MASTER'S THESIS

Designing an interoperability framework with benefits, barriers and challenges for healthcare ecosystems: A case study in an elderly care ecosystem

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Designing an interoperability framework with benefits, barriers and challenges for healthcare ecosystems: A case study in an elderly care ecosystem

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Abstract

Sharing medical information between practitioners has been a challenge for healthcare organizations for a long time. Semantic, syntactic, technical and pragmatic interoperability standards, if present, can be different per healthcare sector. For the quality of healthcare it is essential that healthcare practitioners have access to accurate and up to date information.

Interoperability can provide a more longitudinal medical record of patients health and delivering the promise of Electronic Medical Records (EMR). Developing interoperability is however slow due to its complexity and uncertainty for decision makers over the results, initial and running cost and long-term investments needed.

This research was conducted by designing an interoperability framework with benefits, barriers and challenges for a healthcare ecosystems in elderly care. From a systematic literature review (SLR) an initial framework was designed and then empirically tested in an elderly care ecosystem.

The results show a framework with 8 interoperability levels and 22 sublevels with aspect descriptions that could help decision-makers in healthcare ecosystems making more substantiated decisions. We found that the aspects concerning policies, health processes, information and cost are most relevant and promising for the success of interoperability. The role for governance and government in this development remained open.

Key terms

Interoperability, healthcare ecosystem, benefits, barriers, challenges, elderly care.

Summary

Interoperability in healthcare ecosystems is an important subject for quality development in healthcare. Both government and healthcare organizations strive for national and regional solutions for better sharing information and creating a more longitudinal medical record of patient's health. However, the complexity involved with interoperability can be discouraging for organizations. The objective of this study is to reduce complexity by providing a better understanding of the benefits, barriers & challenges faced by healthcare organizations when implementing interoperability. To do so, we formulated the following research question.

What does a framework of interoperability benefits, barriers and challenges in a healthcare ecosystem look like?

To answer this question we performed a Systematic Literature Review (SLR) resulting in an initial framework and then empirically test the framework in an embedded case with semi- structured interviews.

We expected to find a variety of similar articles in the SLR since interoperability is an important subject in healthcare. What we found however was a lack thereof, missing a comprehensive overview of the subject. Some articles focused on the technical part of interoperability and some on the syntactic or semantic part of interoperability.

We found that benefits, barriers and challenges are closely related. If a barrier or challenge is resolved, it will likely result in a benefit for the organization, often on the same level. We used the Nictiz framework as a template and for each level in the framework we distinguished the benefits

and barriers & challenges. The SLR resulted in eight levels and 23 sublevels containing benefits and barriers & challenges of interoperability in healthcare ecosystems.

The empirical part aimed at testing the initial framework, was conducted in an elderly care ecosystem with four healthcare organizations. We performed 12 semi- structured interviews with each 40 questions. The interviewees were asked for relevance for each aspect in the framework, their overall impressions on completeness, its usability for organizations and a ranking of the aspects in the framework. This resulted in our final framework.

Our research shows that our framework is helpful in reducing complexity for healthcare organizations. A clear overview of the aspects involved when implementing interoperability will help substantiate decision makers and communication with the stakeholders within the ecosystem as well as with legislators, financiers, and software developers. It helps to know which aspects need to be addressed and resolved for information to be readily available when practitioners need it. The research also shows that the need for timely and accurate information is increasing with patients receiving care from multiple organizations simultaneously.

The research shows that costs play an important role in current decision making and was therefore a just level to add to the framework. With growing cost for healthcare in general and shortage of practitioners, interoperability could have a considerable impact on reducing the administrative burden (now 45% of their time) and by extension healthcare in general.

The framework shows different types of standardization, conditional for the success of interoperability. The interviews also showed us that healthcare has a need for the practitioners perception of patient's health for which free text is still needed. From a practitioners point of view there is still a preference for unstructured information above limitations in structured information. Meaning that within the standards it is conditional not to restrict information so that it creates new problems.

From the ranking of the aspects we learned that the policy, health process, information and cost aspects were considered as most important for the success of interoperability. Since this was found on both the benefits as well as the barriers and challenges and that these might be interconnected, we advise investments in the aspects first for fast and sound results.

Finally we could not make a clear determination whether governance should be presented as part of or separate in the framework from the policy and legal level. This is due to the regional approach that is currently in effect in the Netherlands. The interviewees stated pros and cons to this approach and the role government has to facilitate the development of interoperability with regulations, standardization, security and fundings. Since governance aspects were deemed important by the interviewees, we believe future research is needed to get a better understanding how governance in healthcare interoperability can be positioned best.

List of abbreviations

- CCR Continuity of Care Record
- CDA Clinical Document Architecture
- CDE Common Data Elements
- DICOM Digital Imaging and Communications in Medicine
- EDIFACT Electronic Data Interchange for Administration, Commerce and Transport
- EHR Electronic Health Record
- EMR Electronic Medical Record (internal domain of a health organization)
- EPD Electronic Patient Dossier (Dutch)
- FHIR Fast Healthcare Interoperability Resources
- GDPR General Data Protection Regulation
- GP2GP general practitioner to general practitioner exchange
- HIE Health Information Exchange
- HIS Health Information Systems
- HIT Health Information Technology
- HIMSS Healthcare Information and Management Systems Society
- HL7 Health Level Seven
- IHE Integrating Healthcare Enterprise
- IDMP Identification of Medicinal Products
- IEEE Institute of Electrical and Electronics Engineers
- ICD/ICF/NNN Family of International Classifications
- ICPC International Classification of Primary Care
- IHE Integrating the Healthcare Enterprise
- IoT Internet of Things
- LMR longitudinal medical record
- LOINC Logical Observation Identifiers Names and Codes
- M-Health Mobile Health, health supported by mobile devices
- NHIN Nationwide Health Information Network
- openEHR Open standard for Electronic Health Record
- OSI Open Systems Interconnection model
- PHR Personal Health Record
- SOA Service Oriented Architecture
- SOAP Simple Object Access Protocol
- SNOMED CT Systematized Nomenclature of Medicine (Clinical terms)
- Telehealth The distribution of health-related services via telecommunication technologies
- WGBO Medical Treatment Contracts Act
- XDS Cross Enterprise Document Sharing

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1. Introduction

1.1. Background

Sharing medical information between practitioners has been a challenge for healthcare organizations for a long time. In 2011 the development of a National Electronic Patient Dossier (EPD) was abandoned due to concerns over the safety of the system. Healthcare organizations have struggled since to find solutions for sharing medical information between organizations (*Eerste Kamer Verwerpt Unaniem Voorstel Landelijk EPD - Eerste Kamer Der Staten-Generaal*, n.d.). The ministry of public health, aware of the challenges, has been supporting healthcare organizations with subsidy programs aimed at sharing medical information through interoperability. Subsequent legislation will be developed in the upcoming years to make this transition mandatory for healthcare organizations (*Gegevensuitwisseling | Gegevensuitwisseling in de Zorg*, n.d.).

Interoperability can be defined as the ability of two or more systems to exchange information and to use functionality of one another (Chen et al., 2008). "Without interoperability and health information exchange, health information will remain in proprietary silos" (Brailer, 2005). Through Interoperability in healthcare, clinicians will (finally) have access to a longitudinal medical record of their patient's health. Interoperability can thus be seen as a fundamental requirement to derive the benefits of electronic medical records (EMR) in enhancing the quality of healthcare with faster and more accurate information.

Implementing interoperability also comes with barriers and challenges. Initial costs appear to be high and return on investment uncertain, thus causing the sector to be unwilling to implement interoperability (Adenuga et al., 2015). Furthermore, there is no overall coordination for sharing information between different information systems and healthcare organizations have no economic incentive or legislative obligation to share medical information with other organizations (Hjort-Madsen, 2006). Hjort-Madsen's study also shows that interoperability is not just a technical issue but that organizational, economic and political factors are just as important. Finally, healthcare consists of many specialties with their own requirements, governance, standards and systems making it difficult to share information between these specialized systems (Benson & Grieve, 2021).

Acceptance of interoperability has been slow due to the complex nature of healthcare and the severity that a single error can have on a patient's health (DePalo & Song, 2012). Due to this complexity healthcare organizations struggle in implementing interoperability. This study aims to give a better understanding of the benefits, barriers and challenges considered by healthcare organizations when implementing interoperability in healthcare ecosystems.

1.2. Exploration of the topic

This study has been carried out in the field of **interoperability** in healthcare ecosystems. Interoperability can be understood as the ability of two or more systems or components to exchange information and to use the information that has been exchanged (Geraci et al., 1991). Interoperability is commonly seen as occurring at four levels (Janssen et al., 2014):

- **technical interoperability** refers to network connectivity, moving data from system A to system B bridging the effect of distance;
- **syntactic interoperability** refers to implementing standards to ensure structured data can be exchanged over an infrastructure;
- **Semantic interoperability** refers to creating ontologies and meta data for interpretation of information;

- **Pragmatic interoperability** refers to all organisational and collaborative aspects of quality and trust;

Benson et al. (2021) describes clinical interoperability as an extra level defining it as the ability of two or more clinicians in different care teams to transfer patients and provide seamless care to the patient. The potential for interoperable healthcare ecosystems is in improving the quality of patient's care with a longitudinal medical record (Braunstein, 2015). Interoperability can bind together networks of real-time life- critical data that will drastically transform information accessibility in healthcare (Brailer, 2005). Without means of integration, medical information will remain in proprietary silo's causing fragmentation of information and a risks for patient's health when information is not available when doctors need it.

Healthcare ecosystems can be seen as digital platform ecosystems. Digital platform ecosystems comprise of a platform owner (a) that implements governance mechanisms (b) to facilitate value creating on a digital platform between the platform owner (c) and an ecosystem of autonomous complementors and consumers (d) (Hein et al., 2020). In healthcare in the Netherlands however, there is no precise platform owner implementing governance and legislation is limited so far, but autonomous organizations are working together in regional partnerships striving to share the governance responsibility of the ecosystem in the coming years.

Nictiz, the knowledge organization for digital information sharing in healthcare in the Netherlands, has developed an **Interoperability framework** for healthcare (figure 1). This framework has been used to structure a Reference Domain model for the Care (RDC) and a reference architecture for hospitals (*ZiRAonline.Nl*, n.d.). ZIRA can be seen as a daughter of the Netherlands government reference architecture (NORA, which on its turn was derived from the European Interoperability Reference Architecture (EIRA).

A distinctive feature in this framework is the addition of Health processes between the Policy and Information level. We will use this framework as a 'business standard' in this study to identify benefits, barriers and challenges on each level of this framework. This framework will thus help structure our research when extracting information from literature and in the empirical part. Other frameworks such as TOGAF and the Zachman framework are more generic and less used in healthcare in the Netherlands which makes this framework a logical choice for this study.

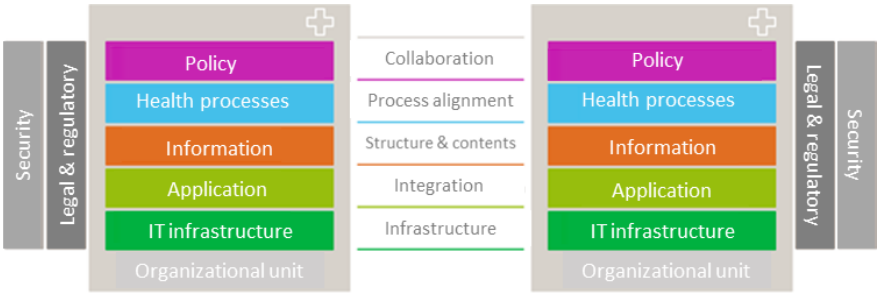

Figure 1, Nictiz framework for interoperability

1.3. Problem statement

Implementing interoperability in healthcare ecosystems brings benefits, barriers and challenges for organizations. The benefits lay in a (more) longitudinal medical record through which clinicians will have a better understanding of patient's health. The problem however is that these benefits are relatively unknown to management thus making them less willing to invest in interoperability.

The barriers and challenges lay in the complexity involved. Technical, economical, organizational and legislative barriers and challenges need to be overcome when implementing interoperability. A clear view of these barriers and challenges is needed in organizations to estimate the nature and magnitude of these barriers and challenges and to find possible solutions when implementing interoperability.

Interoperability will stay as complex as it is, unless an overview can be given from research. A framework will help organizations estimate interoperability opportunities, cope with barriers and challenges and help making substantiated decisions towards interoperability.

1.4. Research objective and questions

The objective of this study is to provide a better understanding on how organizations in elderly care can benefit from interoperability. Furthermore, we aim to give a better understanding on the barriers and challenges organizations face when implementing interoperability in healthcare ecosystems. From a Systematic Literature Review (SLR) it is our goal to construct a theoretical framework with interoperability benefits, barriers and challenges. We will than empirically test this framework in an elderly care ecosystem by confronting this framework to a real-world situation. With this study we seek to add knowledge on this subject that can help organizations benefit from interoperability and deal with barriers and challenges along the way. This study aims to contribute to the knowledge of interoperability in healthcare ecosystems by answering the following research question:

What does a framework of interoperability benefits, barriers and challenges in a healthcare ecosystem look like?

Theoretical framework:

1. ***What are the interoperability benefits for healthcare organizations from literature?***
2. ***What are the interoperability barriers and challenges for healthcare organizations from literature?***
3. ***How can these factors (benefits and barriers) be integrated in an initial conceptual framework?***

Empirical research:

1. ***How can the identified interoperability benefits from the healthcare literature be validated with empirical information?***
2. ***How can the identified interoperability barriers and challenges from the healthcare literature be validated with empirical information?***
3. ***How do healthcare organization cope with these aspects when implementing interoperability in healthcare ecosystems?***

The theoretical framework sub- questions will be answered in the SLR. The SLR will provide us with relevant studies on our subject. We will then code specific word or phrases from the articles, analyse, summarize and synthesize these aspects in an initial framework in the next chapter.

The empirical research sub- questions will be answered with semi-structured interviews in a healthcare ecosystem. The interviews will provide us with information that help validate and refine our initial framework in chapter four.

1.5. Motivation/relevance

Interoperability in healthcare ecosystems is an important subject for quality development in healthcare. Governments and healthcare organizations strive for solutions for better information sharing and thus creating a more longitudinal medical record of patient's health. The complexity involved in developing interoperable healthcare ecosystems makes organizations hesitant to invest in these systems.

This study is relevant because its objective is to provide a better understanding on the benefits, barriers and challenges faced by healthcare organizations for elderly care when implementing interoperability. This study and its theoretical framework can be used to discover how other healthcare organizations and ecosystems cope with the complexity of implementing interoperability. Furthermore, this framework can help organizations dealing with the complexity involved when implementing interoperability and help to overcome barriers and challenges to create the so desired benefits of a longitudinal medical record.

1.6. Main lines of approach

In this chapter we described an introduction to interoperability, benefits, barriers and challenges faced by healthcare organizations. In the next chapter we will perform a systematic literature review to create a better understanding about our subject that will help us to answer our research questions in a theoretical framework. In the third chapter we describe the methodology of our empirical research. After the research is executed and data is collected in chapter four, we will compare the results with the theoretical model and draw conclusions from that in chapter five. We conclude with recommendations for further research.

2. Theoretical framework

2.1. Research approach

The theoretical foundation of interoperability benefits, barriers and challenges faced by healthcare organizations will be developed in this section trough a Systematic Literature Review (SLR). Our goal is to create a better understanding of our subject from literature, and connect this study with previous research thereby by providing a well-structured review of the prior studies on this research topic. We will use an SLR to create an initial framework we will test in the empirical part of this study. In this SLR we aim to answer the following questions:

1. *What are the interoperability benefits for healthcare organizations from literature?*
2. *What are the interoperability barriers and challenges for healthcare organizations from literature?*
3. *How can these factors (benefits and barriers) be integrated in an initial conceptual framework?*

In this SLR we will use the four stage selection process from Dybå (2007) shown in figure 2.

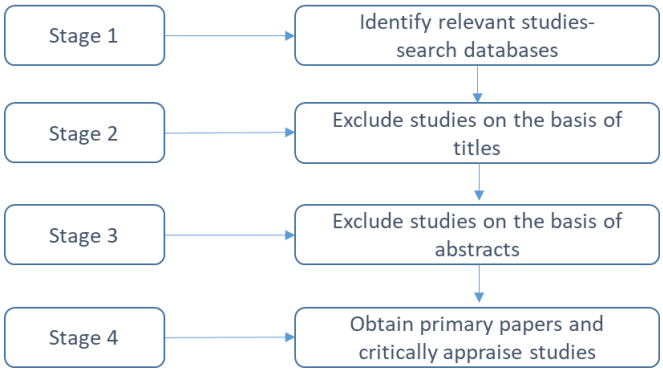

Figure 2, Selection process from Dybå

To identify relevant articles we will use the building block method. This means that we will combine different key terms and their synonyms in one search string using Boolean Operators. The key terms were derived from the research questions and using synonyms for benefits (advantages), barriers (obstacles) and challenges (problems, issues). We have chosen to use 'TitleCombined' and 'Abstracts' terms in our query to enhance relevance. In this study we will use the Open University's (OU) database to find relevant studies (stage 1) since it is possible to search in multiple databases simultaneously and its advanced search options. The search query used in stage 1 is shown below:

((TitleCombined:(interoperability)) OR (Abstract:(interoperability))) AND ((TitleCombined:(healthcare)) OR (Abstract:(healthcare))) AND ((TitleCombined:(benefits OR advantages)) OR (Abstract:(benefits OR advantages))) AND ((TitleCombined:(barriers OR obstacles OR challenges OR problems OR issues)) OR (Abstract:(barriers OR obstacles OR challenges OR problems OR issues)))

For stage 2 we exclude studies based on the title. Studies about specific interoperability solutions or in specific fields will be excluded to preserve a wide perspective for this stage. In stage 3 we will study the abstracts of the remaining articles and compare them to our research questions. In stage 4 the remaining articles will be examined in detail to determine relevance. The results of this process are shown in Appendix A2.

Inclusion criteria in this SLR

- Peer reviewed publications only;
- English;
- Publication dates from 2010-2021;
- Studies about interoperability in healthcare ecosystems;
- Studies about benefits, barriers and challenges in interoperability in healthcare;
- Studies about implementing interoperability in healthcare;

Exclusion criteria in this SLR

- Studies about specific technical solutions such as blockchain and IoT;
- Studies outside of healthcare;
- Studies mainly related to interoperability within healthcare organizations since we seek interoperability between organizations;

Data extraction & synthesis

After the literature selection process, we will evaluate and extract useful information. The purpose of evaluating is to determine relevance and value of the studies for our research (Saunders et al., 2019). To determine relevance, we will use a template with review questions (Appendix A1). For extracting relevant information we will use Atlas.ti to code specific words, lines or phrases that help us answer the questions in the first part of this section. Coding will be performed on the aspects of *benefits*, *barriers* and *challenges* regarding interoperability in healthcare ecosystems. The descriptions of these aspects from the articles, will be classified on the levels of the Nictiz framework for interoperability. The Nictiz framework is developed as an interoperability reference for healthcare in the Netherlands (section 1.2) and will help structure the extraction process. The descriptions in table 1 were used to classify the aspects. Results are shown in Appendix A3.

