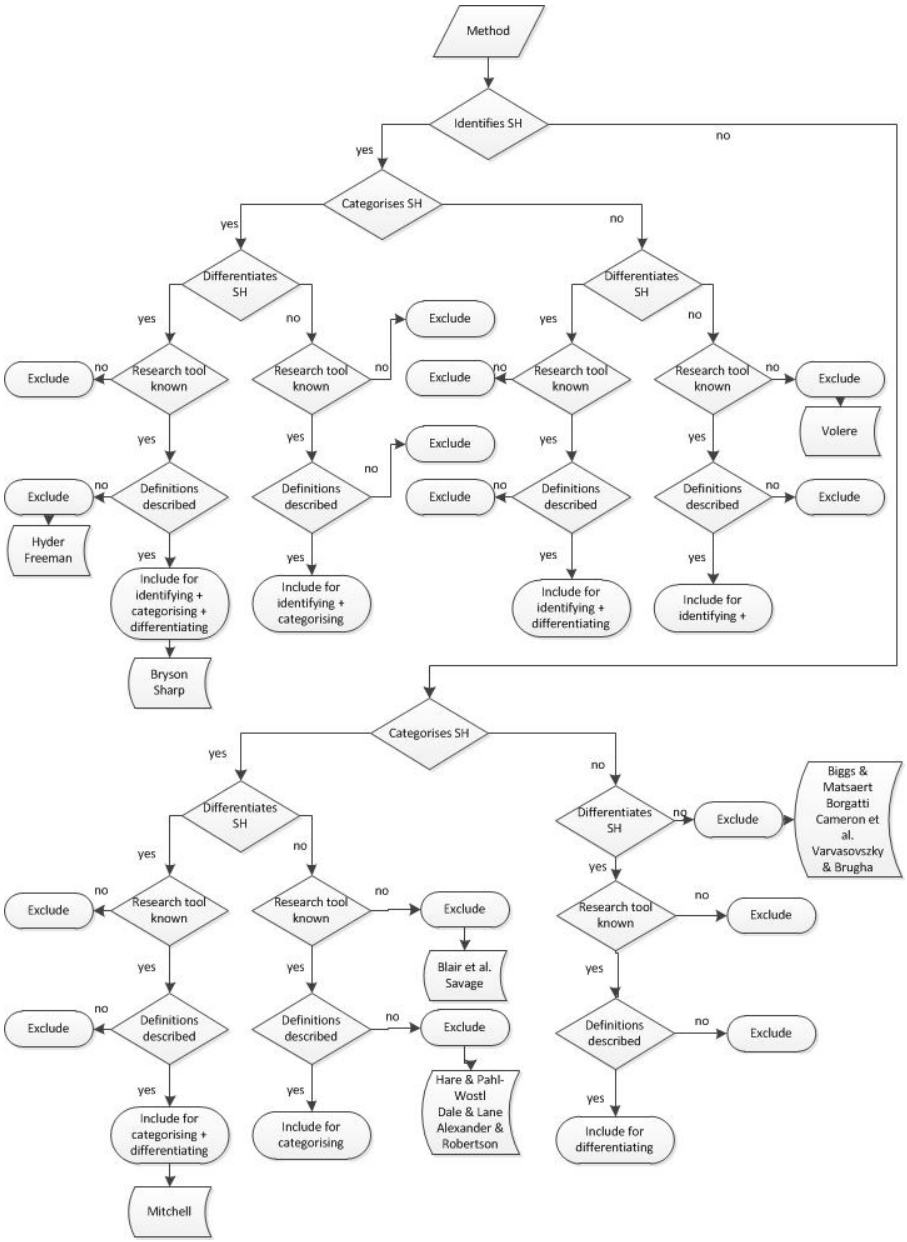


Figure 10: *Flowchart with outcomes of evaluation methods for stakeholder analysis*

As can be seen from the flowchart, there was not one single method for stakeholder analysis that fit all of the requirements as posed in chapter 4. Accordingly, a new, combined method needed to be developed. This combined method is based on:

- Basic stakeholder analysis technique by Bryson (2004)
- Stakeholder theory of Mitchell et al. (1997)
- Identifying stakeholders by considering relationships by Sharp et al. (1999)

The model of Hyder et al. (2010) is also included for the new method, although his method does not fulfil all of the criteria mentioned in chapter 4. The reason for including the model of Hyder et al. (2010) is, however, that their FHS is specifically aimed at healthcare.

As the first steps of the new method, the steps one and two of the Future Health System (FHS) of Hyder et al. (2010), - 'Articulate a clear problem statement' and 'Clearly define the new health policy or strategy to be considered' – were copied. Accordingly, the first steps of the newly developed method for analysing stakeholders consisted of defining the problem, and defining the new health policy or strategy at stake. Step three consisted of a brainstorm session, to investigate possible stakeholders. This step was taken from Bryson's Basic Stakeholder Analysis method (2004). By visualizing the outcomes of the brainstorm session, in which the outcomes of the first session were discussed into detail, the stakeholders and their roles were investigated in the fourth step. Differently from Sharp et al. (1999), however, it was taken for the new, combined stakeholder analysis method that there might be more than four covering roles of stakeholders. The fifth step contained the stakeholder theory of Mitchell et al. (1997) to assess the degree of salience of stakeholders. This method almost corresponds to the steps of the FHS in which the current level and type of power/influence for each stakeholder are articulated (Hyder et al., 2010). Since the definitions of power and influence are not clearly described in the FHS, though, it was chosen in the new method to use the stakeholder theory of Mitchell et al. (1997) instead of the FHS of Hyder et al. (2010) to assess stakeholders saliency. Investigating the consensus between stakeholders was considered to be important as well, but it might not always be necessary to use a five-point scale, as Hyder et al. (2010) mentioned in their FHS. For the Infection Manager, it was instead decided to use a questionnaire to see whether or not the stakeholders agree with the created list of stakeholders. Identifying the main concerns of each stakeholder about the proposal, which is also related to the FHS – 'Identify the main concerns of each stakeholder about the proposal – was done by face-to-face interviews. Besides the main concerns, the stakeholders' needs could also be investigated from these interviews.

In short, the new method for analyzing stakeholders in eHealth contains the following seven steps:

1. Define problem statement
2. Define new health policy or strategy to be considered
3. Brainstorm about possible stakeholders and reflect upon this brainstorm session in a second session
4. Categorize stakeholders
5. Differentiate stakeholders based on their salience
6. Check the consensus among stakeholders
7. Identify the main concerns of each stakeholder about the proposal and the needs of the stakeholder

Since the first two steps, which contain the problem statement, belonging to the contextual inquiry phase (see Figure 3 in chapter 3), are already described in chapter 1, these steps are not further taken into account in this thesis. The other steps will be discussed below.

5.7 Investigating stakeholders and their needs for the Infection Manager

To identify which stakeholders might be involved in the Infection Manager, a brainstorm session, step 3 of the combined method, was performed with several members of the EurSafety Health-net project. This resulted in a list with 36 potential stakeholders, who could be categorized in six roles (step 4), namely: regulators, developers, users, consumers, financing and interest group. An overview of the categorized roles of the stakeholders, after having had a second brainstorm session to make sure all possible stakeholders were mentioned on the list, is shown in Figure 11 .