Table 1, Nictiz levels translated from Nictiz.nl

Nictiz Framework	Definition
Policy	This level relates to the organizational side of the collaboration between the healthcare organizations involved.
Health processes	This level relates to the process side of the collaboration between the care organizations (clinical teams) involved.
Information	This level relates to the information aspects. What information must be recorded and shared in the context of the collaboration during the transfer moments in care processes. Standards: SNOMED, ICF, NNN, LOINC, ICD 10.
Application	This level relates to the information systems that are relevant for the healthcare organization involved in collaboration and how the required information is shared between these systems. Standards: HL7, FHIR, EDIFACT.
IT Infrastructure	This level relates to the technical infrastructure within which the information systems of the organizations involved are located, such as the network, servers, database engine. Standards: IHE, XDS
Security	Agreements about the availability, exclusivity and integrity of all forms of information. These agreements relate to all levels of architecture.
Legal & regulatory	Agreements about cooperation at national and international level as laid down in law or regulations.
Optional level	This level is added as an optional level in case of relevant data in the literature that could not be positioned in the levels above.

The results of the extraction forms will be summarized, classified and integrated into our initial framework in four stages (Figure 3). For each level in our framework we will collect the aspects from

Appendix 3 and remove any duplicates. This will result in a long list of all the aspects we found in the SLR. Aspects that could be classified in more than one level from the descriptions in the articles, will be parted and moved to the according level based on the definitions in table 1. The remaining aspects will be summarized in short statements describing the main benefits or barriers and challenges for each level in our framework .

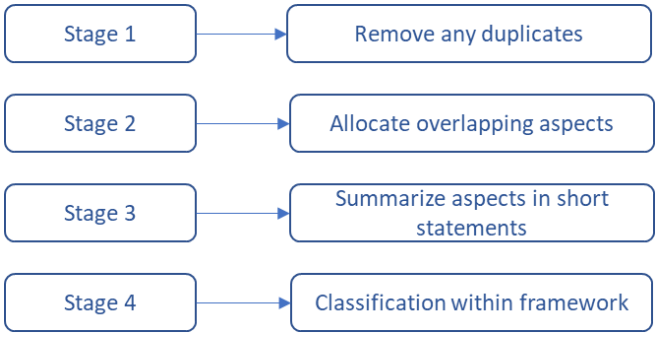

Figure 3, synthesis process

Validity & reliability

In this SLR we watch over reliability by describing our approach in detail. We started with a broad search query with 128 results. Had we included 'ecosystems', the results would probably have been to narrow thus resulting is missing relevant studies. We are aware of the large amount of articles on interoperability in healthcare that will probably in some form mention benefits, barriers and challenges. For this study however we chose these aspects as our main objective an thus expected these aspects in the title or abstract for our SLR when we created our search string.

To enhance construct validity, we used a review template to evaluate and extract information from the studies and thus created a procedure for reviewing. We described inclusion and exclusion criteria and we described the stages we will use in this SLR. To improve internal validity we will use Atlas.ti to code the selected studies. Coding the relevant aspects and classifying them makes it possible to synthesize the relevant aspects from these studies. This method also provides insight in the review steps thus enhancing reliability. We will use Atlas.ti to create a network with which connecting aspects can be identified for a framework.

External validity of the SLR is limited to interoperability in healthcare, which will be reflected later in the empirical part. The studies used in this SLR originate from eight different countries and different healthcare domains. The extent to which our framework will be generalizable to other industries or even specific health specialist will be very limited. Further research is needed to better the accuracy of our framework.

We try to minimize researcher bias for the SLR trough the review template, the use of a program for coding the studies and by sharing our results in this study so other researchers will be able to recreate our SLR.

2.2. Implementation

There are a lot of articles in healthcare written on Electronic Health Records (EHR) that are touching on the subject of interoperability. The perspectives vary greatly, from personal health records, eHealth, mHealth-, blockchain- and IoT solutions, specific medical disciplines, low income countries or architectural frameworks. Many of these articles describe benefits or barriers when coping with

interoperability in these fields. Though these aspects can and are relevant, we focused on the articles with a broader perspective and generic aspects to build our initial framework.

The search query gave us 128 results in stage 1. In stage 2 we selected 56 articles based on the titles (and key words) of the articles. Based on the abstracts we found 26 articles suitable for a full text assessment and marked 11 articles for a spare list (S). Based on the exclusion criteria another 14 articles were excluded. Out of 128 articles, 12 articles have been found useful for this study. These 12 articles were reviewed in detail using our review template. Appendix A2 shows the results of the four stages; a '0' meaning the article was rejected in that stage and a ' 1' it was accepted for the next stage.

2.3. Results and conclusions

We expected to find a variety of similar articles since interoperability is an important subject for over a decade and hospitals were thought to be familiar with the subject. What we found however was a lack thereof, missing a comprehensive overview of the subject. Even though we focused on the articles with a broader perspective, they each had their own domain of expertise or starting point. Some articles focused on the technical part of interoperability (Fragidis et al., 2016; Vergari et al., 2011) and some on the syntactic or semantic part of interoperability (Batra et al., 2015; Kush et al., 2020; Oyeyemi & Scott, 2018). This made us question and evaluate our search query several times. Using a template to classify the aspects was helpful in the coding process. The drawback was that we (sometimes) needed to make a decisions on which level we would classify an aspect if the perspective of the benefits or barriers were not clear from the articles. This occurred mainly to adjacent levels in the framework i.e. if a benefits belongs to the Application level or to the Information level. The definitions in table 1 were used in this classification process.

Furthermore we found that benefits, barriers and challenges are closely related. If a barrier or challenge is resolved, it will likely result in a benefit for the organization, often on the same level. For example, syntactic interoperability requires the use of standards like HL7 FHIR. If a healthcare organization has implemented HL7 FHIR it will benefit from better sharing and receiving health data. For our framework we decided to present these aspects on both sides to create a full picture. For further research we advise to study the relationship between the barriers & challenges on one side and the benefits on the other side when they are resolved.

Table 2, Total aspects found

Total aspects found in the SLR	Benefits	Barriers
Policy	8	29
Health processes	13	6
Information	31	42
Application	10	22
IT Infrastructure	4	16
Security	1	15
Legal & regulatory	1	3
Cost aspects	4	6
Total:	**75**	**146**

The articles originate from eight different countries emphasizing interoperability as a global challenge; Brazil, Greece (2 articles), India, Ireland, Italie, UK, Taiwan and the USA (4 articles). As

stated before each article has its own perspective on interoperability. However, most of the aspects we found were on the levels of Policy, Information and Application (table 2). This would suggest that the complexity as well as the benefits will be mainly found in these areas. Another explanation could be that research has been focused more on these levels because of the impact for clinicians rather than on IT staff. Of course our search string could also be cause for this variation.

Synthesis

For the eight levels in our framework we will discuss the benefits in case interoperability is well developed as well as the barriers and challenges to develop them.

Policy

Literature shows us the importance that policy makers have in supporting interoperability. On a national level it is their job to deliver national health policies to assure standardization and interoperability of systems. On a national level it is also important to reduce technical complexity and build trusting relations with system vendors. On a local level policy makers should strive for collaboration between healthcare organizations, creating an open environment in which information can flow freely. In short, organizing standards and collaboration and reducing (technical) complexity, as this will favourably influence clinicians attitude towards EMR and interoperability.

Health Processes

Information needs to be incorporated in health processes and thus organized on a local level. Medical errors are largely attributed to miscommunication. Clinicians therefore need to adjust their work so that others can benefit from the information they compose as well as benefit from information composed by other clinicians. This will help reduce fragmentation of information, documentation time, data accessibility, quality and better collaboration between clinical teams.

Information

Literature shows us that standards for semantic operability are perhaps the most important element for the success of interoperability. Unfortunately healthcare uses a variety of standards for comparable information, often designed for specific health specialists. A widely adopted, global data standard is essential for health data to be exchanged and to ensure meaningful, reliable, timely information without interpretation errors. Fast and ubiquitous access to patient records will benefit the quality of healthcare and patients health.

Application

Literature shows us that syntactic interoperability requires data exchange standards. Findability, accessibility and reusability will be less without, thus lessening its value. Many healthcare organizations have different EHR systems and standards in use which requires them to invest in these systems to be able to exchange information between heterogeneous EHR systems. EHR systems in which syntactic interoperability standards are used among all participant are conditional for the success of interoperability. Standards such as HL7 (HL7 FHIR), XML and HTTP are becoming common in healthcare organizations, reducing the barriers and opening up traditional information silos.

IT Infrastructure

Literature shows us that technical interoperability, the ability to move data between systems, is complex and costly. The articles show us an ongoing discussion over a benefits/ barriers of a

centralized repository versus a (semi-) distributed repository. This is very much comparable with the discussion in the Netherlands where both approaches are promoted. Standardizing technical interoperability should be initiated on a national level to benefit from scale, security and increase of information integration and support innovative applications for patient health and research.

Security

Literature shows us that security, privacy and trust are important for both clinicians and patients. Authenticating save access to patients information is essential to reduce the risk of damaging the doctor patient relationship. Clinicians also need to trust that information is up to date even if the information is updated somewhere else. As patients become more involved in their health records, they can manage access to their information or be aware of who has had access. This will enhance trust and patient participation in their health processes.

Legal & legislation

Literature shows us that legislation is somewhat lagging behind in development. If healthcare organizations are sharing information through access in a central repository or in a (semi) distributed repository, it is often not clear who the owner of the data is and who is responsible for the quality of the data. Legislation requires save information access, exchange and maintenance of patient's EHR. Adoption of standards supports legal use of EHR and justification for sharing and decision making.

Cost

We added this level to the initial template based on the articles in this SLR. Throughout the articles cost aspects came along with benefits and barriers. Due to the complexity of information in healthcare organizations and interoperability in particular, large investments are required to address the barriers and challenge on all levels. Changing policies, developing standards on a national or even global level, changing EHR systems, creating collaboration and implementing interoperability in healthcare organizations will be costly. In this SLR we have found national programs in the billions to support EHR and interoperability with only limited results. Stakeholders all need to have deep pockets to make interoperability a success. Only then, cost savings are possible with a one-time entry of data, less time collecting information and the ability to combine information for better healthcare.

Conclusions and implications for the remainder of the research:

We conclude the SLR with our initial (conceptual) framework in table 3. We found a large number of benefits, barriers and challenges healthcare organization need to deal with when considering, implementing and operating interoperability. This framework also shows the complexity of our subject for healthcare organizations on a technical, economic and political level. A complexity that is not limited to within healthcare organizations but also in collaboration between organizations, national (and global) policy makers and software developers. The articles covered all levels in our framework although not each articles covers all. The synthesis of all elements in our conceptual framework as well as the layout in eight levels will need to be validated in the empirical part in het next chapters. In Appendix A4 the same framework is shown with an extra column with further explanation and examples of the descriptions in table 3. Table 4 contains short definitions of specific (technical) terms in the conceptual framework.

Table 3, Conceptual framework for Interoperability benefits, barriers and challenges

Level/ Dimension	Sublevel	Description	References
Policy Benefits	Collaboration	• Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	(Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Vergari et al., 2011)
Policy Barriers & Challenges	Regulating standardization	• It is important that regional and national health policies be established on standardization to assure interoperability of systems.	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Kush et al., 2020; Lin et al., 2012; Vergari et al., 2011)
Health processes Benefits	Clinical interoperability	• Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	(Dickerson & Sensmeier, 2011; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Vergari et al., 2011)
Health processes Barriers & Challenges	Transition of care	• The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Janett & Yeracaris, 2020)
	Doctor- patient relationship	• The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	(Janett & Yeracaris, 2020)
Information Benefits	Semantic interoperability	• Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	(Batra et al., 2015; Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Lin et al., 2012; Oyeyemi & Scott, 2018; Vergari et al., 2011)
	Patient participation	• Patients will be more engaged in their health with access to their own patient health record (PHR).	(Roehrs et al., 2017; Valle et al., 2016)
Information Barriers & Challenges	Non-standard formats	• Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	(Batra et al., 2015; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Roehrs et al., 2017; Valle et al., 2016; Vergari et al., 2011)
	Creating and maintaining standards	• Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	(Batra et al., 2015; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Vergari et al., 2011)
	Competitive industry	• HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	(Dickerson & Sensmeier, 2011)
Application Benefits	Syntactic interoperability	• Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	(Batra et al., 2015; Kush et al., 2020; Lin et al., 2012; Oyeyemi & Scott, 2018)
Application Barriers & Challenges	Non-standard EHR's	• Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	(Batra et al., 2015; Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Roehrs et al., 2017; Vergari et al., 2011)
	Data silos	• The majority of the data continue to be confined in data silos.	(Kouroubali & Katehakis, 2019)
IT Infrastructure Benefits	Technical interoperability	• Technical interoperability standards allows data to move over an infrastructure between two systems.	(Fragidis et al., 2016; Vergari et al., 2011)
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	• Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	(Dickerson & Sensmeier, 2011; Fragidis et al., 2016; Vergari et al., 2011)

Level/ Dimension	Sublevel	Description	References
Security Benefits	Patients ownership of the data	• As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	(Roehrs et al., 2017)
Security Barriers & Challenges	Authentication	• Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	(Batra et al., 2015; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Roehrs et al., 2017; Valle et al., 2016; Vergari et al., 2011)
	Patients trust	• To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	(Fennelly et al., 2020; Janett & Yeracaris, 2020)
	Doctors trust	• Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	(Roehrs et al., 2017)
Legal Benefits	Justifying decision making	• Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	(Dickerson & Sensmeier, 2011)
Legal Barriers & Challenges	Accessibility and ownership	• Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	(Kouroubali & Katehakis, 2019; Roehrs et al., 2017)
Cost aspects Benefits	Expected cost savings	• Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Valle et al., 2016)
Cost aspects Barriers & Challenges	High initial costs	• Healthcare organisations are reluctant to committing on implementation because of the initial costs.	(Fennelly et al., 2020; Kouroubali & Katehakis, 2019; Roehrs et al., 2017; Valle et al., 2016)

Table 4, Glossary for the conceptual framework

Clinical interoperability:	The ability of two or more clinicians in different care teams to transfer patients and provide seamless care to the patient.
Semantic interoperability	Ensures that each system has the ability to understand the information received from others without ambiguity.
Syntactic interoperability	Refers to implementing and adhering to standards and ensures that structured data can be exchanged over the technical operability infrastructure.
Technical interoperability	The ability of moving data between two systems, not dependent on the type of information being moved, neutralizing the effects of distance.
Authentication	The process or action of verifying the identity of a user or process.

2.4. Objective of the follow-up research

The objective of this study is to provide a better understanding how organizations in elderly care can benefit from interoperability. Having a better understanding of the barriers and challenges faced by organizations when implementing interoperability is likely to reduce the threshold and be helpful for decision makers. The objective for the empirical part is to validate the theoretical framework by performing an embedded case study in an elderly care ecosystem. We wish to find out if our initial framework gives a sufficient understanding and if possible refine the framework with the research outcomes.

3. Methodology

3.1. Conceptual design: select the research method(s)

The research philosophy positivism, comes from the conception that valid knowledge can only be found through empirical research. This means focussing on strictly scientific empirical methods to collect pure data without human influence, interpretation or bias (Saunders et al., 2019). A positivist reasons that organizations are real in the same way as physical objects and natural phenomena. A researcher should focus on discovering observable and measurable facts to generate meaningful data, looking for causal relationships to create law-like generalisations that help predict behaviour in organizations.

The objective in the empirical part is to validate the framework from chapter 2 in a real life situation. We aim to test our framework to find out if the elements are valid in practice and if additional elements are needed. We therefor wish to answer the following sub- questions:

1. *How can the identified interoperability benefits from the healthcare literature be validated with empirical information?*
2. *How can the identified interoperability barriers and challenges from the healthcare literature be validated with empirical information?*
3. *How do healthcare organization cope with these aspects when implementing interoperability in healthcare ecosystems?*

We have examined a number of research methods. The main objective of an ***Experiment*** is to find causal relationship. Since our framework does not contain such a relationship this method would not be suitable. In case of a future study in which the relation between a challenge and its comparable benefit would be held, an experiment could be considered. A ***Survey*** is mainly used to answer questions like 'who', 'what', 'where' and 'how many', and is usually associated with a deductive research approach (Saunders et al., 2019). If our goal would have been to collect a large amount of structured data validating the relevance of our framework, a survey would be sufficient. However, since our aim is to develop an in-depth understanding and the reasoning behind it, a survey would not suffice.

A ***Case study*** is defined as an in-depth inquiry into a topic or phenomenon within its real-life setting (Robert K. Yin, 2018). Case studies are suitable to answer 'why', 'how' and 'what' questions and are therefore usually used for explanatory and exploratory types of research. Sanders et al. (2019) states that a case study is best used for evaluating a conceptual framework. Since we want to validate and refine our framework looking for reasoning and understanding, a case study is the best solution. Since we wish to understand interoperability in a healthcare ecosystem in which multiple healthcare organizations communicate with each other we will perform an **Embedded case study** (Robert K. Yin, 2018). Embedded case studies contain more than one sub-unit of analyses, in this case the healthcare organizations in an (information) ecosystem. The advantage of an embedded case study is that it will result in an in depth understanding of a healthcare ecosystem as a hole when conducting interviews with more than one organization.

There are however also disadvantages to an embedded case study. An embedded case study will be limiting in generalizability for other healthcare ecosystems and it will be harder to find expert interviewees with sufficient knowledge of our entire subject. It will however give a faithful image of how the ecosystem participants considers the aspects in our theoretical framework.

3.2. Technical design: elaboration of the method

Case organizations

We will perform an embedded case study in a healthcare ecosystem. We chose an elderly care ecosystem because of its close collaboration with regional hospitals, general practitioners and other care organizations. Elderly care organizations are also interesting because of current national development programs and the researchers experience in this field. In figure 4 the ecosystem is displayed from the viewpoint of an elderly care organization, collaborating with different types of healthcare organizations. Our main focus will be with the organization in the centre and the information that is exchanged with a hospital, general practitioner and other care organization, for patients transferal and shared care. Laboratories and pharmacies are not in scope because there is no form of shared care and limited transferal information. Also due to time limitation for this research we advise to include them in future research.

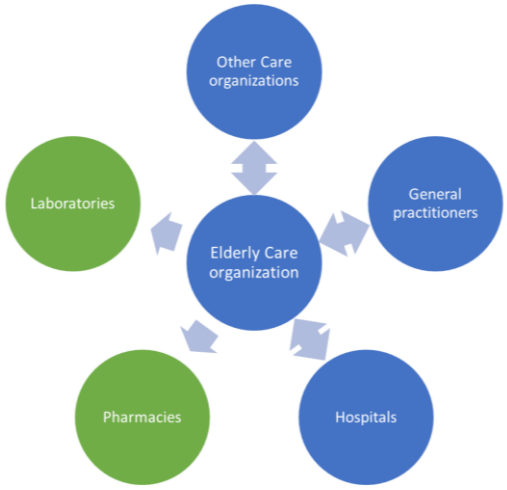

Figure 4, Elderly Care Ecosystem

Semi- structured interviews

The information required to validate our framework is the extent to which the elements in our framework are recognized, acknowledged and deemed relevant in our case organizations. In order to find this out, we will perform semi-structured interviews. This will help to structure the interviews for further analyses and offers the possibility to react to the answers given by the interviewees. Since we desire an in depth understanding of the interoperability benefits, barriers and challenges, we believe it is necessary to ask follow-up questions for further explanation. A structured interview would not give us this opportunity, hence we selected a semi- structured interview.

Interviewees

Our framework consist of eight levels, each with its own aspects on benefits, barriers and challenges. To validate our framework we need to have sufficient testing coverage on all levels. To this end, multiple interviews must be held with professionals that work within the selected organizations.

Participant selection criteria

Within the selected healthcare organizations, different departments are responsible for different levels (i.e., Policy, Health processes, Information, etc.), some more than likely overlapping in knowledge. Since our framework is in logical order, the interviewees will likely be knowledgeable in adjacent levels but do not need to be experts on all levels for a full (validating) coverage. The general

manager will for example be knowledgeable with the organizations Policy, as well as Health processes and Costs. The Head of the medical department will be knowledgeable on Policy, Health processes and Information, etc.. We will conduct 8 interviews within an elderly care organization with an 'expert' per level (table 5). Additionally we will conduct an interview with one collaborating hospital, general practitioner and other care organization in the ecosystem (8 +3 = 11 interviews in total). We expect overall expert knowledge on the subject to be mainly available within the IT-information department and will conduct interviews accordingly within the hospital and other care organization. General practitioners are usually small practices with the practitioner being the expert.

Table 5, Interview scheme

SLR framework	Elderly Care organization (8 interviews)	Hospital, general practitioner and other care organization (3)
Policy	General manager (1)	IT- information department (2), general practitioner (1)
Health processes	Head of medical department (1)	
Information	Doctor (1)	
Application	Information manager (1)	
IT Infrastructure	IT Manager (1)	
Security	CISO (1)	
Legal & regulatory	Internal control (1)	
Cost aspects	Health Care procurement (1)	

Interview protocol

The data collection will come from conducting semi-structured interviews. These interviews are characterized by prepared theme's and questions that can be altered during the interviews depending on the context of the interviewee and the answers given (Saunders et al., 2019). The interviews will be 1:1 to prevent interference between the interviewees. In case we detect inadequate knowledge over de concepts of interoperability in general and the coherence in our framework with the interviewees, we will explain these concepts in their context during the interviews.

The interviews will consist of four parts. The first part contains questions on the familiarity of interoperability with the interviewee and to what extent the organization is considered interoperable by the interviewee. To prevent any bias, we will not share our framework at this point. In the second part we will validate our initial framework (table 3) in detail, reviewing all elements in our framework (8 levels * 2 dimension * 23 sub-levels). The interviewee will be given a copy of our framework and we will go through each level and sub-level. We will emphasize on the levels that are most familiar to the interviewee to get an in-depth understanding in this part. The extra column with 'further explanation' in Appendix A4 can be used to support the interview.

In the third part we will be looking for an overall impression of our framework and its usability. For further refinement the interviewee will be invited to point out any missing elements in our initial framework. In the fourth part we will question how the interviewee and the organizations consider and rank the aspects in our framework when implementing interoperability. Our goal is to understand to what extent both are driven in their decisions by these aspects.

The interviews will be recorded for further analyses. By doing so the interviews will be more focused and efficient and afterwards the interviews can be worked out. In Appendix B1 the Interview protocol is presented. In Appendix B2 the information Letter and Consent Form.

To test our interview protocol, researcher bias and interview style, we will conduct a pilot interview before the actual interviews. The pilot will be held with an expert in our subject and with the ability to assess our interview protocol.

3.3. Data analysis

Analysing qualitative data from a deductive perspective can be done by using the initial framework to help organize and classify the data analyses. If the outcome of our analyses is in line with our framework, the theoretical base is likely to be true. If the analyses shows one or more results that are outside of our framework, these results need further explanations (Robert K. Yin, 2018).

A disadvantage to this method is that aspects from an initial framework could have been excluded beforehand and that the initial framework differs too much from the ideas and context of the interviewees (Bryman, 2020). It is therefore of interest to determine the important variables, theme's and aspects and their relation to design in a descriptive framework (Robert K. Yin, 2018).

To validate our framework we will transcribe the interviews and share the transcription with the interviewee for final (factual) checking. Within the transcription we will add non-verbal communication we observe during the interviews as suggested by (Saunders et al., 2019). We will analyse the transcriptions using Atlas.ti. To do so we will code the answers in comparison with our initial framework. Each aspect in the initial framework will then receive a qualification of relevance from the motivation in the interviews. The qualification determines a positive or negative validation according to table 6. A suggestion for refinement is determined separately from the validation. So even if an aspect was qualified as relevant or with little or no significant relevance the answer could still give us a suggestion for refinement.

Table 6, Validation and refinement

Qualification of relevance	Validation	Indication for refinement
a) Yes, this is relevant	Positive	Yes/No
b) Yes, some relevance, but.	Positive	Yes/No
c) No, only little relevance	Negative	Yes/No
d) No significant relevance	Negative	Yes/No

Refinements to our framework are accepted if more than one interviewee desires adjustment. For a new or unjust element, we will go over our SLR articles to find justification for these elements and to see if substantiation can be found. The outcome will thus help us validate our initial framework and refine accordingly. This will answer the first two questions of the empirical part.

The fourth part of the interviews will provide us with additional information on how organizations consider the aspects in the framework for implementing interoperability. How do they weigh them and how does this effect decision making. The usability of our framework will also be evaluated here from the interviews, answering the third empirical question.

3.4. Reflection w.r.t. validity, reliability and ethical aspects

Construct validity

Does the test measure the concept (our interoperability framework) which it was intended to measure? We have chosen to validate the initial framework with semi- structured interviews. These type of interviews allow for variation of questioning between interviewees and for follow-up questioning. The risk involved is that our framework will not be tested equal on all parts. In order to deal with this risk triangulation is needed. Triangulation is the use of different methods for data

collecting to make sure we measure what we need (Saunders et al., 2019). The participants also receive a transcription of the interview to confirm accuracy, asking them to comment and correct if necessary.

Internal validity

To what extent are we confident that the results really follow from the data, are trustworthy and not influenced by other factors? Before the interviews are held we will test the interview protocol and potential researcher bias in a pilot interview to enhance the quality of the interviews (Saunders et al., 2019). Furthermore we provide anonymity for the interviewees, helping them to give us true answers that might otherwise be sensitive.

We will construct the refined framework with the same coding principles as in the SLR. The validation and suggestions for refinement will be used to refine our initial framework. In case of any uncertainties, we will contact the interviewees for additional information and check the literature for substantiation of the refinement.

Interviewing four different organizations also helps internal validity as well as overlapping (expert) knowledge between the interviewees on the levels in our framework.

Finally, the researcher has a comprehensive experience in this field and an in depth knowledge of the type of organisations in this case study which will help in follow-up questions when needed.

External validity

To what extent can our results be applied to other situations or organizations? Our initial framework has been developed from a systematic literature review for healthcare organizations in general. In this embedded case study employees from different departments, organizations and specializations have been interviewed to validate our framework. We are reluctant to state that this framework applies to other healthcare organizations / ecosystems since this is an embedded case study. The extent to which our framework is validated in the empirical part might be an indicator that it can be applied in other situations since the initial framework was set up from healthcare literature in general.

Reliability

The extent to which the results can be reproduced when the research is repeated under the same circumstances. We have documented our research methodology extensively so future researchers will be able to reproduce the results. Even though semi-structured interviews are not designed for repetition, the results and analyses can be followed in detail in this study.

We will also provide a detailed description of our coding method for the interview transcripts and the interview protocol has been documented. Finally we provided an description of the analyses method.

Ethical aspects

The extent to which we are concerned over objectivity, privacy and interests of those involved. In our embedded case study we interview employees on key positions in the organizations. It is important that they can give their views and ideas on the subject without the risk of being confronted on their views. We therefor offer to handle all information with anonymity. Furthermore we need to be careful with references to our case organizations to prevent that the information will be read and possibly misinterpreted by third parties both inside and outside of the organizations.

4. Results

4.1. Research implementation

The embedded case organizations as proposed in the research method, were selected in a healthcare ecosystem for elderly care (Appendix C). The interviews were conducted in a medium sized elderly care organization (A), a general practice (B), a large elderly care organization (C), and a large academic hospital (D). Since our research aims at interoperability in an elderly care ecosystem, most of the interviews were held from the perspective of the elderly care organizations in the centre of figure 5. The other organizations are part of the ecosystem in elderly care and are also working in close collaboration with and transferring patient to each other (light arrows). Laboratories and pharmacies were not interviewed due to their supporting role in the ecosystem and also due to time limitations.

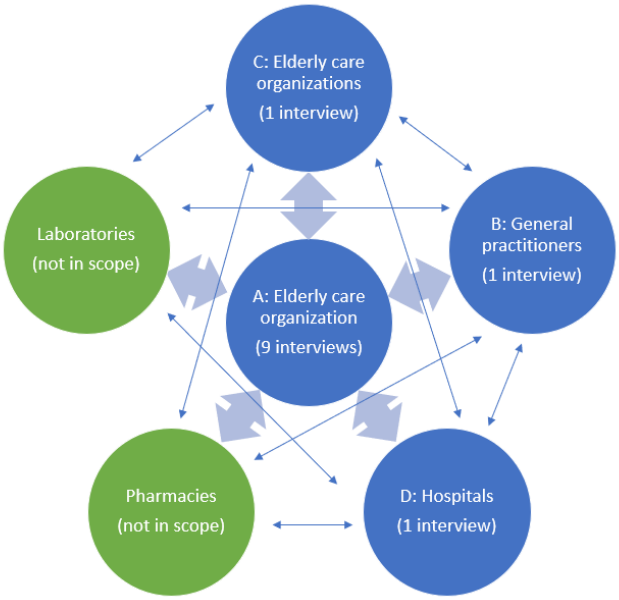

Figure 5, embedded case

Interviewed experts

The interviewees were selected on their position in the organizations and their knowledge of the eight levels in the framework so that each level would have sufficient coverage. Since the majority of healthcare practitioners are collecting information on a daily base and therefor dealing with challenges on the health process and information level, more expert knowledge was found on those levels (Appendix F1). Table 7 shows the organization, education level, position and experience for each interviewee. For privacy purposes the healthcare organizations have been given a code. Code A & C are elderly care organizations, B a general practice and D a hospital. The CISO is working for both elderly care organizations.

Table 7, Interviewed experts

Int.#	Org. #	Education level	Position	Experience healthcare	Experience in position
1	A	bachelor	Manager IT	2 years	2 years
2	A	no higher education	Functional manager	13 years	6 years
3	A	bachelor	Medical, paramedical and psychosocial manager	30 years	10 years
4	A	bachelor	Care administration coordinator	10 years	10 years

Int.#	Org. #	Education level	Position	Experience healthcare	Experience in position
5	B	academic	General practitioner	35 years	27 years
6	A	academic	Specialist geriatric medicine	17 years	17 years
7	A/C	bachelor	Chief information security officer (CISO)	8 years	3 months
8	A	academic	Managing director	30 years	4 years
9	A	academic	Internal control and data protection officers	6 years	4 years
10	A	bachelor	Manager finance & control	18 years	1 year
11	C	academic	Director operations and IT	10 years	10 years
12	D	bachelor	Information manager transmural cure	19 years	5 years

4.2. Data Extraction and Analysis

In this paragraph we will present the results of the interviews. Each answer was coded for extraction, analysis and synthesis purposes using Atlas.ti and Excel (Appendices D, E and F). The questions in part 1 being exploratory on the familiarity of the subject. The questions in part 2 aimed at validating and refining each aspect of the initial framework separately. The questions in part 3 aimed at getting an overall impression of the framework and part 4 the practical use of the framework when implementing interoperability.

4.2.1. Familiarity with the subject

In part 1 we asked five questions (Q5-Q10) to assess familiarity with the subject, the organizational maturity and the presumed benefits and barriers & challenges before sharing our initial framework.

We asked the interviewees to define Interoperability (Q5). Some of the interviewees indicated that they found it to be a difficult word and subject. The answers given contained keywords such as collaboration, cohesion, information exchange and communication between systems. Missing from the definition in §1.2 was the ability to reuse the information that has been exchanged. The interviewees however acknowledged the importance of reusing information after given them the definition from §1.2.

#2 Exchanging data between organizations and their applications. #5 The exchange of data between specialists, hospitals, mental healthcare, nursing homes, pharmacy and laboratory. In other words, all parties in the healthcare chain. #12 The Nictiz model has been developed as a tool for this. Interoperability affects multiple layers such as infrastructure, information, process and the policies that we have to agree on.

We then asked to what extend the interviewees would consider themselves familiar with the subject (Q6). The interviewees responded that however they did not consider themselves as experts on the subject, within the organization they would consider their knowledge above average.

#1 Not expert but within the organization above average knowledge. #11 Fairly knowledgeable in this area within the organization. #12 Seen within the organization as an expert on this subject.

The organizational maturity (Q7) on interoperability was considered relatively low in the organizations. Information is being shared between these organization but limited as far as digitalized, structured data and reusability. The organizations in this ecosystem are working together to improve collaboration and governance in regional partnerships.

#6 Still in our infancy, this is partly due to the fact that we switched to fully digital working relatively late compared to other organizations (medical team). Because we are a relatively small organization, we tend to wait until others have solved these challenges before we step in. #11 As an ambition certainly but It takes two to tango.

The benefits considered by the interviewees (Q8) were divers. Saving time gathering information, less error prone, less systems to logon to, patients that do not have to answer the same question over and over, better alignment of care, faster transfers and overall better quality of information. Though most aspects were found in the literature review, new was the emphasis on the **reduction of the administrative burden** healthcare practitioners face on a daily base, which could potentially help reduce shortages of healthcare staff in the future (cost level).

#2 Less error-prone and an administrative burden reduction. #5 That we will receive the information on our computer and can put it directly into the patient's EMR. Easily receive data, send documents and that we will have an insight into all relevant parts of the EMR that is important as another healthcare provider. #6 Huge error reduction and huge time saver when done right. The amount of time I spend, together with the nurses, physio, etc. to find out where a client comes from, from which department and then get hold of them by phone to collect information is enormous.

The barriers & challenges considered by the interviewees (Q9) were also divers and most of them seen in the literature review such as safety, standardization, overall trust and understanding each other. New from the interviews was the necessity for organizational (managerial) **awareness** of the current time-consuming methods and the **willingness** to change and invest in interoperability. We will see similar answers further on were the interviewees expressed interoperability as a complex and long term challenge for organizations.

#2 Awareness within the organization of the importance of this topic and what we can gain from it. .. where the operation now mainly experiences the bottlenecks in the current working method. #3 The question for the organization is whether we really want it and whether we have the knowledge to set up such a thing. It starts with the will to make it as easy as possible for employees to work with one system. #4 The main challenge lies in technology and making agreements about sharing information within the healthcare domain.

#6 In the first place awareness of the possibilities. Decision makers probably have no idea what we're doing and how error-prone retyping is. I think it is also a barrier that healthcare staff are generally not very innovative, from management to the workplace. And thirdly, I do not know whether all systems can be connected to each other. This is especially a barrier with medical data because I still prefer to type, knowing what is entered than dealing with the uncertainty whether what was send was correct or when there is no information, there was actually nothing and not that it didn't get through.

The level the interviewees focus on in their work (Q10) is presented with the other results of part 1 in Appendix F1

4.2.2. Validating and refining the initial framework

For validation and refining purposes we asked the interviewees to what extend they would consider the aspects in the initial framework as relevant and motivate their answers (Q11-Q33). This resulted in a qualification of relevance for each aspect in the initial framework. The overall results of the qualification and validation process are shown in table 8 (23 aspects * 12 interviewees = 276 answers).

Table 8, Validation initial framework for each aspect and interview

Qualification of relevance	Validation	Answers interviews	Percentage
a) Yes, this is relevant.	Positive	225	82 %
b) Yes, some relevance, but.	Positive	42	15 %
c) No, only little relevance.	Negative	6	2 %
d) No significant relevance.	Negative	3	1 %
Total		276	100 %

If the motivation gave us a suggestion for refinement, the answers (or part of it) were highlighted in the analysis. In total 76 suggestions for refinement were found in part 2 (Appendices E1-12 and F2).

For each aspect in the initial framework we then analysed the combination of the validation, suggestions for refinement and rankings (4.2.5) to determine if the framework needed adjustments. Below we highlighted two benefits and two barriers that stout out in the analysis. The complete analysis is included in appendix F3.

Policy Barriers & Challenges- Regulating standardization: *It is important that regional and national health policies be established on standardization to assure interoperability of systems.* This aspect has been validated in all interviews. There were eight suggestions for refinement and it got the second highest ranking for barriers and challenges with 27 points showing this to be an important barrier in the framework.

The interviewees thought of this aspects as conditional for the success of interoperability and a probable cause why the national EPD was unsuccessful in 2011. The regional or national approach was discussed several times, also in part three and four. A regional approach was considered best since collaboration takes place on a regional level but there were also strong arguments for the role of the government to regulate standards on a national level.

#8 I can imagine that order in which the development would ideally take place regional before national. Our region is really different from other regions and I would think it is important that attention is paid to that in the areas in which we differ. #11 I think the Netherlands is small enough to organize it nationally. We will have to make agreements at national level in which standards we communicate information.

Health processes Benefits- Clinical interoperability: *Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.* This aspect has been validated in all interviews. There was one suggestion refinement (the right care at the right place) and with 46 points this was the biggest benefit scored in the interviews meaning that an elderly care ecosystem will benefit most from this aspect.

#7 Totally agree. For the processing time alone, it is important that it saves time when information is available. #11 Yes, of course it helps. In addition, it is also important to look for the right care in the right place.

Health processes Barriers & Challenges – Doctor- patient relationship *The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.* This aspect was validated in 9 interviews. Two of the interviews scored this aspect with no significant relevance. There were 6 suggestions for refinement and it scored average with 13 point.

The interviewees questioned the description for elderly care since there is little screen time in the presence of patients. However, the amount of information required to register is increasing over the years. We reviewed the literature on this aspect again (Janett & Yeracaris, 2020) and decided that this aspect was justly criticised since it is more related to the development of EMR then interoperability. Since we aim to validate our framework for interoperability we believe this aspect is **not valid** and excluded it in the final framework.

#5 We also have to record more and more. .. It is necessary, often for legal reasons. #6 No, I don't think this has so much to do with an EMR or interoperability, but more with control. …Moreover, in the nursing homes we are walking around all day and do most of the administrative work afterwards (unlike general practitioners). For us, we spend a lot of time retyping, especially during intake, and if that information were already available, I would only have to read. #12 No, I do not endorse this. It is a challenge that 45% is lost on administration, but it does not have to directly damage the relationship.

Information Benefits- Semantic Interoperability: *Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.* This aspect was validated in all interviews. There were 3 suggestions for refinement and it scored the third biggest benefit from interoperability with 31 points. Since this aspect describes the benefit of the information level it is not surprising that it had a high score. Access to timely, reliable and accurate information is essential for all involved in healthcare. Two interviewees reasoned the importance of free text fields and abbreviations within the standards to describe the patient's condition. The subjective perception of the patient's condition from the patient as well as the clinicians point of view is an essential part of healthcare. The interviewees argued the importance of this perception and the need to test the perception when care is shared or patients are being transferred. Furthermore interviewee 12 argued that semantic standards are relevant but that healthcare will benefit more from receiving unstructured information than no information at all, advocating this aspect as relevant but not the most urgent.