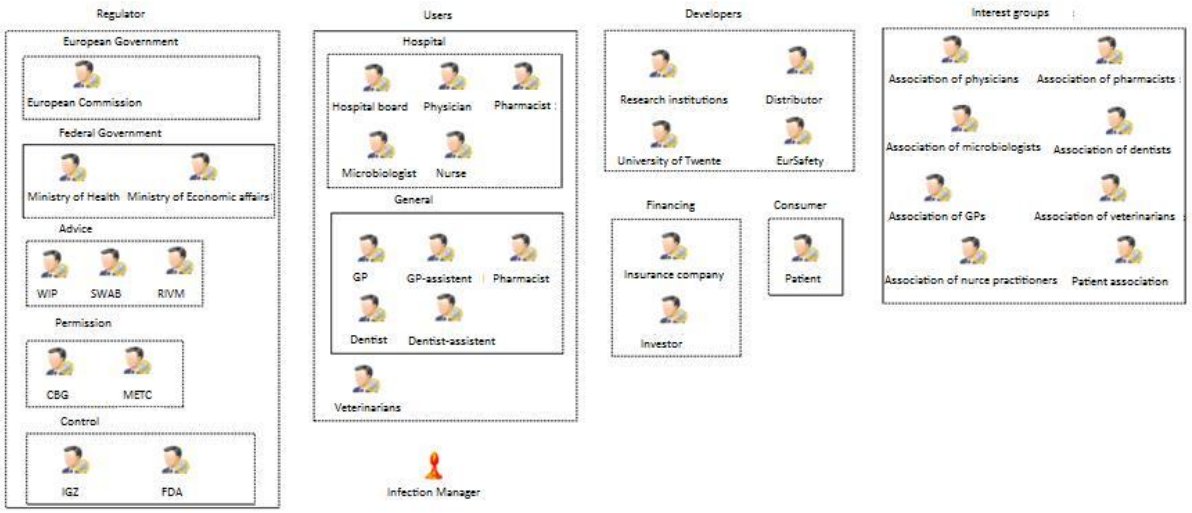


Figure 11: *Overview of possible stakeholders and their roles*

To define which stakeholders would be invited to participate in a questionnaire about the list of stakeholders, an assessment of the degree of salience of stakeholders – based on power, legitimacy and urgency – was performed (step 5). This assessment was performed by the researcher. After having created a table with the possible stakeholders, ordered by their roles, the power, legitimacy and/or urgency of each stakeholder was analysed, considering the definitions of Mitchell et al. (described in section 5.2). When a stakeholder did have power, legitimacy and/or urgency, this was marked by an "X" in the table. The outcomes of the assessment, which showed stakeholders' influence in terms of Mitchell et al. as 'definitive', 'dependent', 'dangerous', 'dominant', 'demanding', 'discretionary' , and 'dormant' (described in 5.2), were discussed with two members of the EurSafety Health-net project. The results of the assessment, including an analysis of the stakeholders' class, are given in Table 2.

Table 2: *Outcomes assessment stakeholders*

Stakeholders' roles	**Stakeholders**	**Stakeholders attributes**			**Stakeholders' class**
		Power	**Legitimacy**	**Urgency**	
Users	Clinician	X	X	X	Definitive
	Dentist	X	X	X	Definitive
	Dentist-assistant		X	X	Dependent
	GP	X	X	X	Definitive
	GP-assistant		X	X	Dependent
	Microbiologist	X	X	X	Definitive
	Nurse		X	X	Dependent
	Pharmacist	X	X	X	Definitive
Developers	EurSafety Health-net project		X	X	Dependent
	Research institute		X	X	Dependent
Regulators/	ECDC	X	X	X	Definitive
Outside agencies	Health Care Inspectorate	X	X	X	Definitive
	Ministry of Health	X	X	X	Definitive
	Health Council		X	X	Dependent
	RIVM			X	Demanding
	SWAB	X	X	X	Definitive
	WIP	X	X	X	Definitive
Decision makers	CGB	X	X		Dominant
	Hospital board	X	X	X	Definitive
	METC	X	X		Dominant
Interest groups	Professional associations		X	X	Dependent
Financing	Insurance company	X			Dormant

As can be seen from this Table 2 , there were many stakeholders mentioned on the list of possible stakeholders that was created in the brainstorm session who had both power and legitimacy and urgency. These stakeholders belonged to the 'definitive' group, according to Mitchell et al. (1997). For this current study, these were the people who were invited to fill in a questionnaire about the Infection Manager and its possible stakeholders.

From the invited participants, who thus belonged to the 'definitive' group, 16 completed the questionnaire – two dentists, two general practitioners, two pharmacists, two pulmonologists, one internist, one marketing analyst of an insurance company, one hospital pharmacist, one member of the board of the KNMvD, one microbiologist, one surgeon, and one veterinarian. The given descriptions of their roles in infection management can be summarized by the following terms (see Appendix C, third and fourth question):

- Analysing data about infections
- Advising other professionals about types of antibiotics and trends
- Making guidelines for infection prevention
- Reviewing/changing local policies regarding prescription
- Setting up Antibiotic stewardship

After the investigation of the degree of salience of the stakeholders, and after having invited specific stakeholders to participate in the questionnaire, consensus about the possible stakeholders (step 6) was checked by analysing the participants' answers to questionnaire (Appendix B), as mentioned in section 4.2.1.

For this, the two questions of the questionnaire that were about whether the participants could mention whether or not a stakeholder is, in their opinion, involved in infection management, were taken into account (Appendix C, fifth and sixth question). The outcomes can be described as presented in the following histogram (Figure 12).

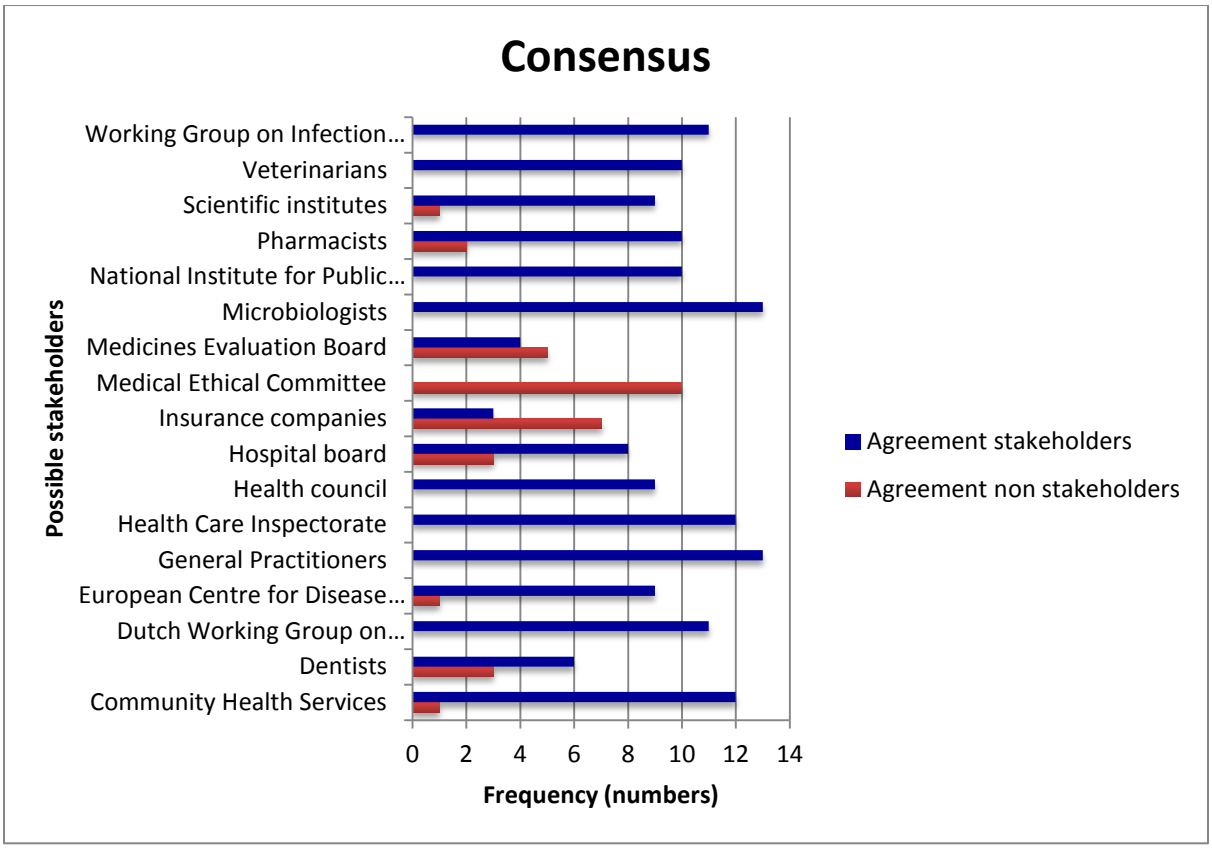


Figure 12: *Overview of consensus from questionnaire*

In Figure 12, the blue bars show the number of times that there was agreement among the participants in the questionnaire that a possible stakeholder (as mentioned on the y-axis) would indeed be related to infection management, and would therefore be needed to be considered in the implementation of the Infection Manager. The red bars show the number of times that participants in the questionnaire did not consider someone or some organisation, as mentioned on the x-axis, as a possible stakeholder in infection management. Since it was not mandatory to fill in whether or not a person or organisation belonged to the stakeholders involved in infection management, the sum of the blue and red bar does not have to be 15.