#6 Yes, completely true and at the same time (which you might like not to hear) that won't work because doctors all work in their own field. People are going to abbreviate in letters and different medical fields will keep their own abbreviations. #8 An unambiguous interpretation is possible in the case of diagnoses, but when it comes to the perception of the care worker about the patient's condition, it is good to be aware that it may concern a subjective opinion and to test the perception. #12 There is always a lot to do about it, but in practice I have had little trouble with it. Until now in transmural exchange it is nice if it is exchanged in standards, but the care worker is already happy if it comes in unstructured format.

4.2.3. Overall impression and completeness

The answers in the third part were analysed for completeness of the framework. Suggestions for refinement were highlighted in the answers (Appendix E1-E12 and F4). For analysis purposes we will combine the answers of Q34-Q36. In total, the answers in this part gave us 15 suggestions for refinement.

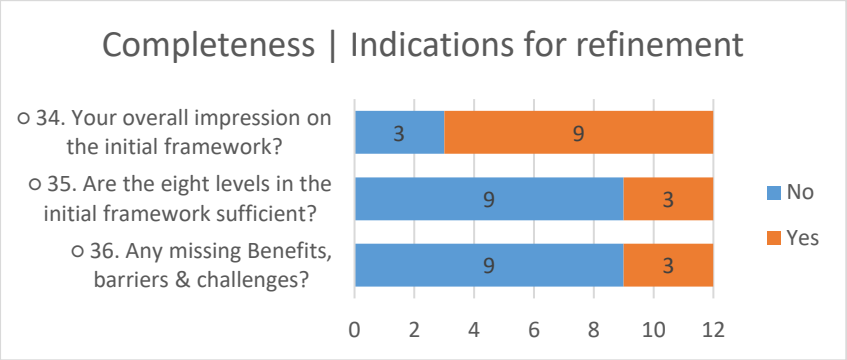

Figure 6, Completeness, indications for refinement

The overall impression from the interviewees was that interoperability is a complex, comprehensive and multivariable subject. A long term strategy is needed on a national, regional and organizational level to deal with this complexity with a role for government to support development on standardization and security with regulations and funding. The interviewees stated that further elaboration and deepening of the subject is necessary to create more awareness over the benefits, as well as the risks involved in current methods to help decision makers towards interoperability. Finally two interviewees suggested to add a separate level for 'Patient'. Yet, the aspects in the framework regarding the patient participation scored average in the rankings, the patient ownership of the data below average and patients trust did not get a single point in the rankings. Because

patients involvement in interoperability is limited, especially in elderly care, we are reluctant to add an extra level for 'Patient' based on this research.

#2 I wonder what a healthcare employee really gains from all that healthcare data. We say it's an advantage, but that's what the literature shows. #6 When it's not your job, it helps a lot to separate and organize these topics. It helps in raising awareness before we start developing. #8 It's also fun to be involved in such a development! #12 I think it's pretty complete. By working out along the five-layer model, it was simply done very well.

4.2.4. Practicality for implementation

The answers in the part 4 were analysed for practicality of the framework. Suggestions for refinement were highlighted in the answers (Appendix E1-E12 and F4). For analysis purposes we will combine the answers of Q37-Q39. The answers in this part gave us 17 suggestions for refinement.

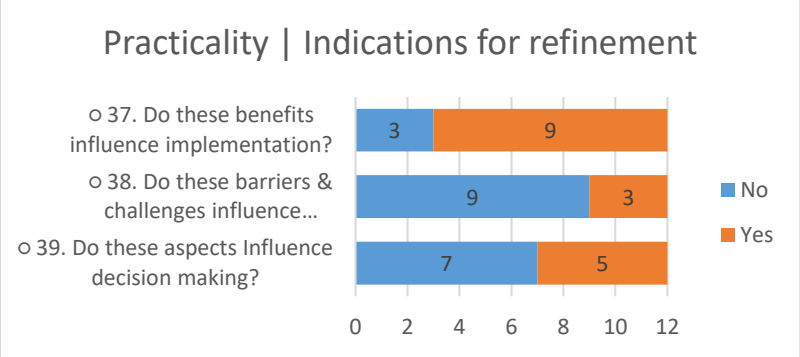

Figure 7, Practicality, indications for refinement

The interviewees stated that the practical use of a framework lies in reducing complexity. It helps when organizations have a clear view of all aspects involved and the ability to reach different people/ experts in the organization per subject. The interviewees stated that decision making is now mainly a cost -based process (when not obligatory from regulations) so further quantifying the costs as well as the revenues would be needed. Finally it helps to create short term goals that are less complex even if the benefits will only have an effect further into the future (Appendix F4).

#1 It helps to know what benefits there are. To start with, whether the benefits outweigh the costs. #8 What it does through the simplification always helps. To know whether all elements have been identified for a complex issue and to think about it sufficiently. For me it's about the added value and that may well lie further in the future. #9 Working towards what is possible in the short term might help. Organizations hardly know where to start due to differences in maturity on this subject.

4.2.5. Ranking the aspects from the initial framework (Q40)

We asked the interviewees to rate the top 5 benefits and top 5 barriers & challenges from 1-5, with 5 being the most beneficiary/ challenging. Table 9 and 10 show the results of the highest rankings as a percentage of the interviewees that chose a score between 1-5. (complete results in Appendix F5). High rankings were given to the aspects in the upper and lower portion of the framework on the Policy, Health processes, Information and Cost levels. The results confirm the difficulties we found earlier to come to collaboration between organizations, making agreements on standardizations and the cost involved in interoperability. It also shows that if those challenges are met, the benefits that likely rise from it are also seen on the levels where collaboration takes place for clinicians.

Table 9, Highest ranking benefits by the interviewees

Level (Benefits)	Sub level	Description	#1	#2	#3	#4	#5
Policy	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.		25%	17%	17%	25%
Health processes	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.		8%	17%	17%	50%
Information	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	25%	17%	8%	33%	8%
Information	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).		17%	33%		
Cost aspects	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same HER and there is a one-time entry of data, cutting out repeated work.	17%	8%	8%	33%	8%

Table 10, highest ranking barriers & challenges by the interviewees

Level (Barriers & challenges)	Sub level	Description	#1	#2	#3	#4	#5
Policy	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.			25%	17%	17%
Health processes	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.					25%
Health processes	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.				17%	8%
Information	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	25%	8%			8%
Cost aspects	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.		42%	17%		17%

4.3. Synthesis

Table 11 shows the finalized interoperability framework with benefits, barriers and challenges for a healthcare ecosystems. We compared the results from the theoretical and empirical part in Appendix F6 and highlighted the refinements in the table below (green). Governance was added as an optional level for future researchers, since we could not determine from the interviews if governance is best organized in regional partnerships (Policy sublevel), on a national or even European level (Legal level) or classified as a separate level in the framework. In chapter 5 we will reflect on the refinements and discuss the key lessons learned.

Table 11, Finalized framework for interoperability

Level/ dimension	Sublevel	Description- Refined
Policy Benefits	Collaboration	Collaboration, **shared care and transfers** between healthcare organizations will improve if information is shared in an open, interoperable environment.
Policy Barriers & Challenges	Regulating standardization	It is **conditional that standardization is regulated nationally with attention to regional differences** to assure interoperability of systems.
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care, **at the right place.**

Level/ dimension	Sublevel	Description- Refined
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers **so** good agreements are needed for this process.
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency and room for the (subjective) perception of the patient condition.
	Patient participation	Depending on the type of care, patients and family will be more engaged in the health process with access to the patient's health record (PHR).
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors. Non-standard information is still better than no information at all.
	Creating and maintaining standards	Choosing, maintaining and mandatory of standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.
	Competitive industry	Healthcare organizations depend on an increasingly smaller number of HIT providers operation and competing in a specific health sector, diminishing the development of interoperability between sectors.
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.
Application Barriers & Challenges	Non-standard HER's	Many healthcare organizations have different HER systems with different (syntactic) standards in use.
	Data silos	The majority of the data continue to be confined in data silos.
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex, especially on the short term. For the success of interoperability, wide adoption is needed to make these platforms a success.
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can, depending on the patient, manage and grant permissions for access or share their health data with third-parties. It is important that doctor will be able to access the patient files independently
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified without to many obstacles before accessing medical information.
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information between doctors and patients need to be in place.
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact HER implementations when it is unclear who is responsible for updating information.
Legal Benefits	Justifying decision making	Adoption of standards in legislation helps organizations trust in each other. Monitoring these standards by a third independent party would increase trust even more.
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information brings legal issues over accessibility and ownership when the information is being shared with multiple organizations and systems.
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same HER and there is a one-time entry of data, cutting out repeated work.
Cost aspects Barriers & Challenges	High initial and structural costs	Healthcare organisations are reluctant to committing on implementation because of unknown initial and structural costs.

Optional level for future research

Governance Benefits (optional level)	Governing interoperability developments	Interoperability governance support decision-making processes in the best interest of healthcare and create a better healthcare- IT alignment in support of interoperability
Governance Barriers & Challenges (optional level)	Governance structure with a strong legal mandate	Due to the complex nature of interoperability and long term investments needed a governance structure is needed with a strong legal mandate. Organizational and governmental awareness of the current problems and willingness to collaborate and invest are essential for the success of interoperability.

5. Discussion, conclusions and recommendations

5.1. Discussion – reflection

Reflection on the literature review and framework development

For the literature review we used a specific search query in which we focused on interoperability in healthcare with benefits, barriers & challenges in the title or abstract. The query resulted in 128 articles from which twelve articles were found useful for our research. Due to time limitations we were unable to use different search queries, expanding the amount of articles for the review. The reviewed articles contained a variety of aspects from different perspectives on the subject but none of the articles contained a framework we could develop further on.

We chose the Nictiz framework for interoperability as a reference for our framework. We coded the relevant aspects in the articles and summarized the descriptions in sublevels of the framework. We added an extra level for cost aspects to the Nictiz framework because of the benefits and barriers expressed in the articles. This resulted in a framework with 8 levels and 23 sublevels.

Reflection on the embedded case

The embedded case was conducted in an elderly care ecosystem containing 2 elderly care organizations, a general practitioner and an academic hospital. Our focus was with one elderly care organization (9 interviews) and three other organizations in the ecosystem (3 interviews). We decided not to interview a laboratory and a pharmacy because of their supportive role in the ecosystem and also due to time limitations.

The overall maturity on interoperability of the organizations was considered relatively low by the interviewees. This made the third empirical question regarding the way organizations cope with these aspects when implementation interoperability, difficult to answer. We therefor asked follow up questions regarding the usability of the framework for future implementations.

Reflection on the interviews

Due to the amount of questions and duration of the interviews supporting documents were not asked during the interviews. Given the answers on the maturity of the organizations, we concluded that supporting documentation if any were probably limited. We believe however that the interviews gave us sufficient input for validation of the initial framework because of the many years of experience in healthcare of the interviewees. The answers regarding the completeness of the framework in part three (Q 34-36) and usability in part four (Q37-39) were sometimes overlapping and therefor combined per part in the analysis and synthesis. Follow up questions were mainly needed in these parts to get a better understanding of the usability of the framework.

The interviews were held in a live setting (except int. 12) so we could observe non-verbal communication. The interviewees showed no restraint answering the questions and were open about their own knowledge as well as their organizations maturity on the subject. Specific terminology was explained during the interviewees when needed. We conducted one extra interview in organization A (int. 4) with an interviewee with experience in administrative information exchange contrary to medical information exchange.

The semi- structured interviews were aimed at getting an in depth understanding of our subject. We therefor asked for each aspect in the framework to what extend the interviewee would consider it a

relevant aspect. The interviewees often responded in agreement with the aspects without further motivation. Cause for this could have been that the interviewees were selected on their expert knowledge on 2-3 levels but were asked to give their view on all. The extensiveness and complexity of the subject seems to demand different experts working closely together in and between organizations. This might also be one of the causes that development is slow and motivation was sometimes missing.

Finally, the answers were qualified and validated as to the relevance of the aspects. We also determined which answers contained suggestions for refinement and needed a follow-up question. Opposition to the aspects was limited so we were sensitive for suggestions for refinement (76 in total). The influence of the researcher can be seen in the qualification, the refinement of the framework as well as in the considerations for an extra level for governance and patient.

Reflection on the results

The results in chapter four show the validation and refinement of the initial framework from the interviews. Validation of the framework was possible with exception of the sublevel doctor -patient relationship we excluded in the final framework. Refinement of descriptions of the aspects was mainly textual, clarifying the aspects in line with the interviews and literature. For example "Collaboration between healthcare organizations will improve.." was changed to "Collaboration, shared care and transfers between healthcare organizations will improve..". Below we will reflect on the key lessons learned in relation to the research questions and the final framework.

1. Governance:

The Policy level relates to collaboration between organizations and the Legal & regulatory level relates to (inter-) national agreements such as GDPR and WGBO. The Dutch government however does not (or barely) enforce the use of other standards. Nictiz provides and maintains medical standards but organizations are relatively free to use them.

After 2011 when Dutch government rejected a national EPD, the national approach has been a regional approach in which healthcare organizations make regional agreements on shared care, transfers and the use of systems and standards. Interoperability developments are supported with subsidies and outcome oriented regulations but progress is slow. A crucial question in the coming years will be if the regional approach will be able to overcome (national) barriers & challenges and if healthcare organizations, software developers and other stakeholders will be able to develop interoperability without a legislative 'stick' as the general manager in interview 8 indicated.

From the interviews we learned that a regional approach will benefit regional and sector specific healthcare but that it will probably take longer to create consensus over interoperability standards. Moreover, creating standards and agreements overlapping sectors and regions will be more difficult. From the interviews we cannot make a clear conclusion whether the regional approach will be successful without legislation to compel organizations to use standards for information exchange. There were pros and cons for a national and for a regional approach and the role for government to support, facilitate and enforce standards for interoperability. Furthermore, during our research the European commission made an announcement for a European Health Data Space and a shared strategic EU interoperability governance with nine recommendation such as a strong legal mandate, a strategic and operational level, involvement of practitioners, etc. (Cristina Cosma & Ruben Narzul, 2022). Since European legislations ultimately takes precedence over national, this will be a crucial development with national and regional repercussions likely to happen. Therefor we chose not to

add governance- aspects as a sublevel to the Policy or Legal & regulatory level, but left it as an optional (sub-) level for future researchers to determine the position (classification).

2. Cost (and revenues):

We added this level to the Nictiz framework in chapter 2 and it proved to be essential from the motivation and rankings. The interviewees explained that cost and revenues are important factors for decision makers in healthcare similar to what we found in literature (Valle et al., 2016). A direct revenue for patients health is often preferred over indirect, long-term and uncertain revenues. The interviewees indicated the importance of a clear understanding of the cost and revenues before implementing interoperability. We therefor advise future research to elaborate on this aspect.

3. Perception of patients health:

The interviews showed that not all health information can be defined in standards. Even though standards (clinical, semantic, syntactic and technical) are seen as conditional for the success of interoperability, healthcare practitioners still need the ability to describe the patient's condition from their and the patients perception. Knowledge in healthcare is increasing rapidly but there is still a lot to discover on (the coherence of different) diseases. The perception and struggles a patient experiences can differ from day to day and the effect of treatments can differ greatly between patients. Therefor it is important that within these standards there is still room for this perception and expert opinion of the doctor. And, sharing unstructured information takes precedence over no information (int.12).

4. Sharing information becomes a continuous process:

Sharing information in elderly care is becoming a continuous process among different organizations in the ecosystem with increasing data volumes (Roehrs et al., 2017). Where this used to be a one-time process during transfers, the results show that patients frequently receive care simultaneously from multiple organizations in the ecosystem and that data is growing exponentially. Collaboration, the use of standards and interoperability becomes even more important as network care is growing.

5. Doctor - patient relationship invalidated from framework

The Health process sublevel doctor- patient relationship was excluded from the final framework due to negative validation in three interviews. The barrier was considered more to do with EMR than with interoperability. Since there was only one reference article for this aspect (Janett & Yeracaris, 2020) and indeed concerned with EMR we decided to exclude it from the final framework.

6. Research and education purposes:

The interviewees confirmed that health data is still confined to silos. For research purposes this poses an obstacle to collect and combine data, we saw earlier in. (Batra et al., 2015; Kush et al., 2020). Healthcare research in general will benefit from interoperability when a longitudinal medical record is available to better understand the relation between diseases. Education can also benefit from interoperability standards to help students use the same semantics in describing a patient's health and communicate accordingly.

Construct validity

The transcriptions of the interviews were send to the interviewees for factual checking. Two interviewees responded with minor textual changes (incl. typos). Four interviewees responded with a confirmation. We therefore we believe that the transcriptions gave a correct representation of the interviews.

Internal validity

We performed a pilot interview from which we learned that the initial framework could be presented best in Dutch language. We therefor translated the initial framework and the interview protocol and returned the interview transcriptions in Dutch for better understanding and factual checking by the interviewees. In the coding process of the interviews we translated the outcomes back to English.

We asked the interviewees to rank the aspects from 1-5 to get an understanding of the importance of the aspects separate from the validation. We chose 1-5 because the number of benefits in the framework are less than the number of the barriers & challenges. Furthermore we changed the ranking of *only* the barriers and challenges to a top 5 for both benefits as well as the barriers & challenges.

During the interviews some (technical) terms needed explanation such as semantic and syntactic interoperability. We added a glossary to the interview protocol so we could give each interviewee the same explanation. This helped the interviewees with the context in which the terms were used before answering the questions.

External validity

The generalizability of the research is limited since only one elderly care ecosystem was used in this case. For healthcare in general it will be even less without further research. Even though we expect most aspects to be consistent in other ecosystems, there will be nuances for different ecosystems. Patients population and participation will differ on age and medical condition. The type, size and collaboration of the organizations in the ecosystem will be different in other ecosystems as well as the maturity and expert knowledge on the subject. In this research we excluded laboratories and pharmacies because they deliver a service to the healthcare organizations but are not responsible for the overall health of the patient. Yet, as we learned from the literature and interviews medication errors occur frequently and are a relevant subject for healthcare practitioners and thus future research.

Reliability

We watched over reliability by describing the research method in detail and reporting on any deviations. The interview protocol, embedded case description and interview transcriptions are included in Appendix B, C and D. For each aspect in the framework we asked each interviewee the same validating question. For validating purposes we coded each answer and separately determined suggestions for refinement. In the analysis we combined the results in Appendix E & F.

Researcher bias was reduced by asking follow up question if the answers were not clear to us. However we chose not to press for further motivation if it was not given freely. We also reduced researcher bias by asking the same question for each aspect in the initial framework. Finally we planned time for the transcriptions close to the interviews and chose to do this process personally and not automated.

Ethical aspects

We anonymized the data in the report so no relation can be found to the interviewees and their organizations. We kept separate files in which the relation can be found as well as the recordings and consent forms. Some of the interviewees asked us for a copy of the report. A copy will be given to them after publication.

5.2. Conclusions

Interoperability in healthcare ecosystems is an important subject for quality development in healthcare. Both government and healthcare organizations strive for national and regional solutions for better sharing information and creating a more longitudinal medical record of patient's health. However, the complexity involved with interoperability can be discouraging for organizations. The objective of this study is to reduce complexity by providing a better understanding of the benefits, barriers & challenges faced by healthcare organizations when implementing interoperability. To do so, we formulated the following research question.