As can be seen from the histogram there was consensus among the stakeholders who completed the questionnaire that the following eight possible stakeholders had to be taken into account for the development in the Infection Manager:

- Dutch Working Group on Antibiotic Policy (SWAB)
- General Practitioners
- Health Care Inspectorate
- Health council
- Microbiologists

- National Institute for Public Health and the Environment (RIVM)
- Veterinarians
- Working Group on Infection Prevention (WIP)

The stakeholders who participated in the questionnaire did not at all agree about the importance of the Medical Ethical Committee for the development of the Infection Manager. There was no consensus about the importance of insurance companies and the Medicines Evaluation Board either. Since all other possible stakeholders who were mentioned in the questionnaire obtained at least two times more positive than negative votes from the participants in the questionnaire of whether they were possible stakeholders, they were also included for further analysis.

Besides the question whether or not the participants agreed with the list of stakeholders drawn in the questionnaire, the participants were also asked to come up with other possible stakeholders, that were not yet mentioned to them (seventh question of Appendix C). This led to 15 other possible stakeholders, shown in Table 3:

Table 3: *Overview other mentioned possible involved stakeholders*

Other mentioned possibly involved stakeholders:	Frequency: (number)
Animal Drug Authority	1
Cleaning and detergent industries	1
Dutch Federation of Agriculture and Horticulture	1
Federation of Veterinarians of Europe	1
Hygiene and infection prevention department of hospital	1
Hygienists	1
International Federation for Animal Health Europe	1
Medical specialists	3
Midwifes	1
Ministry of Economic Affairs, Agriculture and Innovation	1
Nurses	3
Pharmaceutical industry	2
Vetinf@ct	1
World organisation for Animal Health	1
Working Group on Veterinary Antibiotic Policy	1

From this list with other possible stakeholders, as mentioned by the participants in the questionnaire, the medical specialists and the WVAB were included for the interviews, since these two can also be seen as ‘definitive’ stakeholders, because they also have power, urgency and legitimacy. In practice, this meant that the medical specialists and the WVAB were also asked to

participate in interviews about infection management and the Infection Manager (see chapter 5.8). The other possible stakeholders who were mentioned by the participants in the questionnaire did not fulfil these three criteria, and they were therefore not regarded as salient, and not included in further analyses.

After the analysis of consensus among participants in the questionnaire with respect to possible stakeholders in infection management and after having come to conclusions about which stakeholders needed to be taken into account for the implementation of the Infection Manager based upon the answers obtained from the questionnaire, step 7 (Identify the main concerns of each stakeholder about the proposal and the needs of the stakeholder) had to be taken. Since this step is highly important for answering the third sub-question of this thesis – 'What are the stakeholders' needs in relation to infection management?' – it will be discussed in a separate chapter, below.

5.8 Stakeholders' needs

In this chapter an answer will be given to the second sub-question 'What are the stakeholders' needs in relation to infection management?'. The needs of the stakeholders were investigated in interviews with six participants who had also participated in the questionnaire, as mentioned in section 4.2.2. The main questions were divided into six categories – current situation, interest in a digital portal, content of information, design of the dashboard, use of the portal, willingness to pay – which is also described in section 4.2.2. – . Below, the responses related to the stakeholders' needs obtained from the interview will be discussed per category.

5.8.1 Current situation

To come to conclusions about the stakeholders' needs, it is important to investigate the current situation. This corresponds to the activities that belong to the contextual inquiry of the CeHRes roadmap, as described in section 3.1. The participants of the interviews were asked to describe how they are currently informed about multi-resistance bacteria and antibiotics policies (question 1 of Appendix C). Most participants remarked that the information they obtained came from national reports. The participants working in hospitals also mentioned that the knowledge they have about resistant bacteria also depends on the information that microbiologists give them, or comes from the laboratories which work closely together with hospitals. In Table 4 an overview is given of all of the sources that were mentioned as places where the stakeholders who were interviewed got information about multi-resistant bacteria from.

Table 4: *Overview mentioned sources for information about multi-resistant bacteria*

Source	Frequency (number)
Committees (local and regional level)	1
Conferences	1
Laboratories	2
Microbiologists	3
National reports	4
Professional associations	1
Professional journals	1
WVAB	1

As can be seen from table 4, no source was mentioned by all participants. This, and the fact that most of the participants remarked that there was not one single source that covers all information about infection management at once, emphasizes the importance of such a source, such as the Infection Manager, in which all information can be obtained.

5.8.2 Interest in a digital portal

During the interviews, the participants were also asked whether or not they were interested in a digital portal focused on infection control and infection prevention (question 5-9, Appendix C) . All participants were positive about the development of such a portal, and they all mentioned that it would be good to have a place where all the information they needed could be obtained at once. Other advantages of the Infection Manager mentioned by the stakeholders were that the Infection Manager could make it possible to provide and find up-to-date information, the possibility to compare one's own policy with the national policy on infections – on the condition that the national policy is presented in the Infection Manager –, and that it would possible to exchange knowledge about treatments, infection prevention, and infection control.

Nevertheless, there were also some critical remarks from stakeholders, namely that the Infection Manager would only be useful if it is frequently updated, and some stakeholders expressed their doubts about the efficiency of exchanging information on a forum that is open to a general public as well.

Answers about the desired form of the Infection Manager – as application on mobile phones, tablets or as a website – varied. At this moment, most participants use a computer for their programs they need in their daily work. If the Infection Manager would be connected to the programs they use, they would like to access the Infection Manager on their computer as well. If the Infection Manager can, however, be used for prescribing and controlling antibiotics for a certain patient, then several stakeholders who were interviewed suggested that it might be useful to have the Infection Manager as an application on the mobile phone or tablet as well.

5.8.3 Content of information

To find out what the needs of the stakeholders are regarding the information in the Infection Manager, several questions were asked about the kind of information, and the need adjusting information. In addition, a question was asked about who would need to have to control over information in the Infection Manager (question 10-13 of Appendix C).

What kind of information was desired, depends on the aim of the Infection Manager. As most participants see the Infection Manager as place to collect background information about antibiotics and multi-resistance bacteria, they expect information about the latest trends, research findings and outbreaks in humans as well as in animals. Besides that, information on laws and regulations was mentioned as interesting information that could be presented in the Infection Manager. Other participants believed that the information in the Infection Manager has to be linked with programs used in their practice or hospital, so that the Infection Manager can give information for particular patients. As an example, one stakeholder mentioned that he would like to see the results of the laboratory shown in the Infection Manager, with an automatic indication of the type of antibiotics that is, or has to be used, for how long, with what dose et cetera. It was mentioned that it would also be desirable to see directly what the advice of a microbiologist would be for the treatment of an infection in a particular patient.

The question about the possibility of adjusting information to the Infection Manager, raised a lot of questions about who would be able to adjust information in the Infection Manager, which information can be seen by whom, and how the user can be sure that the information shown is correct. The main conclusion from the answers to this question was that it would be best when a microbiologist decides what kind of information is useful to add to the Infection Manager. By appointing a professional who adjust and controls the information, subjective information from different people about different topics can be avoided. The answers of the interviews showed that most stakeholders who were interviewed preferred a microbiologist in the controlling position. The question about adjusting information also led to the question how participants would be notified if there were changes made in the Infection Manager. Half of the stakeholders who were interviewed would like to receive an E-mail, while the other half believed that a notification in the Infection Manager itself would be enough. Two participants mentioned that they would prefer the possibility to choose whether they would be informed by E-mail or via the Infection Manager.

5.8.4 Design of the dashboard

After having handed out a print screen of the dashboard of the Infection Manager as it is available online at this moment, the participants were asked to give a first reaction and to mention any unclear terminology used for the icon names that occurred on the dashboard. Most first impressions

were positive about the layout and the possibility of using the icons, although several participants indicated that the number of icons might be high. A possible solution to reduce the number of icons was also given by a participant, who mentioned that "It would be great when a user can decide by him/herself which icons are shown on the dashboard" [own translation – AV].

The answers to the question of whether or not the interviewees understood the icon names, demonstrated that the terminology used on the dashboard was not clear to all participants. The term 'Antibiotic Stewardship' was unknown to two of the six participants, and three of them were wondering what you would get after clicking on that icon, since antibiotic stewardship could be used for background information but also for consults.

The term 'Antibiotic Formularium' (antibiotic formulary) also raised a lot of questions. The participants did not know whether you would find information about restrictions by prescribing an antibiotic, or you would get a list with types of antibiotics. Other names that were mentioned as were 'Projectblog' (project blog), 'activiteitenagenda' (Agenda with activities) and 'uitbraakprotocol' (outbreak protocol). It was first sight not clear to the stakeholders who participated in the interviews what kind of information would be put under these icons either.

5.8.5 Use of a digital portal

Besides questions about the content of information and the design – as described above –, the participants were asked whether or not they would make use of the Infection Manager and what conditions have to be met before using the Infection Manager. The main conclusion of the answers to these question is that at this moment the willingness to use the Infection Manager depends on the information in it and its functions. Important requirements that have to be met before the stakeholders who were interviewed would use it, are that the Infection Manager has to be connected to the current programs they are using at work, it has to be easily accessible, time-saving and reliable. The most important functions seem to be the antibiotic formulary and the antibiotic stewardship.

The answers also showed that stakeholders found it important to have the possibility to try out the Infection Manager. The estimated time for this trial varied from three weeks to three months. There was no need for a training about the Infection Manager, if the Infection Manager contained a proper working help function.

5.8.6 Willingness to pay

It became clear during the interviews that the participants had different ideas about who should finance the Infection Manager. In most interviews, the government and hospitals were mentioned as

possible financers for the Infection Manager, but other possibilities for financing were mentioned as well. All mentioned possible financers are shown in table 5.

Table 5: *Overview mentioned possible financers*

Possible financer	(n)
Contribution by professional	2
European Union	1
Government	3
Hospital	3
Microbiologists/ laboratories	1
Multidisciplinary	1
Part of DOT/DBC-system	1
Pharmacotherapeutic compass (Farmacotherapeutisch Kompas)	1

As can be seen from table 5, it seemed not directly clear to the interviewees who should pay for the Infection Manager – there was not one single organisation mentioned by all participants in the interview as the most probable financer. Two participants mentioned the option of a contribution by professionals . One respondent however believed that the Infection Manager will not work out when professionals have to pay by themselves, and another respondent stated that there will be only a willingness to pay for professionals if they use the Infection Manager often. Accordingly, before deciding on whether professionals have to pay themselves for the use of the Infection Manager, these opinions should be taken into consideration. It seems that a proper try out period, as mentioned before as well, should at least be provided for free to users of the Infection Manager.

These results of the interview regarding the stakeholders' needs, are used to determine what the values are that drive the needs of the stakeholders. These values are described in the following paragraph.

5.9 Values behind the stakeholders' needs

This paragraph gives an answer on the last sub question 'What values drive stakeholders' needs'. For this, the stakeholders' needs which derived from the interviews, corresponding values were determined. Which value covers which needs and requirements of the stakeholders who were interviewed, is described below.

As can be seen from the results about the stakeholders' needs (see 5.8), the interviews made clear that there was not one single source that covers all information about infection prevention and infection control. Advantages of the Infection Manager mentioned by the participants were that the

Infection Manager could be a source in which all the information they needed could be obtained at once, the Infection Manager could make it possible to provide and find up-to-date information and it would be possible to exchange knowledge about treatments, infection prevention and infection control. However, mentioned requirements were that the Infection Manager has to be frequently updated, connected to the programs they use in their daily work, and has to work on several different sources as a computer and tablet. Besides that, several participants mentioned that the Infection Manager has to be linked with programs used in their practice or hospital, so that the Infection Manager can give information for – and about the status of – particular patients. These requirements can be covered by the value 'functionality'. In this case, functionality can be defined as the quality of being suited to serve a purpose well (Oxford dictionaries, 2012).

Besides the above mentioned requirements, the outcomes of the interviews regarding the kind of information in the Infection Manager also showed that the kind of information that was desired depends on the aim of the Infection Manager. Since the Infection Manager is seen by most participants in the interviews as a place to collect background information on antibiotics and multi-resistance bacteria, they expect information about the latest trends, research findings and outbreaks in humans as well as in animals. Furthermore, information on laws and regulations was mentioned as interesting information that could be presented in the Infection Manager. These needs correspond to the value 'compatibility', which can be defined as "the ability of exchanging information and using exchanged information" (Van Dale, 2012).

The question about the possibility of adjusting information to the Infection Manager, raised a lot of questions about who would be able to adjust information, which information can be seen by whom, and how can the user be sure that the information shown is correct. By appointing a professional – frequently mentioned was a microbiologist - who adjusts and controls the information, incorrect and subjective information can be avoided. This can be covered by the value 'security'. Security can be defined as the extent to which unauthorized access can be prevented (Oxford dictionaries, 2012), and – in this case – also prevent subjective information.

The value 'usability', defined as "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11, 1998), covers the needs and requirements about the design of the Infection Manager, the trialbility, and the way of getting a notification of reinventions/changes in the Infection Manager. Hence, usability covers the these need of choosing whether or not an icon would be shown on the dashboard, the unambiguous terminology of the icons, and the possibility to choose in which way reinventions or changes in the Infection Manager has to be notified. The meanings about how the

user has to be notified about updates in the Infection Manager varied. Some of the participants preferred an E-mail, while others preferred an online notification. The by two mentioned possibility to choose in what way the user gets a notification, probably satisfies all. Besides that, usability covers the requirements of the easily access to the Infection Manager, the trialability of the Infection Manager, and the requirement that the Infection Manager is time-saving.

Besides these four values, one other value has to be added. During the interview, it became clear that the 'attitude' – "characteristics, with respect to an object" (Van Dale, 2012) – was found very important as well. Several participants had doubts about the feasibility, reliability, and effectiveness of the Infection Manager.

Now the values that drive the needs of the stakeholders have been investigated, an answer to the main research question 'What are the possible critical factors for the implementation of the Infection Manager in healthcare?' will be given in the following chapter, by filling in Osterwalder's (2004) business model canvas. Thereafter, a checklist for identifying possible critical factors will be composed.

6 Conclusion

This part of the thesis provides an answer to the main research question – "What are the possible critical factors for the implementation of the Infection Manager in healthcare?" – by translating the outcomes of the questionnaire and interviews (mentioned in chapter 5) into the business model canvas of Osterwalder (2004) (described in section 3.2). These investigated needs and values can then be taken as a base for the identification of possible critical factors in the implementation of the Infection Manager.

6.1 Critical factors

As mentioned in chapter 3.2, four facets that enhance value can be distinguished within the business model canvas of Osterwalder (2004). These are value creation, value proposition, value delivery, and value capture.

The value creation part of the business model canvas consisted of 'key partners', 'key activities' and 'key resources'. In case of the Infection Manager, the 'key partners' were the identified possible stakeholders. The most important –'definitive' – stakeholders for the Infection Manager were found to be (see section 5.7):

- Dentists
- Dutch Working Group on Antibiotic Policy (SWAB)
- European Centre for Disease Control
- General practitioners
- Health Care Inspectorate
- Hospital board
- Medical specialists
- Microbiologists
- National Institute for Public Health and the Environment (RIVM)
- Pharmacists
- Veterinarians
- Working Group on Infection Prevention (WIP)

The 'Key activities' that have to be performed to come to collaboration among the stakeholders were explored by investigating the stakeholders' needs (mentioned in section 5.8) and the values that drive these needs (described in section 5.9). The main activities that were found to be important for the implementation of the Infection Manager contain fulfilling the requirements that belonged to the values 'functionality', 'compatibility', 'security', and 'usability'. The Infection

Manager must for instance be easily accessible, it has to be frequently updated, and the information has to be correct. Besides these values, it was important to create a positive 'attitude' among the involved stakeholders.

The 'Key resources' for the Infection Manager contained its infrastructure. The Infection Manager has been developed to function as an application that can be used on several different sources – computer, mobile phone and/or tablet.

The value proposition in this study is the Infection Manager itself. The aim of the Infection Manager is to increase patients' safety and infection prevention by infection management in border regions. As mentioned in the results of the interviews with the stakeholders (section 5.8.1), there was not one single source that covers all information about infection management at once. The Infection Manager could be the first source in which all information is available.

The value delivery could be found in the of customer relations, customer segments, and channels in the business model canvas. For this study, the stakeholders were contacted by phone or E-mail. By filling in a questionnaire and/or participating in face-to-face interviews, the stakeholders' opinions and needs were obtained. To investigate the customer segments, the goal of the Infection Manager has to be taken into account. Its goal is not only to reach professionals, but also people who are interested in antibiotics, infection control and infection prevention. Hence, customer segments of the Infection Manager are both the stakeholders mentioned above, but also other possible stakeholders, as mentioned in Figure 11 in section 5.7 and Table 3 in section 5.7. The 'channels' represent how the technology can be accessed by the customers. Although the Infection Manager is still in a developmental phase, it is available via a website. In the future, the Infection Manager has to be available via other sources – as required by the stakeholders – such as mobile phones and tablets as well.