What does a framework of interoperability benefits, barriers and challenges in a healthcare ecosystem look like?

To answer this question we performed a Systematic Literature Review (SLR) resulting in an initial framework and then empirically test the framework in an embedded case with semi- structured interviews.

We expected to find a variety of similar articles in the SLR since interoperability is an important subject in healthcare. What we found however was a lack thereof, missing a comprehensive overview of the subject. Some articles focused on the technical part of interoperability (Fragidis et al., 2016; Vergari et al., 2011) and some on the syntactic or semantic part of interoperability (Batra et al., 2015; Kush et al., 2020; Oyeyemi & Scott, 2018).

We found that benefits, barriers & challenges are closely related. If a barrier or challenge is resolved, it will likely result in a benefit for the organization, often on the same level. For example, syntactic interoperability requires the use of standards like HL7 FHIR. If a healthcare organization has implemented HL7 FHIR it will benefit from better sharing and receiving health data. We used the Nictiz framework as a template and for each level in the framework we distinguished the benefits and barriers & challenges. The SLR resulted in an extra (eighth) level for 'costs aspects' and 23 sublevels containing benefits and barriers & challenges (table 3).

The empirical part aimed at testing the initial framework, was conducted in an elderly care ecosystem with four healthcare organizations. We performed 12 semi- structured interviews with each 40 questions. The interviewees were asked for relevance for each aspect in the framework, their overall impressions on completeness, its usability for organizations and a ranking of the aspects in the framework. This resulted in our final framework in table 11.

Our research shows that our framework is helpful in reducing complexity for healthcare organizations. A clear overview of the aspects involved when implementing interoperability will help substantiate decision makers and communication with the stakeholders within the ecosystem as well as with legislators, financiers, and software developers. It helps to know what aspects need to be addressed and resolved for information to be readily available when practitioners need it. The research also shows that the need for timely and accurate information is increasing with patients receiving more care from multiple organizations simultaneously.

The research shows that costs play an important role in decision making and was therefore a just level to add to the framework. Further research is needed to get a better picture of the initial and running cost as well as the revenues when healthcare practitioners spend less time gathering and retyping information. With growing cost for healthcare in general and shortage of practitioners, interoperability could have a considerable impact on reducing the administrative burden (now 45% of their time) and by extension healthcare in general.

The framework displays different types of standardization, conditional for the success of interoperability. The interviews also showed us that healthcare has a need for the practitioners perception of the patients health for which free text is still needed. From a practitioners point of view there is still a preference for unstructured information above limitations in structured information. Meaning that within the standards it is conditional not to restrict information so that it creates new problems.

From the ranking of the aspects we learned that the policy, health process, information and cost aspects were considered as most important for the success of interoperability. Since this was found on both the benefits as well as the barriers and challenges and they might be interconnected, we advise investments in these aspects first.

Finally we could not make a clear conclusion whether governance should be presented separately in the framework from the policy and legislation level. This is due to the regional approach that is currently in effect in the Netherlands. The interviewees stated pros and cons to this approach and the role government has to facilitate the development of interoperability with regulation, standardization, security and fundings. Since governance aspects were found to be important, we believe that future research is needed to get a better understanding how governance in healthcare interoperability can be positioned best.

5.3. Recommendations for practice

As stated by the interviewees, the framework gives an overview of the aspects involved and what needs to be addressed by healthcare organizations dealing with the complexity of interoperability. Even though the framework's comprehensiveness made an impression on the interviewees, decision makers might be able to make better, substantiated decisions knowing at least *which* aspects are involved.

The framework can also be used when organizations in the ecosystem discuss collaboration on sharing information. For example technical and syntactic interoperability agreements need to be in place in order to share information safe and effectively.

Finally this research sets a generic framework on the subject. If problems occur in the ecosystem, it helps to point out where improvement is needed. Specialists on a level or sublevel can use the framework to discuss requirement with other specialists which will help the development of interoperability. It will also help healthcare in general to adopt a framework for interoperability to speak the same language.

5.4. Recommendations for further research

Further research is advised from the limitations in this research and from the results. First, this research was limited to one elderly care ecosystem. Further research is needed in other elderly care ecosystems as well as other healthcare ecosystems such as primary care, general practitioners care, hospitals, mental healthcare, disabled care, etc.

Second, this research set out a generic framework of interoperability in healthcare ecosystems with focus on interoperability benefits and barriers & challenges. The interviews showed that expert knowledge on the framework as a whole was limited. We therefore advise further research on the levels and sublevels of the framework separately. Especially the different types of interoperability (clinical, semantic, syntactic and technical) deserve more attention. We also advice to quantify the cost and revenues that might come from interoperability.

Third, we advise research on the governance aspects of interoperability. From this research we could not make a clear conclusion what role governance (and government) should play regulating interoperability, creating and maintaining standards, enforce and audit organizations to use standards, creating leverage towards software developers and creating a breeding ground for the development of interoperability.

Fourth we advise to expand the literature review. Due to time limitations we were able to perform an in depth analysis of twelve articles and used a specific search query for our results.

Figure 10 shows in orange our starting point, in blue what we added and in green what we advise for further research.

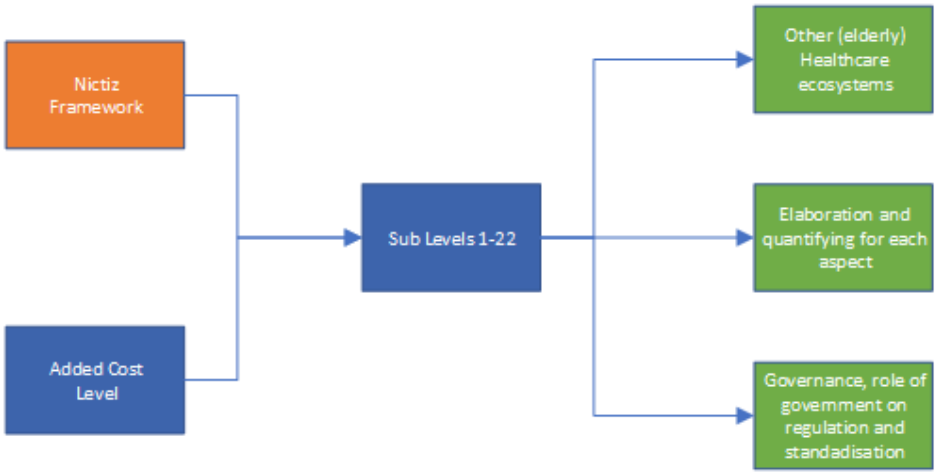

Figure 8, Recommendations for further research (green)

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Appendix A1 Data Extraction Template

General information

Title of the article	
Author(s)	
Year of publication	

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?		
Is the context like our own?		
Is this article used as a reference in other articles?		
Does the article provide guidance for future research?		
Does the article contain benefits regarding interoperability?		
Does the article contain barriers and challenges regarding interoperability?		
Does the article contain healthcare ecosystems or digital platforms		
Is the study's methodology sufficient?		

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy			
Health processes			
Information			
Application			
IT Infrastructure			
Security			
Legal & regulatory			
Cost aspects			

Appendix A2 Review literature

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
1	The benefits and threats of blockchain technology in healthcare: A scoping review	2020	2	1	S	0				no
2	Implementing healthcare interoperability utilizing SOA and data interchange agent	2015	8	1	1	1	yes	yes	yes	yes
3	Interoperability in Health and Social Care: Organizational Issues are the Biggest Challenge	2018		1	1	1	yes	yes	yes	yes
4	Adoption of enterprise architecture for healthcare in AeHIN member countries	2020		0	0	0				no
5	The new European interoperability framework as a facilitator of digital transformation for citizen empowerment	2019	3	1	1	1	yes	yes	yes	yes
6	Harnessing Data Science Through Healthcare IT Interoperability	2019		1	0	0				no
7	Patient-centric ICTs based healthcare for students with learning, physical and/or sensory disabilities	2018	4	0	0	0				no
8	The Role of the Internet of Things in Healthcare: Future Trends and Challenges	2021		0	0	0				no
9	Quantifying the competitiveness of the electronic health record market and its implications for interoperability	2020		1	S	0				no
10	FAIR data sharing: The roles of common data elements and harmonization	2020	5	1	1	1	yes	yes	yes	yes

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
11	Ubiquitous Health Profile (UHPr): a big data curation platform for supporting health data interoperability	2020	1	1	1	0				no
12	Structurally Mapping Healthcare Data to HL7 FHIR through Ontology Alignment	2019	4	1	1	0				no
13	Smart integrated IoT healthcare system for cancer care	2019		0	0	0				no
14	Using Information Technology to Improve the Quality of Pediatric Healthcare	2017		0	0	0				no
15	The Current State of Research, Challenges, and Future Research Directions of Blockchain Technology in Patient Care: Systematic Review	2020	2	1	0	0				no
16	Interoperability issues on heterogeneous wireless communication for smart cities	2015	19	1	0	0				no
17	"A decade's worth of work in a matter of days": The journey to telehealth for the whole population in Australia	2021		0	0	0				no
18	A systematic review of IoT in healthcare: Applications, techniques, and trends	2021		0	0	0				no
19	OmniPHR: A distributed architecture model to integrate personal health records	2017	74	1	1	1	yes	yes	yes	yes
20	A system architecture for ensuring interoperability in a South African national electronic health record system	2021		1	1	0				no
21	Logical Observation Identifiers Names and Codes for Laboratorians Potential Solutions and Challenges for Interoperability	2020	5	1	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
22	Adoption of Electronic Personal Health Records in Canada: Perceptions of Stakeholders	2016	21	1	1	0				no
23	Electronic health records implementation in Morocco: Challenges of silo efforts and recommendations for improvements	2019		1	0	0				no
24	Multimodal Wearable Intelligence for Dementia Care in Healthcare 4.0: a Survey	2021		1	1	0				no
25	Clinical decision support models and frameworks: Seeking to address research issues underlying implementation successes and failures	2018	25	0	0	0				no
26	Best practices in scaling digital health in low and middle income countries	2018	25	1	0	0				no
27	OpenMRS as a global good: Impact, opportunities, challenges, and lessons learned from fifteen years of implementation	2021		1	0	0				no
28	Easing the development of healthcare architectures following RM-ODP principles and healthcare standards	2013		0	0	0				no
29	An Integrated Framework to Achieve Interoperability in Person-Centric Health Management	2011		1	1	1	yes	yes	yes	yes
30	One country's journey to interoperability: Tanzania's experience developing and implementing a national health information exchange	2021		1	1	0				no
31	Blockchain Integration With Digital Technology and the Future of Health Care Ecosystems: Systematic Review	2021		1	S	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
32	A distributed simulation methodological framework for OR/MS applications	2017		0	0	0				no
33	Use of standardized terminologies in clinical practice: A scoping review	2021		1	1	0				no
34	A distributed framework for health information exchange using smartphone technologies	2017		0	0	0				no
35	The potential adoption benefits and challenges of LOINC codes in a laboratory department: a case study	2017		0	0	0				no
36	Monitoring IaaS Cloud for Healthcare Systems: Healthcare Information Management and Cloud Resources Utilization	2020		1	0	0				no
37	Blockchain for 5G and beyond networks: A state of the art survey	2020	9	0	0	0				no
38	Role of OpenEHR as an open source solution for the regional modelling of patient data in obstetrics	2015	28	0	0	0				no
39	Patient monitoring in mobile health: opportunities and challenges	2014		0	0	0				no
40	A Role for Data: An Observation on Empowering Stakeholders	2013	8	0	0	0				no
41	Promoting innovation in healthcare	2017		0	0	0				no
42	Patient Access to Personal Health Information: An Analysis of the Consumer's Perspective	2017		1	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
43	Successfully implementing a national electronic health record: a rapid umbrella review	2020		1	1	1	yes	yes	yes	yes
44	Electronic Patient Record System in Hamad Medical Corporation, Qatar: Challenges and Improvements	2017		0	0	0				no
45	Studying the impact of interoperable electronic health records on workflow in ambulatory care	2015	7	1	1	0				no
46	Blockchain application in healthcare service mode based on Health Data Bank	2020		0	0	0				no
47	Development of an Ease-of-Use Remote Healthcare System Architecture Using RFID and Networking Technologies	2012	9	0	0	0				no
48	Interdisciplinary Mobile Health Model to Improve Clinical Care After Heart Transplantation: Implementation Strategy Study	2020		0	0	0				no
49	Telemedicine and health policy: A systematic review	2021		0	0	0				no
50	Process-Oriented Integration and Coordination of Healthcare Services across Organizational Boundaries	2012	6	1	0	0				no
51	Health information technology implementation - impacts and policy considerations: a comparison between Israel and Portugal	2015	12	0	0	0				no
52	The Arden Syntax standard for clinical decision support: Experiences and directions	2012	67	1	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
53	Remote monitoring costs, benefits, and reimbursement: a European perspective	2013	13	0	0	0				no
54	Security and privacy issues in cloud computing	2017	5	0	0	0				no
55	Translational Medicine and Patient Safety in Europe: TRANSFoRm—Architecture for the Learning Health System in Europe	2015	29	1	0	0				no
56	Edge Mesh: A New Paradigm to Enable Distributed Intelligence in Internet of Things	2017	55	0	0	0				no
57	Feasibility of ehealth implementation in India learning from global experience	2019		0	0	0				no
58	Electronic health records and cardiac implantable electronic devices: new paradigms and efficiencies	2016		0	0	0				no
59	Integration of a nationally procured electronic health record system into user work practices	2012	51	0	0	0				no
60	Autonomous mapping of HL7 RIM and relational database schema	2011	4	0	0	0				no
61	Diabetes digital app technology: benefits, challenges, and recommendations. A consensus report by the European Association for the Study of Diabetes (EASD)...	2019	5	0	0	0				no
62	Public strategies for improving eHealth integration and long-term sustainability in public health care systems: Findings from an Italian case study	2018	7	1	S	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
63	Is blockchain for Internet of Medical Things a panacea for COVID-19 pandemic?	2021		0	0	0				no
64	Developing Regional Primary Health Analytic Capability	2018		0	0	0				no
65	Developing and Evaluating Digital Interventions to Promote Behavior Change in Health and Health Care: Recommendations Resulting From an International...	2017	189	1	1	0				no
66	Lightweight Proof of Game (LPoG): A Proof of Work (PoW)'s Extended Lightweight Consensus Algorithm for Wearable Kidneys	2020	1	1	0	0				no
67	Telepsychiatry in the 21(st) century: transforming healthcare with technology	2013		0	0	0				no
68	Blockchain Applications in Health Care and Public Health: Increased Transparency	2021		0	0	0				no
69	Applying a framework for assessing the health system challenges to scaling up mHealth in South Africa	2012	87	0	0	0				no
70	Realising the full potential of data-enabled trials in the UK: a call for action	2021		0	0	0				no
71	A Novel System Architecture for the National Integration of Electronic Health Records: A Semi-Centralized Approach	2013	12	1	S	0				no
72	Technical Challenges of Enterprise Imaging: HIMSS-SIIM Collaborative White Paper	2016	14	0	0	0				no
73	Critical Factors Influencing Hospitals' Adoption of HL7 Version 2 Standards: An Empirical Investigation	2010	32	1	1	1	yes	yes	yes	yes

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
74	Enhancing Patient Response Time and Hospital Efficiency. Evidence from the Wielkopolska Region (Poland)	2016		0	0	0				no
75	The adapt European project: The transdisciplinary development of assistive technology for the benefit of the disabled people	2018		0	0	0				no
76	Telepsychiatry in the 21st Century: Transforming Healthcare with Technology	2013		0	0	0				no
77	Electronic Medical Records in the American Health System: challenges and lessons learned	2020		1	S	0				no
78	StayHome: A FHIR-Native Mobile COVID-19 Symptom Tracker and Public Health Reporting Tool	2021		1	0	0				no
79	Sharing clinical decisions for multimorbidity case management using social network and open-source tools	2013	14	1	S	0				no
80	A hybrid and scalable multi-agent approach for patient scheduling based on Petri net models	2017	10	0	0	0				no
81	The Internet of Things: Impact and Implications for Health Care Delivery	2020	1	0	0	0				no
82	Feasibility of ehealth implementation in India learning from global experience	2019		0	0	0				no
83	Challenges and recommended technologies for the industrial internet of things: A comprehensive review	2020	14	1	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
84	Combining Mixed Reality and Internet of Things: An Interaction Design Research on Developing Assistive Technologies for Elderly People	2019		0	0	0				no
85	Do You Need My Health Data - Just Ask: Using Blockchain Technology for Collaborative Patient-Centric Health Care	2020		0	0	0				no
86	Blockchain as a disruptive technology for business: A systematic review	2020	16	0	0	0				no
87	Using national electronic health care registries for comparing the risk of psychiatric re-hospitalisation in six European countries: Opportunities and limitations	2019	2	1	0	0				no
88	A knowledge-based taxonomy of critical factors for adopting electronic health record systems by physicians: a systematic literature review	2010	65	1	1	0				no
89	Open-Source Electronic Health Record Systems for Low-Resource Settings: Systematic Review	2017	14	0	0	0				no
90	Natural Language Processing and Its Implications for the Future of Medication Safety: A Narrative Review of Recent Advances and Challenges	2018	13	0	0	0				no
91	Utilizing a Prototype Patient-Controlled Electronic Health Record in Germany: Qualitative Analysis of User-Reported Perceptions and Perspectives	2018		1	S	0				no
92	Patient Monitoring in Mobile Health: Opportunities and Challenges	2014		1	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
93	Driving digital transformation of comprehensive primary health services at scale in India: an enterprise architecture framework	2021		0	0	0				no
94	Family physician perceptions of personal health records	2010		0	0	0				no
95	Integrated Nationwide Electronic Health Records system: Semi-distributed architecture approach	2016	3	1	1	1	yes	yes	yes	yes
96	AI-empowered, blockchain and SDN integrated security architecture for IoT network of cyber physical systems	2022		0	0	0				no
97	Using Health Information Exchange to Support Community-based Innovations	2018		0	0	0				no
98	A Role for Data	2013		0	0	0				no
99	Tissue Multiplex Analyte Detection in Anatomic Pathology – Pathways to Clinical Implementation	2021		0	0	0				no
100	Toward Integration of mHealth in Primary Care in the Netherlands: A Qualitative Analysis of Stakeholder Perspectives	2020		1	S	0				no
101	A Hybrid Lifetime Extended Directional Approach for WBANs	2015	12	0	0	0				no
102	Alert based disaster notification and resource allocation	2010	22	0	0	0				no
103	The Feasibility of the Nationwide Health Information Network	2016		1	1	1	yes	yes	yes	yes