Value capture covered 'cost structure' and 'revenue costs' in the business model canvas. Ideas about revenue costs – how the Infection Manager could be financed – were mentioned during the interviews. Possible financers were listed in Table 5 in paragraph 5.8.6. The most frequently mentioned possible financers were the hospital and the government. But it might also be a good idea to make a structure that includes several financers, so that the user is not dependent on one specific financer. At this moment, as mentioned in the introduction, the development of the Infection Manager is financed by the European Union and regional governments.

Below, in Figure 13, the business model canvas of Osterwalder (2004) is filled in for the Infection Manager.

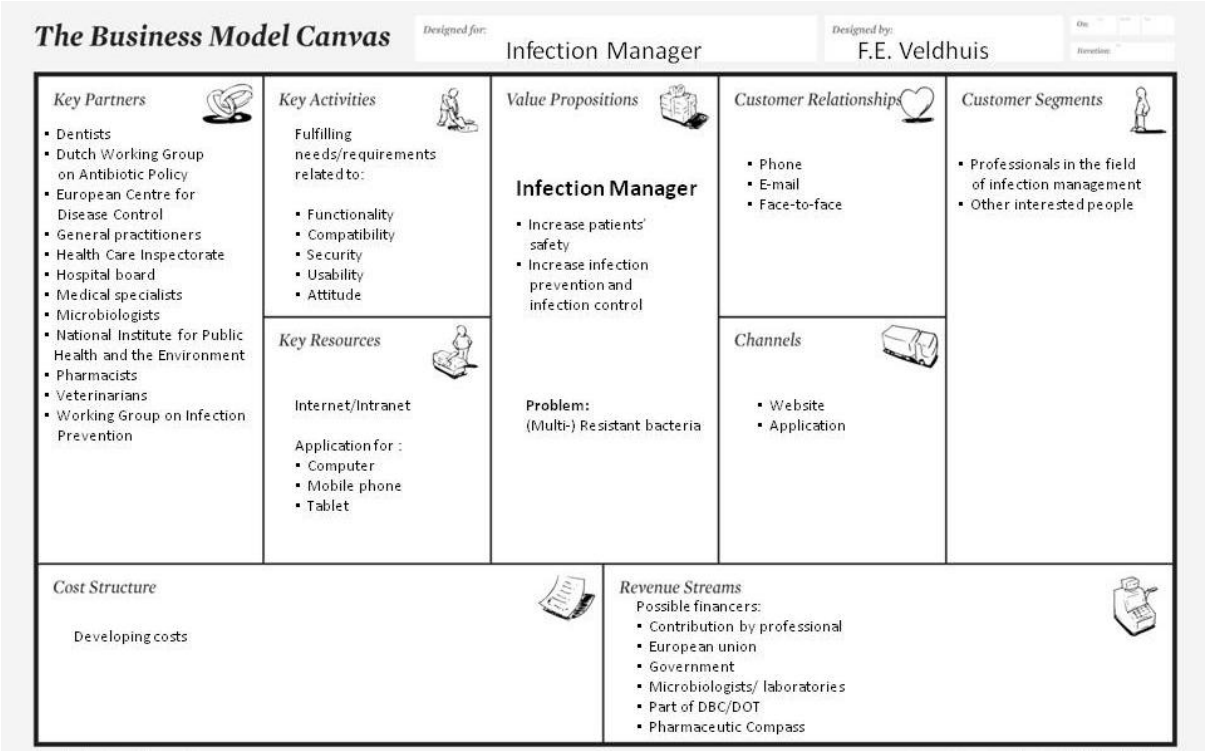


Figure 13: *Business model canvas of Osterwalder (2004) for the Infection Manager*

From this Figure 13, possible critical factors can be derived, by reflecting whether or not a block contains all information needed for the implementation. In the block with the 'key partners' the 'definitive' stakeholders of the Infection Manager were mentioned. If this block is compared to the 'customer segment', the first critical factor can be identified: The involvement of stakeholders. The business model canvas showed that only professional stakeholders were involved, while the Infection Manager is intended for use both by professionals and other interested people, as can be seen in the block 'customer segment' in Figure 13. The second critical factor that can be derived regard the key activities: Are the needs and requirements related to the functionality, compatibility, security, usability and attitude fulfilled? The third critical factor contains the requirements related to the resource that the stakeholder wants to use. Is it possible to use the Infection Manager via the by the stakeholder preferred source? In relation to the value proposition, critical factors are that it has to be clear what problem will be solved by the Infection Manager, and what its aim is. To determine critical factors related to the value delivery, all information about the customer relations, customer segments, and channels has to be unambiguous. The way the relationships are maintained, have to be the way the stakeholders prefer. Otherwise, collaboration between the Infection Manager – or rather, its developers – and the stakeholders can be rather difficult. Besides the problems with collaboration, the channels of the Infection Manager have to be the channels that the stakeholders want to use. The critical factors that are related to the value capture consist of complete information about the cost structure – how much does the development of the Infection Manager cost and how

much will the use and maintenance of the Infection Manager cost – and the revenue costs – who is going to finance the use and maintenance of the Infection Manager –.

The criteria mentioned above can be summarized per value type in the following checklist (Figure 14). The checklist is complemented with possible questions focused on whether or not all necessary information for the implementation of the Infection Manager is known.

Value creation:
- **Are the involved stakeholders known?**
- **Are the needs of the stakeholders in relation to the Infection Manager known?**
- **Are the requirements of the stakeholders in relation to the implementation of the Infection Manager known?**
- **Are the stakeholders' needs in relation to the Infection Manager investigated and fulfilled?**
- **Are the requirements of the stakeholders to use the Infection Manager investigated and fulfilled?**
- **Are the resources for using the Infection Manager known?**

Value proposition:
- **Is the aim of the Infection Manager clear?**
- **Are the problem(s) that can be solved by the Infection Manager determined?**

Value delivery:
- **Is the target group of the Infection Manager investigated?**
- **Are the relationships maintained in a – by the stakeholder preferred – way?**
- **Is the infrastructure of the Infection Manager known?**

Value capture:
- **Is the financing of the Infection Manager arranged?**
- **Are the costs of the development of the Infection Manager known?**
- **Are the costs of using the Infection Manager known?**

Figure 14: *Checklist possible critical factors for the implementation of the Infection Manager*

In sum, regarding the critical factors that derived from translating the stakeholders' needs and values into the business model canvas (Figure 14), and regarding the developed checklist for identifying possible critical factors, it can be concluded that the most questions arise for the value creation. The 'key activity' block of the completed business model canvas, represents the values behind the stakeholders' needs and requirements. These needs' and requirements have to be met to increase the chance for a successful implementation of the Infection Manager.

Since the identified possible critical factors mainly contain requirements of the stakeholders, these critical factors have to be further analysed, to avoid a unsuccessful implementation of the Infection Manager. Hence, this contains the contextual inquiry phase of the CeHRes Roadmap (described in chapter 3.1), in which needs and benefits for different stakeholders are identified and a strategy can be made – in this case if necessary changed – to make sure the requirements of the stakeholders will be met.

7 Discussion

In this chapter, several findings of this study will be discussed. The first section is about the findings on methods of stakeholder analyses and the new, combined method for analysing stakeholders. Thereafter, several remarks about the results from the questionnaire and interviews will be made. In the end, the conclusions about the possible critical factors, that were based on the business model canvas, will be evaluated.

7.1 Stakeholder analysis

In this thesis, fifteen methods for stakeholder analysis were compared to each other by their aims. Besides this comparison, it was investigated for each method whether or not it fulfilled the in this thesis established criteria for a useful method for analysing stakeholders. It could be concluded from this investigation that there was not one single method for stakeholder analysis that fit all of the requirements. This led to the development of a new, combined method for stakeholder analysis, which can not only be used for this thesis, but it can also be used in a later stage of the development of the Infection Manager.

In the new, combined method for stakeholder analysis, the brainstorm technique was used to come to a list with possible stakeholders. A disadvantage of this technique, mentioned by Sharp et al. (1999), can be that it might not be clear when a brainstorm session can be finished, because it is not known when all possible outcomes are mentioned. In this thesis, this disadvantage was counteracted by asking stakeholders – after a first brainstorm session – who they considered important to be involved as a stakeholder as well.

Another point of discussion is the method used for assessing the salience of possible stakeholders in and for the development of the new technology. In this thesis the salience of possible stakeholders was assessed by the researcher and discussed with experts, however, as Hyder et al. (2010) mention in their FHS, it might have been more precise to ask the involved participants to assess the salience of the possible stakeholders.

7.2 Results from questionnaire and interviews

In this study stakeholders were asked to fill in a questionnaire and to participate in interviews. These stakeholders were invited by E-mail or phone, which might have caused a bias in the response. Varvasovszky and Brugha (2000) mentioned that an introductory letter can change the perceptions of a potential participant in a survey, and that might cause desired answers. Hence, the invitation might have influenced the perceptions of the participant. In the future, this problem can be solved by inviting stakeholders who are already in a database of a company that spreads questionnaires, for example Survey Sample International. Another advantage of making use of a company that spreads

questionnaires to different populations in their database is that it might increase the response rate. In this study, the response rate to the questionnaire was low. 36 persons and/or organisations were invited to fill in a questionnaire and 16 people completed the questionnaire. The reason for this low response rate might be that the questionnaires were sent during the summer holiday, and that the invited stakeholders might not have understood the importance of their participation in questionnaires and interviews for the development of the Infection Manager, and that it could be profitable for them personally as well if the Infection Manager matches their wishes.

Another bias that may have occured in relation to the interviews is the interviewer bias. Since the interviews were semi-structured, not all participants got exactly the same questions. As a consequence, not all questions were answered by all participants. In addition, the number of participants in the interviews was rather low. Only six people were willing to participate in the interviews. Because of this low number, and because of the non-response of several possible stakeholders to some of the questions, it may be difficult to generalize over the answers obtained.

7.3 Possible critical factors

The objective of this study was to develop a checklist to identify possible critical factors for a successful implementation of the Infection Manager. In this study the business model canvas of Osterwalder (2004) was used to determine the possible critical factors, although this canvas is not especially intended to determine critical factors in eHealth. Reasons for the inclusion of Osterwalder's model were, however, that this business model includes a large variety of factors such as people, relations, activities and financial issues – that are involved when an innovation is developed and implemented. Despite this positive point about Osterwalder's model, however, it does not show the direction of the relations between different components in the model. It does for instance not show how the 'Key partners' are related to the cost structure or revenue stream. It could be helpful in further research to analyse these relations, as they may lead to further information about which people, activities or factors are most important for a successful implementation of the Infection Manager.

8 Recommendations

In this final section, suggestions for further research will be addressed, based on the outcomes of this study.

In this study, the stakeholders' needs and the corresponding values were based on interviews with stakeholders who belonged to the 'definitive' class according the theory of Mitchell et al. (1997). Since the Infection Manager is not only aimed at professionals, but also at other interested people, it is recommended to conduct also interviews with stakeholders who belong to other classes mentioned in Figure 11 and Table 3 (section 5.7). Besides that, it can be advised to perform a focus group discussion with stakeholders to identify their needs and requirements in more detail.

Another recommendation for the development of the Infection Manager is related to the CeHRes roadmap. The results of this study showed that it is important that the stakeholders' requirements are met. Hence, it may be useful to check the whether or not the strategy for the development of the Infection Manager, made up during the contextual inquiry phase, have to be changed. Furthermore, it is recommended to perform research to investigate whether or not the business model canvas fits best to identify critical factors, or that more critical factors can be identified by another model – for example the STOF-model of Bouwman.

9 References

Academisch Ziekenhuis Maastricht (AZM), *Antibioticaresistentie.* Retrieved from http://www.nfu.nl/trf/index.php?id=9&hoofdstuk=1&trf=678

Alexander, I., (2005) A taxonomy of stakeholders: human roles in system development. *International Journal of Technology and Human Interaction,* 1(1)**,** 23-59.

Biggs, S. & Matsaert, H., (1999). An Actor-oriented Approach for Strengthening Research and development capabilities in natural resource systems. *Public Administration and Development.* 19(3), 231-262

Blair, J.D., Nix, T.W., Payne, G.T., Rotarius, T.M. & Whitehead, C.J., (Unknown) , Stakeholder Management: Strategies and Styles retrieved from books.google.com

Borgatti, S.P., Mehra, A., Brass, D.J. & Labianca, G., (2009) Network Analysis in the Social Sciences. *Science,*323:892

Braspenning, J.C.C., Schellevis, F.G & Grol, R.P.T.M, (2004) *Tweede Nationale Studie naar ziekten en verrichtingen in de huisartsenpraktijk. Kwaliteit huisartsenzorg belicht:* Utrecht/Nijmegen: Nivel/WOK

Broens, T. H. F., Huis in't Veld, R. M. H. A, Vollenbroek-Hutten, M. M. R., Hermens, H. J., van Halteren, A. T. & Nieuwenhuis, L. J. M. (2007). Determinants of Succesful Telemedicine Implementations: a Literature Study. *Journal of Telemedicine and Telecare,* 13 (6), 303-309.

Bryson, J.M., (2004). What to do when Stakeholders matter. *Public Management Review*. 6: 1, 21-53

Cain, M. & Mittman, R. (2002). Diffusion of Innovation in Health Care. *Ihealthreports.* Retrieved from www.chcf.org

Cameron, B.G., Seher, T. & Crawley, E.F., (2010). Goals for space exploration based on stakeholder network value considerations. *Acta Astronautica*. 68:2088-2097

Casparie, A.F., (1989) Naar een optimaal antibioticabeleid: een brede aanpak nodig. *Pharmaceutisch weekblad.* 124:302-5.

Center for eHealth Research and Disease Management (2012). *Key-Stakeholders rank the values.* Retrieved from http://www.ehealthresearchcenter.org/wiki/index.php/Key-stakeholders_rank_the_values

Dale, A.P. & Lane, M.B., (1994). Strategic perspectives analysis: a procedure for participatory and political social impact assessment. *Society and Natural Resources.* 7, 253–267.

Deuning, C.M., (2009). Beddencapaciteit ziekenhuizen 2008. *Volksgezondheid Toekomst Verkenning, Nationale Atlas Volksgezondheid.* Bilthoven:RIVM. Retrieved from www.zorgatlas.nl

Fishman, N. (2006). Antimicrobial Stewardship. *The American Journal of Medicine*. 119, 53-61

Fontaine, C., Haarman, A. & Schmid, S., (2006). Stakeholder Theory of the MNC. Retrieved from edalys.fr/documents/Stakeholders%20theory.pdf

Freeman,R.E.,(1984). *Strategic management: A stakeholder approach.* Boston: Pitman

Geneesmiddelenwet, retrieved from www.wetten.nl (July 26, 2012)

Geneesmiddelenwet. Applicable on July 27th, 2012. Retrieved from http://wetten.overheid.nl/BWBR0021505/geldigheidsdatum_27-06-2012

Grol, R. ,(2001). Successes and failures in the implementation of evidence-based guidelines for clinical practice. *Med Care*, 39(8 Suppl 2):II46-54.

Hare, M., & Pahl-Wostl, C. (2002). Stakeholder Categorization in Participatory Integrated Assessment Processes. *Integrated Assesment.* 3(1), 50-62

Health Council of the Netherlands. (2011). *Antibiotics in food animal production and resistant bacteria in humans* (Health Council of the Netherlands Publication No. 2011/16). Retrieved from www.gezondheidsraad.nl/sites/default/files/201116.pdf

Hu, P. J., Chau, P. Y. K., Liu Sheng, O. R. & Yan Tam, K. (1999). Examining the Technology Acceptance Model Using Physician Acceptance of Telemedicine Technology. *Journal of Management Information Systems*, 16 (2), 91-112.