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
104	XML Data and Knowledge-Encoding Structure for a Web-Based and Mobile Antenatal Clinical Decision Support System: Development Study	2020		0	0	0				no
105	Financial Knowledge Graph Based Financial Report Query System	2021		0	0	0				no
106	How Can Digital Health Technologies Contribute to Sustainable Attainment of Universal Health Coverage in Africa? A Perspective	2019	4	0	0	0				no
107	A framework for integration of heterogeneous medical imaging networks	2014		1	1	0				no
108	A Data Types Profile Suitable for Use with ISO EN 13606	2012	4	0	0	0				no
109	Integrating Clinical Trial Imaging Data Resources Using Service-Oriented Architecture and Grid Computing	2010	6	0	0	0				no
110	Adopting telehealth innovations: when evidence is not enough	2013		0	0	0				no
111	Differing Strategies to Meet Information-Sharing Needs: Publicly Supported Community Health Information Exchanges Versus Health Systems' Enterprise...	2016	24	1	1	0				no
112	The global alliance for genomics and health: towards international sharing of genomic and clinical data	2015		1	0	0				no
113	Logical Observation Identifiers Names and Codes for Laboratorians	2020		0	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
114	An Architecture and Management Platform for Blockchain-Based Personal Health Record Exchange: Development and Usability Study	2020	1	1	S	0				no
115	Sharing data to ensure continuity of care	2010		1	1	1	yes	yes	yes	yes
116	Revolutionizing Medical Data Sharing Using Advanced Privacy-Enhancing Technologies: Technical, Legal, and Ethical Synthesis	2021		1	1	0				no
117	Clinicians' Role in the Adoption of an Oncology Decision Support App in Europe and Its Implications for Organizational Practices: Qualitative Case Study	2019	6	0	0	0				no
118	Implementing integrated care – lessons from the national implementation of general eReferrals in Ireland	2017		1	S	0				no
119	Systems architecture for integrated care	2012		1	1	0				no
120	Modularising ontology and designing inference patterns to personalise health condition assessment: the case of obesity	2016	3	0	0	0				no
121	Electronic health records in ambulances: the ERA multiple-methods study	2020		0	0	0				no
122	Personalized Remote Monitoring of the Atrial Fibrillation Patients with Electronic Implant Devices	2011	4	1	0	0				no
123	Quality of human-computer interaction - results of a national usability survey of hospital-IT in Germany	2011	11	0	0	0				no

no.	Title	Year	Reviews	Stage 2	Stage 3	Stage 4	Interop. in Health	Benefits	Barriers	Result
124	Electronic Medical Records in the American Health System: challenges and lessons learned	2020		1	1	1	yes	yes	yes	yes
125	Digital health applications in der ärztlichen und psychotherapeutischen Versorgung. Chancen und Herausforderungen aus Sicht der Leistungserbringer	2021		0	0	0				no
126	Research note	2016		0	0	0				no
127	RDF Model Generation for Unstructured Dengue Patients' Clinical and Pathological Data	2019		0	0	0				no
128	Optimizing Patient Safety Support in the Digital World	2011		0	0	0				no

Appendix A3 Review articles

General information 1

Title of the article	FAIR data sharing: The roles of common data elements and harmonization
Author(s)	Kush, R.D; Warzel, D; Kush, M.A ; Sherman, A; Navarro, E.A; Fitzmartin, R; Pétavy, F; Galvez, J; Becnel, L.B; Zhou, F.L; Harmon, N; Jauregui, B; Jackson, T; Hudson, L
Year of publication	2020

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	Yes	This study aims at resolving overarching issues related to data sharing. The study promotes the use of Common Data Elements as a means of bridging the gap.
Is the context like our own?	Yes	
Is this article used as a reference in other articles?	Yes	
Does the article provide guidance for future research?	Yes	
Does the article contain benefits regarding interoperability?	Yes	
Does the article contain barriers and challenges regarding interoperability?	Yes	
Does the article contain healthcare ecosystems or digital platforms	No	
Is the study's methodology sufficient?	Yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• Remove political and social barriers to data sharing and encourage to work together. • Build better "Bridges" between research and healthcare organization	• "To overcome the barriers to interoperability and responsible data sharing in research and healthcare, which continue to increase costs and hinder availability of information

Nictiz framework	Benefits	Barriers & Challenges	Main findings
			throughout the healthcare system for all stakeholders, appropriate use and adoption of robust data standards and appropriate terminologies is critical. A concerted collaborative global effort is essential." • "Establish a global infrastructure that encourages the acceptance, adoption and re-use of harmonized and preferred CDEs and global data standards "
Health processes			
Information		• the act of exchanging data (interoperability) along with its meaning (semantic interoperability) across studies and between partners has been difficult; • however, usually CDEs are defined for specific projects or collaborations and lack traceable or machine readable semantics. • The problem of comparing data among studies is exacerbated when researchers select different CDEs for the same variable or data collection field. • Without applying data exchange standards along with appropriate domain-relevant content standards and accessible rich metadata that uses applicable terminologies1 , interoperability is hindered by the need for manual transformation and/or mapping. These obstacles to interOperability limit the findability, accessibility and reusability of data, thus diminishing its value.	•

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		• Data that are shared in non-standard formats can take considerable time to understand and can lead to interpretation errors. • Aggregation of datasets that are in different formats, either across studies or repositories or for inclusion in a data commons, requires mapping, which is not only extremely time-consuming and costly, but can also compromise data quality, integrity, completeness, and traceability. • "To promote interoperability and retain meaning within interpretation and analysis, shared data should, as far as possible, be structured, described and formatted using widely recognized data and metadata standards. • meaningful data sharing and the return on investment of medical research requires the broad adoption of consensus-based, widely adopted global data standards and terminologies such that the data can be readily exchanged, interpreted, compared and aggregated across studies. • Standardizing and validating data retrospectively is expensive, time consuming, and potentially introduces errors and biases. • To overcome the barriers to interoperability and responsible data sharing in research and healthcare, which continue to increase costs and hinder	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		availability of information throughout the healthcare system for all stakeholders, appropriate use and adoption of robust data standards and appropriate terminologies is critical. A concerted collaborative global effort is essential. • Establish a global infrastructure that encourages the acceptance, adoption and re-use of harmonized and preferred CDEs and global data standards	
Application	• FHIR could eventually be able to support clinical research needs. • FHIR supports deviations from the primary resources it defines through community defined "Profiles". • FHIR could eventually be able to support clinical research needs.	• Without applying appropriate data exchange standards with domain-relevant content standards and accessible rich metadata that uses applicable terminologies, interoperability is burdened by the need for transformation and/or mapping. These obstacles to interoperability limit the findability, accessibility and reusability of data, thus diminishing its value and making it impossible to adhere to FAIR principles. • In the healthcare arena, Health Level Seven (HL7) [32] is now offering a standard called, Fast Healthcare Interoperable Resources (FHIR), which is designed to improve interoperability among electronic health records.	
IT Infrastructure			
Security			
Legal & regulatory			
Cost aspects			

General information 2

Title of the article	Integrated Nationwide Electronic Health Records system: Semi-distributed architecture approach
Author(s)	Fragidis, Leonidas L; Chatzoglou, Prodromos D; Aggelidis, Vassilios P
Year of publication	2016

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study proposes a semi- distributed architecture approach for an integrated nationwide EHR. This study supports our framework with an infrastructural approach.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	yes	
Does the article provide guidance for future research?	no	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	• The proposed semi-distributed architecture offers a robust interoperability framework without healthcare providers to change their local EHR systems.		• The proposed semi-distributed architecture offers a robust interoperability framework without healthcare providers to change their local EHR systems. • Further, other important issues, such as fast health data transmission, processing time delay, complexity of

Nictiz framework	Benefits	Barriers & Challenges	Main findings
			the system design, privacy and security, are effectively tackled.
Health processes	• The integration of heterogeneous electronic health records systems by building an interoperable nationwide electronic health record system provides undisputable benefits in health care, like superior health information quality, medical errors prevention and cost saving. • such as increased speed in EHR access, • medical errors prevention • medication reduction		
Information	• improve health information quality	• the Citizens Basic Health Data (CBHD) to should be kept in HDs using semantically interoperable standards	
Application		• The integration of EHR systems which are installed in different healthcare providers in order to build an interoperable Nationwide Electronic Health Record (NEHR) system is still a challenge in most developed countries. • The exchange of health data among healthcare providers is performed according to the Fast Healthcare Interoperability Resources (FHIR) standards framework, created by Health Level Seven (HL7).	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		• A backup mechanism for locating Citizens Specific Health Data, in case of Citizens Health Record Locator communication loss of the nearest HD, is also proposed	
IT Infrastructure	• One of the main advantages of the centralized architecture approach is the fast replies on patients' health data requests, resulting from the existence of a central repository. • On the other hand, the major advantages of the distributed architecture approach are the reduced system implementation cost and the data consistency, since there in not a central repository for health patients'' data. Furthermore, since patients' data are kept locally, security and privacy concerns are reduced.	• The proposed architecture integrates hospital's EHR system to a semi-distributed Nationwide Electronic Health Record system. Finally, a prerequisite for implementing the distributed architecture is the high bandwidth availability of the health data communication network. • On the other hand, the development of a central repository is quite costly and, in case data are duplicated from the local to the central database, the system suffers from inconsistency, taking into account that the central repository is updated periodically. Another significant difficulty is that many different systems should send their data to the same central point following the same encoding, which increases the complexity of the design of the system, thus causing implementation delays. • Finally, a prerequisite for implementing the distributed architecture is the high bandwidth availability of the health data communication network.	
Security	• The proposed semi-distributed architecture system design meets the basic principles of information security such as	• The proposed system is required to be a citizen centred system, taking into account that patient centred care is a core component of healthcare quality.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	confidentiality, consistency, integrity, availability and accountability.	• Furthermore, through NHAS, access is provided not only to National EHR system but to all nationwide interoperable Health Information Systems in order to ensure system's consistency. For each entity, a unique identifier has been assigned. • Therefore, all public Hospitals have a unique identifier and all Clinicians in public hospitals have their own personal identifier. • For both security and storage reasons, data are stored in an encrypted format. • On the other hand, the development of a central repository is quite costly and, in case data are duplicated from the local to the central database, the system suffers from inconsistency, taking into account that the central repository is updated periodically. Another significant difficulty is that many different systems should send their data to the same central point following the same encoding, which increases the complexity of the design of the system, thus causing implementation delays	
Legal & regulatory			
Cost aspects	cost saving.		

General information 3

Title of the article	Sharing data to ensure continuity of care
Author(s)	Dickerson, Audrey E; Sensmeier, Joyce
Year of publication	2010

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study promotes efficient communication through interoperability in health information systems and the use of data standards.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	no	
Does the article provide guidance for future research?	no	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	No	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• IHE has developed a number of profiles for specific clinical areas that provide a way to address interoperability problems related to needed clinical data.	To deliver timely, efficient, and high-quality healthcare, clinicians need up-to-date information about each patient receiving care in acute and chronic healthcare settings. Currently, clinical data don't move freely between care settings and time. Addressing interoperability challenges using HIT standards and implementing guides such as IHE profiles

Nictiz framework	Benefits	Barriers & Challenges	Main findings
			can provide a path toward the seamless exchange of clinical data to advance continuity of care by clinicians for the benefit of individuals and communities.
Health processes	• Sharing health data through health information systems is a requirement for clinicians to provide the best possible care. • The ED system automatically notifies the other service bureaus of the patient's pending admission. The respiratory therapist then arrives on the unit to set up the oxygen as ordered. • Nursing workflow and dataflow work are processed together simultaneously in EHRs. • Interoperability is the ability of health information systems to work together within and across organizational boundaries to advance the effective delivery of healthcare for individuals and communities.	• To provide access to patient data in a consistent and timely way, information systems must be interoperable.	
Information	• An electronic summary report is received before the patient's arrival on the unit, including pending lab results and any clinician orders.	• It's impossible to communicate information efficiently without the use of two important concepts: interoperability of health information systems and health information data standards.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	• The pharmacy system sends notification when the patient's unit dose medication will be arriving. • The patient's EHR provides records of the previous acute care episode, including the pertinent health history. • When the patient transfers to a long-term-care or home-care setting, all clinical documentation should be available electronically before transfer so the healthcare entity has the most current and up-to-date information to provide the best safe, quality care. • current clinical information accessible at the point of care. • clinical information sent to any department where the information may be needed (such as the respiratory department). • clinical data received from the ED. • current (up to the minute) clinical information available for nursing handoff or discharge report.	• data standards provide the optimal platform for interoperability in health information systems. • The computer message must include an identifying element within the message, so the clinical data are attributed to the correct patient. • The data can be electronically compared or trended with previous data. • The data can also be sent can also be sent to the patient's personal health record and/or sent to the healthcare provider ambulatory health record. • The data and clinical documentation can be shared throughout an acute care or ambulatory care system, including any specific departments within the system that are necessary for the safe, quality care of the patient. • Data can be compiled for comparison with other similar de-identified data for purposes of developing best practice in healthcare related to pneumonia. • To implement an interoperable system, multiple standards must work together. • HIT standards need to be implemented in a consistent way in order for two different systems to be able to communicate and share data.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	• current medical and nursing orders accessible at the point of care. • current and trended lab reports, special procedures, or X-rays accessible at the point of care • current problem lists, progress reports, and health assessments accessible at the point of care • discharge summaries with instructional sheets available for the patient and customized to his diagnoses.		
Application		• Unfortunately, electronic interfaces are expensive and difficult to maintain. • Integrating the Healthcare Enterprise (IHE) provides implementation guides, also called IHE profiles. An IHE profile may be written using HIT standards to solve problems at the point of care or for related infrastructure issues.	
IT Infrastructure			
Security		• The data sent need to be completely secure, as all clinical data are subject to Health Insurance Portability and Accountability Act rules for confidentiality.	
Legal & regulatory	• Adoption of standards also supports legal use of the health record and enhanced justification for healthcare decision making.		

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Cost aspects	• Implementation of data standards seems daunting, but once these standards are in place, they create a much more efficient and less costly method.		

General information 4

Title of the article	An Integrated Framework to Achieve Interoperability in Person-Centric Health Management
Author(s)	Vergari, Fabio; Salmon Cinotti, Tullio; D'Elia, Alfredo ; Roffia, Luca; Zamagni, Guido; Lamberti, Claudio
Year of publication	2011

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	Yes	This paper focuses on one technological aspect, which is information level interoperability, and claims that the wide adoption of interoperability platforms is the way to open innovation in healthcare.
Is the context like our own?	Yes	
Is this article used as a reference in other articles?	No	
Does the article provide guidance for future research?	Yes	
Does the article contain benefits regarding interoperability?	Yes	
Does the article contain barriers and challenges regarding interoperability?	Yes	
Does the article contain healthcare ecosystems or digital platforms	Yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	• The challenge is to improve care efficiency and effectiveness and to support sustainability of healthcare evolution. The goal is to manage increasing costs, and reduce unnecessary tests by having access to all relevant	• Bringing interoperability into the healthcare system is a great challenge as it requires innovation not only in healthcare technology in general but also in management and working style; • The main benefit of the proposed solution {semantic interoperability} is the possibility to easily create an open and dynamic	This paper focuses on one technological aspect, which is information level interoperability, and claims that the wide adoption of interoperability platforms is the way to open innovation in healthcare. In order to handle the heterogeneity of relevant information and to overcome the fragmentation of the instrumentation

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	data and promoting integration of diagnosis and treatment.	smart environment where different actors and systems cooperate on the same information store to enrich the shared knowledge.	involved, a shared and open source interoperability component was proposed, which is ontology driven and based on the semantic web data model.
Health processes	• The common approach to improve the quality of the care process is to enable service access "at any time and in any place" and to move from "how to treat patients" to "how to keep people healthy and prevent illness."		
Information	• Worldwide healthcare standards are considered important indicators of human progress and civilization as they strongly affect both the economy of countries and the quality of life of citizens;	• Information level interoperability is an important concern since row data originates from heterogeneous devices that are inherently incompatible due to lack of standardization and because they are produced by a competing industry. • The main challenge is to integrate the most recent patient information and their historical data into personal health systems and to transform collected information into valuable support for decision making. • Furthermore, in order to make them available in a meaningful and easy way, such data should be stored and uniformly represented in a data sharing platform. Once data are stored, some mechanisms to retrieve and analyse such data are needed. Finally, a shared metadata for information representation is required to harmonize	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		the process of assessing the patient clinical situation and to support the doctor in his/her decision making process. • Smart space interoperability makes clear separation between device, service, and information level interoperability. The described work was focusing on information level interoperability,	
Application		• Still, there is a recognized barrier to healthcare radical innovation and associated cost-effectiveness improvement: this barrier is the fragmentation of healthcare solutions and the lack of interoperability at many levels; • The implementation of a smart space application based on the proposed approach first requires an ontology to describe the domain of interest, then a set of Knowledge processors need to be developed in order to achieve the desired behaviour.	
IT Infrastructure	• If health and context data are shared and made interoperable, then they might be combined and the new knowledge thus generated could support innovative applications for the benefit of multiple institutions and users. • This section describes the platform that ensures interoperability to the	• This paper focuses on one technological aspect, which is information level interoperability, and claims that the wide adoption of interoperability platforms is the way to open innovation in healthcare. • In order to handle the heterogeneity of relevant information and to overcome the fragmentation of the instrumentation involved, a shared and open source interoperability component was proposed, which is ontology driven and based on the semantic web data model.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	addressed health management scenario. The expected benefit is information integration to increase the knowledge about the patient and to facilitate the exchange of information between user, medical, and statistical planes.		
Security		• Information security and privacy, as well as trust management, are fundamental qualities in a telemedicine scenario, that may become an OIP extension.(open innovation platform)	
Legal & regulatory			
Cost aspects			

General information 5

Title of the article	Electronic Medical Records in the American Health System: challenges and lessons learned
Author(s)	Janett, Robert S; Yeracaris, Peter Pano
Year of publication	2020

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study describes the role of EMR implementation and the importance of standardization as conditional for the sharing information between organizations
Is the context like our own?	yes	
Is this article used as a reference in other articles?	no	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	no	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	• The electronic medical record (EMR) is a disruptive technology that can revolutionize the way we care for patients. The EMR has been shown to improve quality and reliability in the delivery of healthcare	• Considerable problems have been noted to result from a lack of interoperability and standardization of interfaces among these systems, impairing the effective collaboration and information exchange in the care of complex patients. It is extremely important that regional and national health policies be established to	The EMR is unsurpassed as a tool to enhance communication among members of the care team and between providers at various levels of care, supporting horizontal and vertical integration. To maximize the effectiveness of the new capabilities, cultural changes at the practice and system level are

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	services when appropriately implemented. Careful attention to the impact of the EMR on clinical workflows, in order to take full advantage of the potential of the EMR to improve patient care, is the key lesson from our experience in the deployment and use of these systems.; • Comprehensive integrated primary care is perhaps the most significant contributor to reform of the American health system. • Factors such as training, policies and procedures, and financial incentives can be used to favourably influence physician attitudes toward the EMR. • Factors that facilitate population health include improved productivity and efficiency, improved quality, data management, surveillance, and preventive care. • The authors concluded that wider adoption of EMRs with more comprehensive standards for interoperability among systems will improve	assure standardization and interoperability of systems. • Lack of interoperability contributes to the fragmentation of the information environment. • Factors that were deemed barriers to population health management include missing data, lack of standards for interoperability of different EMR systems, loss of productivity, and overly complex technology. • A study of a primary care group27 showed marked improvement of performance on quality metrics after adoption of an EMR, a near doubling of the rate of obtaining mammograms, varicella immunizations, and glycosylated haemoglobin testing and influenza immunization in patients with diabetes. • Environments with multiple different electronic medical record systems or with a mixture of electronic and paper systems present impediments to the EMR's potential to improve collaboration and care coordination through vertical integration4 . In these circumstances, practices often revert to scanning of printed documents, degrading the power of an EMR to search and compare clinical data that would otherwise be entered into specific fields.	necessary to support behaviour norms, compacts, and mutual expectations among providers on collaboration in the care of patients. It is extremely important that regional and national health policies be established to assure standardization and interoperability of systems.

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	the capacity to conduct surveillance and disease management and prevention.	• National and regional policies are required to establish standards for EMR interoperability • It also involves coordination, standardization of work processes, training, and accountability43. • Responsibilities of the referring physician and the receiving physician must be established in advance of the transfer. • The EMR is unsurpassed as a tool to enhance communication among members of the care team and between providers at various levels of care, supporting horizontal and vertical integration. • The key lessons from the US experience in the deployment and use of these systems are (1) attention to interoperability among various systems, and (2) careful attention to the impact of the EMR on clinical workflows, in order to take full advantage of the potential of the EMR to improve patient care.	
Health processes	• A high functioning EMR helps reduce fragmentation in the care delivery system and this improves quality and efficiency by reducing gaps in care. • A meta-analysis on the impact of the EMR on healthcare quality25 found a 22.4% reduction in documentation time, higher adherence to	• Others have criticized the move toward the electronic medical record (EMR) as a threat to the physician patient relationship, to patient privacy, and as an additional administrative burden to the health system contributing to physician burn-out4 • A time motion study in five practices showed that the overall time spent face-to-face with patients after	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	clinical guidelines, and a lower number of medication errors. • A meta-analysis on the impact of the EMR on healthcare quality25 found a 22.4% reduction in documentation time, higher adherence to clinical guidelines, and a lower number of medication errors. • A high functioning EMR will support effective and efficient communication between patients and health care providers, support horizontal integration within the clinic, and support vertical integration between primary care, specialists, hospitals, laboratories and imaging centres. • A high functioning EMR will support effective and efficient communication between patients and health care providers, support horizontal integration within the clinic, and support vertical integration between primary care, specialists, hospitals, laboratories and imaging centres.	implementation of an EMR decreased by about 30 seconds1 • A high functioning EMR will support effective and efficient communication between patients and health care providers, support horizontal integration within the clinic, and support vertical integration between primary care, specialists, hospitals, laboratories and imaging centres.	
Information	• A study of a primary care group27 showed marked	• The failure of various EMR systems to standardize protocols for interoperability	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	improvement of performance on quality metrics after adoption of an EMR, a near doubling of the rate of obtaining mammograms, varicella immunizations, and glycosylated haemoglobin testing and influenza immunization in patients with diabetes. • The EMR is unsurpassed as a tool to enhance communication among members of the care team and between providers at various levels of care, supporting horizontal and vertical integration	can impair appropriate information sharing among providers caring for a patient. • The EMR is unsurpassed as a tool to enhance communication among members of the care team and between providers at various levels of care, supporting horizontal and vertical integration. • Considerable problems have been noted due to a lack of interoperability and standardization of interfaces among these systems, impairing the effective collaboration and information exchange in the care of complex patients.	
Application		• Vendors of EMR systems have engaged in extensive lobbying and marketing efforts to advance the commercial and proprietary interests of their companies. These efforts contribute to the fragmentation of the information environment.	
IT Infrastructure	•	•	
Security		• Moreover, coordination of complex care with specialists and hospitals involves shared access to clinical information and secure channels of communication. • Electronic systems also raise the spectre of potential violations of patient	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		confidentiality and breaches of private personal information.	
Legal & regulatory			
Cost aspects			

General information 6

Title of the article	Implementing healthcare interoperability utilizing SOA and data interchange agent
Author(s)	Batra, Usha; Sachdeva, Shelly; Mukherjee, Saurabh
Year of publication	2015

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study describes interoperability challenges such as the availability of a wide variety of standards in Healthcare. The study promotes the use of a web services to solve this challenge in stat of striving for one standard for all hospitals.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	yes	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	•	• Web services can support electronic healthcare in both intra and inter healthcare integration environment. The main characteristic of web services is that web services use platform-neutral standards such as HTTP, XML, SOAP, and UDDI for

Nictiz framework	Benefits	Barriers & Challenges	Main findings
			system interoperability and are supported by virtually every technology vendor in existence. This makes web services platform-independent. The platform independence is also predominant on the World Wide Web (WWW) [22]. Web service with a compliance of service orientation (a modular approach) promotes data application and integration using open standards and protocols. • A service oriented architecture is a collection of varied services where Service consumer queries the service directory to find out the type of services available in the directory and to obtain a service by communicating with the service provider. • HL7 standard is a structured specification that can be used for interconnection and exchange of health records.
Health processes	•	•	
Information	• Integration of IT with healthcare system requires interoperability that may lead to open connectivity at all levels (i.e. inPatient and outPatient care). This could be achieved by introducing interoperability among various healthcare service	• The challenge lies in availability of wide variety of standards and illustration of same medical record in different structures. This could be ruled out by introducing the concept of web services technology to solve the interoperability problems in the healthcare domain. • Despite the fact that the medical information representation is complex in	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	providers which is important for ensuring that patient information is available anytime and right at the point of care, eliminating unnecessary delay in treatment, avoiding replication of test reports, improving more informed decisions and hence leading to improved quality of care. • The healthcare information systems must incorporate semantic interoperability [37]. The main focus of our research is to achieve healthcare data semantic interoperability which ensures the necessary data quality and consistency. It will enable meaningful and reliable use of longitudinal and heterogeneous data for public health, research, and health service management.	nature, the availability of variety of standards leads to another problem in healthcare domain. • Health knowledge is becoming broad, deep and rich with time. Often, different clinics and hospitals have their own information systems to maintain patient data. There may be redundancy in data because of distributed and heterogeneous data resources. This may hinder the exchange of data among systems and organizations	
Application	• HL7 has established a set of information and message models for the development and implementation of interfaces for communication and transmission of medical data among heterogeneous health information systems.	• Considering the distributed and heterogeneous environment of healthcare domain, there are two ways for exchanging healthcare information. One is that each hospital/clinical system should use/follow the same standard, and the other is utilizing service oriented architecture. Standardizing the access to data through	•

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	The utilization of HL7 allows the implementation of integrated healthcare systems and it offers a native and efficient interoperability framework for software development and exploitation, and improves the workflow between the health information systems. • It is concluded that Searching Algorithm based on Service Oriented Architecture compliance to web services is an effective way to retrieve the information quickly and hence, leads to several benefits including low cost and development time, ease of maintenance, flexible, scalable, reusable, platform independent with rich testability, high availability, location transparency and having adequately faster running time.	the most promising solution of web services, rather than standardizing the electronic health record will help to overcome the integration problems with improved performance among different standards in medical information systems. • The main challenge of HL7 is that some organizations may utilize different versions of HL7 which are not backward compatible. This impacts its usage and leads to the requirement of constructing a new superior standard format for exchanging the information among healthcare information systems in heterogeneous environment. • Despite the fact that the medical information representation is complex in nature, the availability of variety of standards leads to another problem in healthcare domain. • Furthermore, exchanging healthcare details in a distributed environment should be in a flawless way because a patient may come across multiple health facilitators from different locations for different medical specialization over a period of time. • The healthcare information system contains huge volume of data and as the number of services increases, it is important that we shall have some efficient algorithm that is required for searching of data.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
IT Infrastructure	•	• There is still a big void for exchanging health data across the enterprises. Integration of IT with healthcare system requires interoperability that may lead to open connectivity at all levels	
Security	• This leads to the design of a standard format for exchanging healthcare information in a distributed environment in a seamless way. Security, performance and scalability trade-offs become major concerns of consideration to design such data interchange format.	•	
Legal & regulatory	•	•	
Cost aspects	•	•	

General information 7

Title of the article	The Feasibility of the Nationwide Health Information Network
Author(s)	Valle, Jazmine; Gomes, Christian; Godby, Tyler ; Coustasse, Alberto
Year of publication	2016

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	Yes	This article describes the feasibility of a Nationwide Health information Network. Concerns on the implementation costs and barriers on interoperability.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	no	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	no	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	•	The findings of this study have suggested that the utilization of NHIN has the capability to generate opportunities for cost savings after investment for implementation, increase in quality of patient care, and increase in patient-provider communication. Nevertheless, barriers to NHIN implementation and

Nictiz framework	Benefits	Barriers & Challenges	Main findings
			utilization still remain throughout the health care industry, the main one being concerns about interoperability.
Health processes	•	•	
Information	• The fast and ubiquitous access to patient records and other medical information provided by the NHIN could reduce the number of medical errors due to inadequate information regarding a patient's history, prescribed medication, and current condition. • The Nationwide Health Information Network has allowed the physician and patient to have more time to talk among another because the physician no longer has to contact various personnel to receive laboratory or test results and have more face-to-face time with patients; • Patients who are more engaged in their health have been more active participants in the therapeutic alliance collaboratively who manage their health with clinicians to improve factors such as pain reduction, functional outcomes, and medication adherence	• It was determined that apprehensions existed among the interviewed health care executives concerning the interoperability of NHIN; inhibited data translation due to organizations' varying definitions and infrastructure requirements for data transmission and retrieval to outside parties was the main issue voiced. • The lack of a structured nomenclature for data in health care has inhibited the ability of organizations to effectively and efficiently exchange information across a nationwide network.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Application	•	•	
IT Infrastructure	•	• The choice of patient data storage architecture impacted the efficiency, usability, and effectiveness of NHIN at the point of care, given that both architectures studied are popular models utilized within the US health care industry	
Security	•	• The interviews also found that health care executives were worried about patient privacy and the misuse of data.	
Legal & regulatory	•	•	
Cost aspects	• Implementation of an NHIN using various EHR systems in primary care can result in a positive financial return on investment to the health care organization.	• Despite the benefits that NHIN has provided, many health care providers have remained reluctant about committing to implementation and maintenance of such a technology given the high costs and effort associated with establishing NHIN standards; • Areas of apprehension included setup costs of new infrastructure needed, alteration costs of existing technology to be eligible for participation, training costs to educate workforce on using the new technology, and hiring costs to handle the increased workload necessary for operation; • Kaushal et al37 estimated that achieving NHIN required an initial capital investment of $156 billion over the course of 5 years, equal to 2% of total health care spending over that same time span. Two-thirds of this initial investment was for establishing functionalities such as EHRs, computerized	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		physician order entry, and electronic prescriptions, among others. • The remaining one-third of the initial investment was needed for establishing interoperability.	

General information 8

Title of the article	Interoperability in Health and Social Care: Organizational Issues are the Biggest Challenge
Author(s)	Oyeyemi, Afeezat, Olajumoke; Scott, Philip
Year of publication	2018

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	Yes	This study reports major interoperability challenges in Health and social care in England, the main being organisational barriers.
Is the context like our own?	Yes	
Is this article used as a reference in other articles?	No	
Does the article provide guidance for future research?	No	
Does the article contain benefits regarding interoperability?	Yes	
Does the article contain barriers and challenges regarding interoperability?	Yes	
Does the article contain healthcare ecosystems or digital platforms	Yes	
Is the study's methodology sufficient?	Yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• Over 78% agreed that organisational issues were the main interoperability challenge, as shown in Figure 3 below. Commercial competition between suppliers was an additional factor identified by participants, which was categorised as an organisational issue. 'Other' issues included factors such as finance, skill sets and staffing levels.	There are serious challenges to health and social care interoperability. This small-scale study has emphasised the importance of organisational barriers to interoperability, including commercial issues.

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Health processes	•	•	
Information	• According to NHS Digital,4 the primary benefit of interoperability is to offer safe and reliable information transfer, improve data sharing across the care pathway and reduce the likelihood of adverse clinical outcomes. Essentially, interoperability supports continuity of care. It is widely agreed that a set of harmonised standards is the most effective and efficient way to achieve and deliver best interoperable healthcare.	• Interoperability standards provide a common language which enables and supports health service improvements, economic benefits and safety improvements in care delivery. Some of the widely used healthcare interoperability standards are: • Health Level Seven (HL7) • SNOMED CT • Integrating the Healthcare Enterprise • OpenEHR • Semantic interoperability ensures each system has the ability to understand the information received from others without ambiguity. This layer uses coded clinical terminologies, messaging schemes, value sets and profiles	
Application	•	• Technical interoperability is the process of moving data between two systems and is not dependent on the type of information being moved. At this layer, there is no requirement at the receiving end of the system to interpret the content of the data.2 This is what is elsewhere defined as information exchange. • Semantic interoperability ensures each system has the ability to understand the information received from others without ambiguity. This layer uses coded clinical terminologies, messaging schemes, value sets and profiles	
IT Infrastructure	•	•	
Security	•	•	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Legal & regulatory	•	•	
Cost aspects	•	•	

General information 9

Title of the article	OmniPHR: A distributed architecture model to integrate personal health records
Author(s)	Roehrs, Alex; da Costa, Cristiano André; da Rosa Righi, Rodrigo
Year of publication	2017

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study describes a distributed architecture for sharing medical information between practitioners and patients due to the volume of the data and that it is scattered among different organisations.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	yes	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	no	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• However, it is still a challenge to have a unified viewpoint of patients' health history, because typically health data is scattered among different health organizations. • Furthermore, from the patients' viewpoint, they do not have an integrated view of their health records. Although there are	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		consolidated standards to structure the patient's health data, the adoption and implementation of EHR, particularly PHR, is still a challenge. • Much of the obstacles come from the fact that health records are sensitive and have complex management for owners and users. • There are concerns in PHR adoption from healthcare providers and patients, because users are afraid to share their data, as there are concerns about where data will be stored and who will have access to it; • However, in this sense, there are several doubts and challenges to face, such as: would it be necessary for all data to be shared online, or could it be according to a configurable periodicity and at idle moments? Is patient's data reported by a healthcare provider and shared with another one available indefinitely or for a fixed time? When sharing data, are all patient's data available by default (clinical and administrative) or should the patient select which ones to share? In case the patient needs to select, how can patient accomplish this task without great knowledge?	
Health processes	•	•	
Information	• Electronic Health Record (EHR) is a standardized information model, enabling integration among multiple	• Furthermore, there are several standards for these records, some of them open and others proprietary.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	healthcare providers, and this integration is considered their main advantage [24,25]. EHR has several benefits, ranging from supporting medical prescriptions [26], improving disease management [27] and contributing in the reduction of severe medication errors; • Other limitations are related to security of data exchanged between health organizations, or to non-incorporation of data about patient's wellness, such as sports activities or eating habits. • To integrate health systems, there are several health standards for different purposes and initiatives to mitigate some integration problems	• In case of PHRs (Personal Health Records), in which patients by definition can manage their health records, they usually have no control over their data stored in healthcare providers' databases. Thereby, we envision two main challenges regarding PHR context: first, how patients could have a unified view of their scattered health records. • Another factor is that the health data is becoming increasingly larger. Several studies bring out crucial points as getting this mass data about patients health, such as standardization of data, storage capacity, location, safety and how to filter, analyse and quickly obtain such data. • In many cases healthcare providers do not share their patients' data. Hence, they do not have these data up-to-date when their patients are assisted by other healthcare providers [39]. Moreover, these records are usually stored in different standards on different health organizations, which brings difficulties for exchange health records between organizations. • Many health organizations adopt their own formats for use of health records, and even when use open standard usually do not share them with other organizations. Thus, a patient may have health records scattered in several health organizations.	
Application	•	• Usually legacy systems in many health organizations preserve proprietary data	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		structures. In general, these databases are hosted in a data centre inside the health organizations, with restricted access to internal health professionals	
IT Infrastructure	•	• Usually health records are stored in databases within health organizations and rarely have external access. This situation applies mainly to cases where patients' data are maintained by healthcare providers, known as EHRs (Electronic Health Records).	
Security	• As patients are the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties	• how healthcare providers can access up-to-date data regarding their patients, even though changes occurred elsewhere. • Other limitations are related to security of data exchanged between health organizations, or to non-incorporation of data about patient's wellness, such as sports activities or eating habits. • There are concerns in PHR adoption from healthcare providers and patients, because users are afraid to share their data, as there are concerns about where data will be stored and who will have access to it	
Legal & regulatory	•	• Allied to these issues, health organizations maintain the patient's EHR indefinitely, even outdated. This is required for legal reasons, depending on the country. • There are concerns in PHR adoption from healthcare providers and patients, because users are afraid to share their data, as there are concerns about where data will be stored and who will have access to it	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Cost aspects	•	• Health organizations already have a cost of maintaining medical records [43] and not integrated with other institutions.	

General information 10

Title of the article	Successfully implementing a national electronic health record: a rapid umbrella review
Author(s)	Fennelly, Orna; Cunningham, Caitriona; Grogan, Loretto ; Cronin, Heather; O'Shea, Conor; Roche, Miriam; Lawlor, Fiona; O'Hare, Neil
Year of publication	2020

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study reviews the implementation of a national EHR and its interoperability challenges.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	yes	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• Whilst top-down, middle-out and bottom-up governance structures have been utilised, ongoing political willingness, national policies and some independence at an individual organizational level regarding EHR procurement, development and design, were recommended to promote engagement, usability and interoperability;	Therefore, the aim of this review is to identify and explore the key factors which promote a successful EHR implementation across healthcare settings, with active collaboration from key stakeholders in the Irish context. The key organizational, human and technological factors identified in this review provide policy-makers and other key stakeholders with a foundation

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		• It was also important that executive leaders such as CIOs and project management teams establish good and trusting relationships with vendors and consulting firms, and designed the implementation strategy with clear measurable objectives, a fitting implementation process (e.g., big-bang or phased), and clear roles and divisions of labour; • Basic computer and EHR-specific training were identified as key to a successful EHR implementation; • As stated earlier, national and international standards as well as regulation and policies were critical for interoperability and addressing privacy and security concerns. • Additionally whilst the governance approach was identified as important, a successful approach in one country cannot necessarily be replicated in another, as occurred in the UK where the top-down approach successfully employed in the Netherlands resulted in disengaged healthcare organizations across the UK	for making evidence-based decisions during the implementation of a fully interoperable EHR across primary, secondary and long-term care. However, consideration of the specific contextual influences is critical to the successful application of these factors. Additionally, the end-users, existing technological standards and policies, and advances in technology and research in the area, will impact on how these factors dynamically interact during the EHR implementation and will influence success.
Health processes	•	• IT skills as well as personal characteristics of individuals impacted on the success of an EHR implementation; • Additionally, enabling personalization of the EHR interface [53] and access to legacy paper-based records [50,51] as well as consideration of data quality and	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		accuracy [13,44,51] with use of health terminologies and classifications [56] was recommended. However, usability needs to be balanced with security	
Information	• data from electronic health records (EHRs) have been vital to decision-making on public health policies during the COVID-19 pandemic; • An HER provides a longitudinal record of information regarding the health status of an individual in computer-processible form across practices and specialists, and enables authorised access to clinical records in real-time; • the EHR provides access to patient information in a timely manner, enabling healthcare professionals (HCPs) to spend more time with patients 8 , reducing duplication of tests and work, and improving the safety and quality of care provided	•	
Application	•	• Despite the widely recognised benefits of electronic health records (EHRs), their full potential has not always been achieved, often as a consequence of the implementation process.;	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		• Despite the number of benefits which can be derived from these systems, challenges have been met in implementing a fully interoperable EHR between primary and secondary care; • Local contextual factors within countries such as two tier and fully private health systems, lack of employment of national standards [45,53,62], inconsistent data capture in incompatible formats [12], have rendered the creation of a fully interoperable EHR as difficult. Therefore, technical standards and communication between organizations were recommended to ensure interoperability was built in from the outset including for legacy and existing health IT systems	
IT Infrastructure	•	• Procurement or enhancement of infrastructure, including software (e.g., EHR, anti-viral), hardware (e.g., data-entry devices, Wi-Fi, power outlets) and furniture, accounted for a large proportion of the financial resourcing and were deemed critical for the success of the overall EHR implementation	
Security	•	• End-users' concerns with changes to data privacy and security, patient-clinician relationships and their roles and responsibilities, appeared to negatively impact on EHR implementations	
Legal & regulatory	•	•	
Cost aspects	• However, realistic benefits and timeframes specific to the	• Financial resourcing was often highlighted as a barrier especially by primary care	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	organization should be communicated with end-users [44,45,62]. Monetary incentives or penalties have also been shown to be important, especially for privately-governed organizations.	doctors [12,13] and those in lower income countries [48], and scope creep of the budget was a common occurrence for larger hospitals.	