Hyder, A., Syed, S., Puvanachandra, P., Bloom, G., Sundaram, S., Mahmood, S., Iqbal, M., Hongwen, Z., Ravichandran, N., Oladepo, O., Pariyo, G. & Peters, D., (2010). Stakeholder analysis for health research: Case studies from low- and middle-income countries. *Public Health.* 124: 159-166

Infection Manager (2012). *Dashboard.* Retrieved from www.infectionmanager.com

International Standard (1998). *Ergonomic requirements for office work with visual display terminals. Part 11: Guidance on usability* (ISO 9241-11). Retrieved from http://www.it.uu.se/edu/course/homepage/acsd/vt09/ISO9241part11.pdf

Koninklijke Nederlandse Maatschappij voor Diergeneeskunde, retrieved from www.knmvd.nl

Land- en Tuinbouw Organisatie Nederland (2009) *Zicht op Gezonde Dieren*. Retrieved from http://www.lto.nl/nl/25222839-Zicht_op_gezonde_dieren.html

Mevius, D.J., (2012). *Infectieziekten Bullitin.* Retrieved from http://www.rivm.nl/dsresource?objectid=rivmp:118809&type=org&disposition=inline

Mevius, D.J., Koene, M.G.J., Wit, B., Van Pelt, W., Bondt,N. (2012) MARAN 2012

Mitchell, R.K, Angle, B.R. & Wood, D.J., (1997). Toward a Theory of Stakeholder identification and Salience: Defining the Principle of Who and What Really Counts. Academy of Management Review. 22(4): 853-886

Mulder, M., (2010). Bevolkingsdichtheid per gemeente 2010. *Volksgezondheid Toekomst Verkenning, Nationale Atlas Volksgezondheid.* Bilthoven:RIVM. Retrieved from www.zorgatlas.nl

Nijland, N., (2011). *Grounding eHealth – Towards a holistic framework for sustainable eHealth technologies* (Doctoral dissertation). Retrieved from http://doc.utwente.nl/75576/1/thesis_N_Nijland.pdf

Roede, B.M. & Post, N., (2010). Antibioticaresistentie: Zijn er verschillen tussen Nederland en andere landen? *Volksgezondheid Toekomst Verkenning, Nationaal Kompas Volksgezondheid*: Bilthoven: RIVM. Retrieved from http://www.nationaalkompas.nl/preventie/van-ziekten-en-aandoeningen/infectieziekten/antibioticaresistentie/verschillen-internationaal/

Hoogkamp-Korstanje, J.A.A., Mouton, J.W., Van der Bij, A.K., De Neeling, A.J., Mevius, D.J. & Koene, M.G.J., (2012). *Nethmap 2012: Consumption of antimicrobial agents and antimicrobial resistance among medically important bacteria in the Netherlands.* Retrieved from www.swab.nl

Neu, H.C. (1992). The crisis in Antibiotic Resistance. *Science,* 257: 1064-1073

Osterwalder, A. & Pigneur Y., (2010) *Business Model Generation. In: Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, Switzerland: OSF; 2010.

Oxford dictionaries (2012) retrieved from www.oxforddictionaries.com

Pouldelet, E. (2010), *Nieuwsbrief Nederlandse Public Health Federatie,* (67) retrieved from http://www.nphf.nl/footage/doc/newsletters/NPHF_Nieuwsbrief_-_Nummer_67_-_23_november_2010.pdf

Prezies (2011), *Referentiecijfers maart 2008 t/m maart 2011: Prevalentieonderzoek thema beoordeling antibioticagebruik.* Retrieved from http://www.prezies.nl/zkh/prev/ref_cijfers/Referentiecijfers%20Antibioticagebruik%20tm%20maart%2009.pdf

Reed, M.S. et al. (2008). Who's in and Why? A typology of stakeholder analysis methods for natural resource management. *Journal of environmental Management.* 90: 1933-1949

Rijksoverheid (2012), *Antibiotica.* Retrieved from http://www.rijksoverheid.nl/onderwerpen/infectieziekten/antibioticaresistentie

Savage, G.T., Nix, T, W., Whitehead, C.J. & Blair, J.D., (1991). Strategies for assessing and managing organizational stakeholders. *Academy of Management Executive*. 5:2

Sharp, H., Galal, G. H. & Finkelstein, A., (1999) Stakeholder identification in the requirements engineering process, *Proceedings of the Database & Expert System Applications Workshop*, pp. 387–391.

Stichting Farmaceutische Kengetallen, retrieved from http://www.sfk.nl/nieuws-publicaties/PW/2011/2011-15.html (July 26, 2012)

Stichting Werkgroep Antibiotica Beleid, retrieved from http://www.swab.nl/swab/cms3.nsf/viewdoc/102D6425C642468DC125757F0039CDDE (April 16, 2012)

Van Dale (2012) retrieved from www.vandale.nl

Van Gemert-Pijnen, J.E.W.C., Nijland, N., Ossebaard, H.C., Van Limburg, M.A.H., Kelders, S.M., Eysenbach, G. & Seydel, E. (2011). A holistic framework to improve the uptake and impact of eHealth technologies. *J Med Internet Res*: 5;13(4):e111

Van Limburg, A.H.M., Van Gemert-Pijnen, J.E.W.C., Nijland, N., Ossebaard, H.C., Hendrik, R.M.G. & Seydel, E.R., (2011). Why Business Modeling is Crucial in the Development of eHealth Technologies. *J Med Internet Res,* 13(4):e124

Varvasovszky, Z. & Brugha, R. (2000). How to do (or not to do)… A stakeholder analysis, *Health Policy and Planning*, 15(3): 338-345

Volere (2002) *Volere Stakeholder Analysis Template*. Retrieved from http://www.volere.co.uk.

Werkgroep Veterinair Antibiotica Beleid, retrieved from www.wvab.nl (July 25, 2012)

Wolper, L.F., (2004), *Health Care Administratio, planning, implementing, and Managing Organized Delivery Systems,* New York: Great Neck retrieved from books.google.com

World Health Organization (2007). *Critically important antimicrobials for Human Medicine: Categorization for the Development of Risk Management Strategies to contain Antimicrobial Resistance due to Non-Human Antimicrobial Use*

World Health Organization (2012). *The evolving threat of antimicrobial resistance: options for action*. Retrieved from http://whqlibdoc.who.int/publications/2012/9789241503181_eng.pdf

10 Appendices

10.1 Appendix A

Geachte heer, mevrouw

Zorggerelateerde infecties en antibioticaresistentie van micro-organismen vormen in toenemende mate een bedreiging voor de patiëntveiligheid. Betere samenwerking, communicatie en informatie-uitwisseling op verschillende niveaus in het zorgproces is nodig om dit probleem aan te pakken. Op dit moment wordt aan de Universiteit Twente, in samenwerking met het UMCG, een portaal voor nationaal én grensoverschrijdend infectiemanagement ontwikkeld dat professionals kan ondersteunen in infectiepreventie en –bestrijding, o.a. door bewuster en voorzichtiger antibioticagebruik. Om een goed beeld te krijgen van de verschillende stakeholders (belanghebbenden) willen wij u vragen een korte vragenlijst in te vullen, via de onderstaande link. Beantwoording van de vragen kost u ca. 5 minuten. Uw antwoorden worden vertrouwelijk behandeld, en wij zullen resultaten van ons onderzoek bij deelname z.s.m. ook aan u bekend maken.

https://docs.google.com/spreadsheet/viewform?formkey=dGFWZF9kOHVpN2RyUzh1VksyNkk3d3c6MQ

Astrid Veldhuis, master student Health Sciences, UT
Jobke Wentzel, MSc, promovenda UT
Dr. Lisette van Gemert-Pijnen, universitair hoofddocent UT
Dr. Ron Hendrix, arts-microbioloog Labmicta, UMCG, UT
http://www.eursafety.eu
http://www.infectiemanager.nl

10.2 Appendix B

EURSAFETY HEALTH-NET
eursafety.eu

UNIVERSITEIT TWENTE.

Vragenlijst Infectiemanagement

Geachte heer, mevrouw,

Zorggerelateerde infecties en antibioticaresistentie van micro-organismen vormen in toenemende mate een bedreiging voor de patiëntveiligheid. Betere samenwerking, communicatie en informatie-uitwisseling op verschillende niveaus in het zorgproces is nodig om dit probleem aan te pakken. Op dit moment wordt aan de Universiteit Twente, in samenwerking met het UMCG, een portaal voor nationaal én grensoverschrijdend infectiemanagement ontwikkeld dat professionals kan ondersteunen in infectiepreventie en –bestrijding, o.a. door bewuster en voorzichtiger antibioticagebruik. Om een goed beeld te krijgen van de verschillende stakeholders (belanghebbenden) willen wij u vragen een korte vragenlijst in te vullen. Beantwoording van de vragen kost u ca. 5 minuten. Uw antwoorden worden vertrouwelijk behandeld, en wij zullen resultaten van ons onderzoek bij deelname z.s.m. ook aan u bekend maken.

Astrid Veldhuis, master student Health Sciences, Universiteit Twente
Jobke Wentzel, MSc, promovenda Universiteit Twente
Dr. Lisette van Gemert-Pijnen, universitair hoofddocent Universiteit Twente
Dr. Ron Hendrix, arts-microbioloog Labmicta, UMCG, Universiteit Twente
http://www.eursafety.eu
http://www.infectiemanager.nl

Onder infectiemanagement verstaan wij het geïnformeerd samenwerken aan het terugdringen van de gevaren die door (multi-) resistente micro-organismen worden veroorzaakt in zowel zorginstellingen als de samenleving in het geheel. Infectiemanagement kan dus zowel in de praktijk als op beleidsniveau van toepassing zijn door, bijvoorbeeld, het toepassen respectievelijk vastleggen van preventieve maatregelen tegen infecties.

Wat is de naam van de organisatie waar u werkt?

_____

Wat is uw functie binnen de organisatie waar u werkt?

_____

Bent u betrokken bij infectiemanagement? Ja/nee, omdat…

_____

Welke rol/taken heeft u bij infectiemanagement?

_____

_____

Welke stakeholders zijn volgens u van belang bij infectiemanagement? Meerdere antwoorden mogelijk

- o Apothekers
- o College ter Beoordeling van Geneesmiddelen
- o Dierenartsen
- o Europees Centrum voor Ziektepreventie en -bestrijding (ECDC)
- o GGD
- o Huisartsen
- o Inspectie voor Gezondheidszorg
- o Medisch Etische Toetsingscommissie
- o Microbiologen
- o Ministerie van Volksgezondheid, Welzijn en Sport
- o Raad van bestuur van een ziekenhuis
- o Rijksinstituut voor Volksgezondheid en Milieu
- o Stichting Werkgroep Antibiotical Beleid
- o Stichting Werkgroep Infectie Preventie
- o Tandartsen
- o Verzekeringsmaatschappijen
- o Wetenschappelijke onderzoeksinstituten

EURSAFETY HEALTH-NET
eursafety.eu

UNIVERSITEIT TWENTE.

Wie (welke functies/organisaties) is/zijn er volgens u nog meer betrokken bij infectiemanagement?

_____

_____

Wie zijn volgens u geen stakeholders bij infectiemanagement? Meerdere antwoorden mogelijk

- o Apothekers
- o College ter Beoordeling van Geneesmiddelen
- o Dierenartsen
- o Europees Centrum voor Ziektepreventie en -bestrijding (ECDC)
- o GGD
- o Huisartsen
- o Inspectie voor Gezondheidszorg
- o Medisch Etische Toetsingscommissie
- o Microbiologen
- o Ministerie van Volksgezondheid, Welzijn en Sport
- o Raad van bestuur van een ziekenhuis
- o Rijksinstituut voor Volksgezondheid en Milieu
- o Stichting Werkgroep Antibiotical Beleid
- o Stichting Werkgroep Infectie Preventie
- o Tandartsen
- o Verzekeringsmaatschappijen
- o Wetenschappelijke onderzoeksinstituten

[redacted]

Op het portaal voor infectiemanagement zal een aantal applicaties beschikbaar komen die o.a. zorgverleners, patiënten, specialisten en managers kunnen ondersteunen in het geven, ontvangen, adviseren en evalueren van infectie-gerelateerde zorg. Tevens kunnen professionals elkaar via het platform informeren, en helpen om de patiëntveiligheid op het gebied van infectieziekten te versterken. Daarnaast zal het bijvoorbeeld voor geïnteresseerden mogelijk zijn om op het platform informatie over antibiotica in te winnen.

Wat zou voor u de meerwaarde zijn van een portaal voor infectiemanagement?

_____

_____

Denkt u dat u een portaal voor infectiemanagement zou bezoeken/gebruiken? Ja/nee, omdat…

_____

_____

In de volgende fase van dit onderzoek willen wij ingaan op de verschillende standpunten die zijn voortgekomen uit deze vragenlijst. Mogen wij u benaderen om deel te nemen aan dit vervolgonderzoek?
Zo ja, noteer dan uw contactgegevens:

- o **Naam:**

_____

- o **E-mailadres:**

_____

- o **Telefoonnummer:**

_____

10.3 Appendix C

tijd	Vraag/onderdeel	doel
2 min	**Introductie:** Onlangs hebt u een vragenlijst van het EurSafety Health-net project ingevuld over betrokkenen/stakeholders bij infectiemanagement. In deze vragenlijst hebt u aangegeven dat wij u mochten benaderen voor vervolgonderzoek. Daarom bent u nu gevraagd voor dit interview. Aan de hand van dit interview willen wij proberen te achterhalen welke factoren voor u van belang zijn bij eventuele implementatie van de Infection Manager en welke informatie volgens u op de Infection Manager zou moeten bevatten. Om de gegevens goed te kunnen verwerken wil ik dit gesprek graag opnemen. De uitkomsten worden vertrouwelijk behandeld. Ik vraag u eerst om geschreven toestemming voor deelname (informed consent), dan start ik de opname-apparatuur	Uitleg geven over doel onderzoek
Start voice tracer		
	Huidige situatie	**Algemeen**
3 min	***1.*** Hoe wordt u op dit moment op de hoogte gehouden over het antibioticabeleid en multiresistente bacteriën binnen uw vakgebied? ***2.*** Op welke manier zou u op de hoogte gehouden willen worden over het antibioticabeleid en multiresistente bacteriën? ***3.*** Wat doet u nu aan infectiemanagement? ***4.*** Werkt u daarin samen met andere professionals? (Zou u nog meer samen kunnen werken?)	• WIP/SWAB/ bijeenkomsten beroepsgroep • • Antwoord in 1e vragenlijst • Met wie
	Belang digitaal portaal	**Nut**
5 min	***5.*** De infection Manager is een website/digitaal portaal voor nationaal én grensoverschrijdend infectiemanagement dat professionals kan ondersteunen in infectiepreventie en –bestrijding, o.a. door bewuster en voorzichtiger antibioticagebruik. Wat is uw eerste reactie op zo'n portaal? ***6.*** Wat vindt u van een digitaal portaal om de patientveiligheid op het gebied van multiresistente bacteriën te vergroten? ***7.*** Past een digitaal portaal binnen uw huidige werkproces (binnen de huidige apparatuur die u gebruikt) ? (Via welk medium zou u het digitale portaal willen gebruiken?) ***8.*** Ziet u voordelen aan het gebruiken van een digitaal portaal? ***9.*** Ziet u nadelen ziet u aan het gebruiken van een digitaal portaal?	• Wel/niet handig • Kansen/gevaren • Computergebruik/ tablet/geen technologie • Alles bij elkaar, meer contact • Te uitgebreid, niet specifiek genoeg

	Informatie inhoud	
5 min	***10.*** Welke informatie zou u op de infection manager willen hebben staan? ***11.*** Zou u zelf informatie willen kunnen toevoegen? Zo ja, op welke manier? ***12.*** Hoe zou de nieuwe informatie volgens u gecontroleerd moeten worden? ***13.*** Hoe zou u op de hoogte gebracht willen worden van wijzigingen in de infectiemanager?	• Afh. van beroepsgroep • Mail/online/ • Deskundig pannel (wie moet daar in?) • In applicatie/per mail
	Design dashboard	**Overzichtelijkheid**
6 min	***14.*** Hier (fig. 1) ziet u een screenshot van het zogenaamde dashboard van de infectiemanager. Wat is uw eerste reactie op dit dashboard? ***15.*** Wat vindt u van de vormgeving? ***16.*** Is het dashboard overzichtelijk voor u? ***17.*** Zijn de termen waarmee iconen worden aangeduid duidelijk? ***18.*** Zou u naar aanleiding van het getoonde voorbeeld gebruik willen maken van de Infection Manager	• Overzichtelijk/ functioneel • Wat is duidelijk/ onduidelijk • Waarom wel/niet • Welke termen zijn niet duidelijk? • Afhankelijk van informatie/inhoud
	Gebruik	
5 min	***19.*** Waarvoor zou u met de Infection Manager willen gebruiken? ***20.*** Waarom zou u de de Infection Manager wel/niet gebruiken? ***21.*** Zou u de mogelijkheid willen hebben om de Infection Manager tijdelijk te proberen? ***22.*** Zou u uitleg/ training willen hebben in het gebruik van de Infection Manager? ***23.*** Zou het voor u een meerwaarde zijn als de Infection Manager is gekoppeld aan uw sociale netwerk(en)? ***24.*** In hoeverre is een aansluiting met/weergave van regelgeving van belang? ***25.*** Aan welke voorwaarden moet worden voldaan voordat u de infectiemanager zou willen gebruiken?	• Informatie krijgen/delen/ • Overbodig/handig • Gedurende weken/maanden • Uitleg schriftelijk via help, live chat, pers. trainning • Voordeel?Waarom dat netwerk? • Voorwaarde voor gebruik/ onbelangrijk • Keurmerk/ Compleet programma, functionerend