General information 11

Title of the article	The new European interoperability framework as a facilitator of digital transformation for citizen empowerment
Author(s)	Kouroubali, Angelina; Katehakis, Dimitrios G
Year of publication	2019

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study describes the European Interoperability Framework that could work as a facilitator to enhance interoperability between healthcare systems.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	yes	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• Healthcare is a highly complex environment. • Subsequently all programs and projects aiming to change a healthcare system are similarly complex; • The balance of power has not shifted towards citizens, even if they are the	This paper offers a policy viewpoint on how the new European Interoperability Framework (EIF) may benefit the implementation of eHealth systems for the management of personal health information for citizens. Interoperability facilitates sharing of health and illness experiences, coordinated care and

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		fundamental stakeholder within the healthcare ecosystem. • However, there is a lack of incentives to motivate health systems and providers to share health information with patients and with each other, as the benefits are often not directly visible. • Implementing the vision of healthcare professionals adopting digital tools that would allow them to interoperate with those of other clinicians and the health system at large is an enormous task that requires behavioural and organizational changes.	research for citizen empowerment and improved health outcomes.
Health processes	• The new EIF was designed to promote the secure and free flow of data within the EU through advanced interoperability structures for public services across member states [25]. Expected benefits include time-savings, increased transparency, cost savings, better data availability, better data quality, higher satisfaction levels, improved compliance and better decision-making • The new EIF was designed to promote the secure and free flow of data within the EU through advanced interoperability structures for	•	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	public services across member states [25]. Expected benefits include time-savings, increased transparency, cost savings, better data availability, better data quality, higher satisfaction levels, improved compliance and better decision-making		
Information	• In the Netherlands, applications exist that connect mobile devices, with the hospital, the pharmacy, and the general practitioner giving an overview to the citizen of their information in the different systems. • Availability of healthcare information on the Internet has widened the knowledge and understanding of disease for the non-professional and has changed the communication model between physicians and patients; • An interoperable personal health record provides the opportunity to become the active link between citizens and their health information that resides in different places	• An interoperability framework facilitates the creation of the appropriate context in which personal health record applications can be designed and implemented in support of disease specific solutions, such as chronic non-malignant pain, diabetes and cancer. • However, the new EIF, when adapted for personally managed health data, provides a useful and relevant framework to facilitate implementation and adoption of personal health record systems within a coordinated care environment.	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	within the healthcare ecosystem. • Interoperability supports continuity of care as information can be shared across the different actors towards a common goal, which is healthcare and well-being delivery.		
Application	•	• National and regional health systems generate and store large amounts of EHR data for every citizen encounter. The majority of these data continue to be confined in data silos; • Often, data are of variable quality and unstructured, as free text, posing greater challenges for automatic processing; • The role of terminologies is instrumental in enabling interoperability, however, there are issues related to fragmented, inconsistent and complex terminologies, often rendering terminologies difficult to use and implement. • Standardization in message and document exchange has made a significant contribution to sharing health data, however, quality and integrity of data requires collaboration and negotiations among stakeholders	
IT Infrastructure	•	• EHealth implementations do not usually take into consideration the change management that is required as well as the amount of communication and	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		collaboration among stakeholders in order to achieve adequate interoperability	
Security	•	•	
Legal & regulatory	•	• Legal interoperability occurs when organizations that operate under different legal frameworks, policies and strategies are able to work together. New legislations are often needed to establish a public service. When this occurs, it is important to take into consideration existing legislations and the corresponding data protection requirements. • Services across organizations need to be governed by clear service level agreements.	
Cost aspects	•	• Existing eHealth systems collect and exploit only limited, fragmented information without unveiling their real potential. Software vendors and buyers are eager to solve short term problems, while the capacity of systems to truly interoperate and deliver the right data to the right person at the right time require long term strategic investments.	

General information 12

Title of the article	Critical Factors Influencing Hospitals' Adoption of HL7 Version 2 Standards: An Empirical Investigation
Author(s)	Lin, Chi-Hung; Lin, I-Chun; Roan, Jin-Sheng ; Yeh, Jehn-Shan
Year of publication	2010

Relevance and review questions

Subject	Answer (Yes/ No)	Argumentation
Are the research objectives close to our own?	yes	This study describes interoperability challenges from an organisational perspective when implementing HL7 for sharing medical information.
Is the context like our own?	yes	
Is this article used as a reference in other articles?	no	
Does the article provide guidance for future research?	yes	
Does the article contain benefits regarding interoperability?	yes	
Does the article contain barriers and challenges regarding interoperability?	yes	
Does the article contain healthcare ecosystems or digital platforms	yes	
Is the study's methodology sufficient?	yes	

Extraction

Nictiz framework	Benefits	Barriers & Challenges	Main findings
Policy	•	• In fact, main reasons behind a hospital's decision on whether to adopt an innovative technology are more often related to organizational than purely technical issues. • However, the main concerns of a hospital' decision on whether to adopt an innovative technology, such as a healthcare information standard, were	What are the reasons behind the hospitals' lack of intention to adopt HL7? Most prior studies on HL7 have focused on technical issues and general overlooked the managerial side. This has caused a lack of understanding of factors influencing hospitals' decision on HL7 adoption. In fact, main reasons behind a hospital's decision on whether to adopt an

Nictiz framework	Benefits	Barriers & Challenges	Main findings
		often related to organizational issues, rather than purely technical problems.	innovative technology are more often related to organizational than purely technical issues. The results showed that environmental pressure, top management attitude towards HL7, staff's technology capability, system integrity, and hospital's scale were critical factors influencing hospitals' intention on whether to adopt HL7.
Health processes	•	•	
Information	• However, the main concerns of a hospital' decision on whether to adopt an innovative technology, such as a healthcare information standard, were often related to organizational issues, rather than purely technical problems. • Many countries in European Union, North America, and Asia haven been working on integrating healthcare enterprise (IHE) since 1997, aiming to increase the interoperability among heterogeneous applications in order to achieve EMR, EHR and patient health record (PHR) in the future	•	
Application	• The Health Level Seven (HL7) is a standard for the interchange of data within the	•	

Nictiz framework	Benefits	Barriers & Challenges	Main findings
	healthcare industry. It simplifies communication interfaces and allows the interoperability among heterogeneous applications. • Health Level Seven (HL7) is one of the most well-known standards for electronic data exchange within the healthcare industry. Its primary purpose is to simplify communication interfaces and allows interoperability among heterogeneous healthcare applications; • Adopting the HL7 standard could reduce the complexity of communication interfaces employed by different systems.		
IT Infrastructure	•	• Most respondents expressed that the implementation of HL7 was incompatible with their existing IT architectures regarding hardware, software, applications or networks and introducing HL7 into the exiting practice was complex for their IS staff.	
Security	•	•	
Legal & regulatory	•	•	
Cost aspects	•	•	

Appendix A4 Full Conceptual Framework with explanations

Level/ Level	Sublevel	Description	Further Explanation	References
Policy Benefits	Collaboration	• Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	*Factors like training, policies and procedures incentives can favourably influence physician attitudes towards EMR and interoperability.*	(Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Vergari et al., 2011)
Policy Barriers & Challenges	Regulating standardization	• It is important that regional and national health policies be established on standardization to assure interoperability of systems.	*Missing data, lack of standards, different EMR systems, loss of productivity and overly complex technology need to be addressed in regional and national policies as well as in trusting relation with vendors.*	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Kush et al., 2020; Lin et al., 2012; Vergari et al., 2011)
Health processes Benefits	Clinical interoperability	• Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	*By reducing fragmentation of information, documentation time, enhanced data accessibility, data quality, improved compliance, error reduction, less medication, better decision making and better collaboration between clinicians.*	(Dickerson & Sensmeier, 2011; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Vergari et al., 2011)
Health processes Barriers & Challenges	Transition of care	• The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	*Information systems must be interoperable between organizations to provide access to patient data in a consistent and timely way.*	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Janett & Yeracaris, 2020)
	Doctor- patient relationship	• The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	Patients fear doctors will spend to much time looking at their screen instead of engaging in a conversation	(Janett & Yeracaris, 2020)
Information Benefits	Semantic interoperability	• Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	*Fast and ubiquitous access to patient records and other medical information reduces the number of medical errors due to adequate information regarding patient's history, medication and current condition. Essentially, interoperability supports continuity and quality of care with a longitudinal medical record.*	(Batra et al., 2015; Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kouroubali & Katehakis, 2019; Lin et al., 2012; Oyeyemi & Scott, 2018; Vergari et al., 2011)
	Patient participation	• Patients will be more engaged in their health with access to their own patient health record (PHR).	*There will be more time for patient contact since clinicians no longer need to search for relevant information.*	(Roehrs et al., 2017; Valle et al., 2016)
Information Barriers & Challenges	Non-standard formats	• Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	*To prevent these issues the use of consensus-based, widely adopted global data (semantic) standards and terminologies is essential for data to be readily exchanged, interpreted and compared.*	(Batra et al., 2015; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Roehrs et al., 2017; Valle et al., 2016; Vergari et al., 2011)

Level/ Level	Sublevel	Description	Further Explanation	References
	Creating and maintaining standards	• Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	*Standardizing and validating data retrospectively is expensive, time consuming and will potentially introduce errors and biases. Unfortunately healthcare still uses a wide variety of standards for comparable information. Standards may also be specific to a field in healthcare, such as pharmacy, medical devices, etc. which requires solid connections between standards.*	(Batra et al., 2015; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Vergari et al., 2011)
	Competitive industry	• HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	HIT providers will need to invest heavily to standardize their systems and maintain them accordingly. As long as these standards change rapidly the willingness to invest will be less.	(Dickerson & Sensmeier, 2011)
Application Benefits	Syntactic interoperability	• Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	*Findability, accessibility and reusability of data will be better thus enhancing its value. Standards like HL7 (and HL7-FHIR), XML, HTTP, SOAP are common in healthcare organizations. That simplifies communication interfaces and allows for interoperability among heterogeneous applications.*	(Batra et al., 2015; Kush et al., 2020; Lin et al., 2012; Oyeyemi & Scott, 2018)
Application Barriers & Challenges	Non-standard EHR's	• Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	*This requires them to invest in comparable systems able to generate and receive data from other systems. A cohesive EHR in which syntactic interoperability standards are used among all participants is conditional for the implementation of interoperability.*	(Batra et al., 2015; Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Kush et al., 2020; Oyeyemi & Scott, 2018; Roehrs et al., 2017; Vergari et al., 2011)
	Data silos	• The majority of the data continue to be confined in data silos.	It is challenging to open up the historical data silos for interoperability and connect to other platforms.	(Kouroubali & Katehakis, 2019)
IT Infrastructure Benefits	Technical interoperability	• Technical interoperability standards allows data to move over an infrastructure between two systems.	*The platform that ensures interoperability will increase information integration and support innovative applications for patients health. A distributed architecture reduces system implementation cost and data consistency. Furthermore, privacy and security concerns are less when data is kept locally. A centralized architecture gives a faster response time from the existence of a central repository.*	(Fragidis et al., 2016; Vergari et al., 2011)
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	• Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	*In case of data duplication in a central repository, inconsistencies might occur and data must be coded in the same standards. A prerequisite for implementing a distributed architecture is the high bandwidth needed for data sharing. Integrating the Healthcare Enterprise provides implementation guides and principles that need adoption from healthcare organizations. Integration is needed from the most recent patient data as well as historical data that is probably not formatted in a standard.*	(Dickerson & Sensmeier, 2011; Fragidis et al., 2016; Vergari et al., 2011)
Security Benefits	Patients ownership of the data	• As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	*Trust in the security will rise with patients access to their own data.*	(Roehrs et al., 2017)

Level/ Level	Sublevel	Description	Further Explanation	References
Security Barriers & Challenges	Authentication	• Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	*Security, privacy and trust management are fundamental qualities for the success of interoperability.*	(Batra et al., 2015; Fennelly et al., 2020; Fragidis et al., 2016; Janett & Yeracaris, 2020; Roehrs et al., 2017; Valle et al., 2016; Vergari et al., 2011)
	Patients trust	• To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Patients need to trust that there information is shared responsibly to the right persons, under the right conditions and in the right time.	(Fennelly et al., 2020; Janett & Yeracaris, 2020)
	Doctors trust	• Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Doctors need to trust that other doctors and health organizations share quality information on time and in the right conditions.	(Roehrs et al., 2017)
Legal Benefits	Justifying decision making	• Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	The amount of different standards (syntax, semantic, technical) and overlapping areas makes legislation hard. If certain standards can be made obligatory, than that would support legislation and decision making.	(Dickerson & Sensmeier, 2011)
Legal Barriers & Challenges	Accessibility and ownership	• Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	*Furthermore, when organizations share medical information, they are bound to existing legislation (often new legislation is needed). Healthcare organizations need to maintain patient's EHR indefinitely, even outdated, this is required for legal reasons.*	(Kouroubali & Katehakis, 2019; Roehrs et al., 2017)
Cost aspects Benefits	Expected cost savings	• Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	*Monetary incentives or penalties have also shown to be important, especially in the private sector.*	(Dickerson & Sensmeier, 2011; Fennelly et al., 2020; Fragidis et al., 2016; Valle et al., 2016)
Cost aspects Barriers & Challenges	High initial costs	• Healthcare organisations are reluctant to committing on implementation because of the initial costs.	*Cost for setup, maintenance (of EMR), new infrastructure, alteration cost for existing technology, training cost, hiring cost to handle increased workload and expected long term strategic investments, estimating one-third needed for of the initial investment for establishing interoperability.*	(Fennelly et al., 2020; Kouroubali & Katehakis, 2019; Roehrs et al., 2017; Valle et al., 2016)

Appendix B1 Interview protocol

Introduction:

The purpose of this interview is to collect information on how healthcare organizations deal with the complexity involved with interoperability. The goal of this interview in get an in-depth understanding of the consideration faced by healthcare organisations and to validate an initial framework for interoperability containing benefits, barriers and challenges derived from a structured literature review. The interview will start will a brief introduction on the subject, research objectives and goals.

Opening questions:

The researchers wish to establish that the interviewees are a sufficient intersection of the organization.

1. *What is your function and to which department do you belong?*
2. *How many years of experience do you have in this position?*
3. *How many years of work experience do you have in Healthcare?*
4. *What is your Educational level?*

First Part:

The purpose of these questions is get un understanding of the familiarity of the interviewees with the subject with an open discussion.

5. *How would you define Interoperability?*
6. *To what extent do you consider yourself familiar with interoperability?*
7. *To what extend do you consider your organization as interoperable? Is there documentation to support this?*
8. *What are the main benefits you consider coming from interoperability? Please motivate.*
9. *What are the main barriers and challenges you consider relevant when dealing with interoperability? Please motivate.*

Second part:

The purpose of the questions in this part is to validate and refine our initial framework. We wish to discuss this framework and get an in-depth understanding to what extent you consider the elements in this framework to be relevant for your organization/ in your line of work. We would like an emphasis on the levels relevant in your line of work. (a copy of our framework will be presented for this part)

10. Which of the eight levels in our framework do you have to deal with in your line of work?

Policy Benefits- Collaboration

11. "Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment." To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Policy Barriers & Challenges- Regulating standardization

12. *"It is important that regional and national health policies be established on standardization to assure interoperability of systems."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Health processes Benefits- Clinical interoperability:

13. *"Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Health processes Barriers & Challenges -Transition of care

14. *"The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Health processes Barriers & Challenges - Doctor- patient relationship

15. *"The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Information Benefits- Semantic Interoperability

16. *"Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Information Benefits- Patient participation

17. *"Patients will be more engaged in their health with access to their own patient health record (PHR)."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Information Barriers & Challenges- Non-standard formats

18. *"Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Information Barriers & Challenges- Creating and maintaining standards

19. *"Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Information Barriers & Challenges - Competitive industry

20. "*HIT providers are working in a competitive industry which makes cooperation between these providers challenging."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Application Benefits - Syntactic interoperability

21. *"Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Application Barriers and Challenges – Non-standard EHR's

22. *"Many healthcare organizations have different EHR systems with different (syntactic) standards in use."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Application Barriers & Challenges – Data silos

23. *"The majority of the data continue to be confined in data silos."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

IT infrastructure Benefits – Technical interoperability

24. *"Technical interoperability standards allows data to move over an infrastructure between two systems."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

IT Infrastructure Barriers & Challenges – Complexity of the infrastructure

25. *"Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Security Benefits – Patient ownership of the data

26. *"As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Security Barriers & Challenges - Authentication

27. *"Healthcare organizations and individuals must be authenticated and identified before accessing medical information."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Security Barriers & Challenges – Patients trust

28. *"To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Security Barriers & Challenges – Doctors trust

29. *"Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Legal Benefits - Justifying decision making

30. *"Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Legal Barriers & Challenges – accessibility and ownership

31. *"Sharing medical information in cloud solutions brings legal issues over accessibility and ownership."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Cost aspects benefits – Expected cost savings

32. *"Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Cost aspects Barriers & Challenges – High initial costs

33. *"Healthcare organisations are reluctant to committing on implementation because of the initial costs."* To what extent do you consider this statement to be relevant for your organization an why, please motivate?

Third part:

The purpose of these questions is to get an understanding of the overall impression of our framework and to give an opportunity to point out missing elements in the framework and elements within.

34. *Given our framework and the aspects found in literature, what is your overall impression? Please motivate.*
35. *To what extend do you consider the eight levels in the initial framework to be sufficient; what is it usability? Please motivate.*
36. *Are there any missing benefits, barriers and challenges you believe we need to consider adding to our framework?*

Fourth part:

The purpose of these questions is to get an understanding on how healthcare organizations are coping with the aspects from our framework when implementing interoperability.

37. *How do the benefits that come from interoperability influence the implementation of interoperability in your organization?*
38. *How do the barriers and challenges influence the implementation of interoperability in your organization? Please motivate.*
39. *To what extend do these aspects influence decision making in your organization?*
40. *Please rank the benefits, barriers & challenges in the table below from 1-5. With 5 being a very beneficiary or a big challenge and 1 a lower benefit or challenge.*
41. *Is there anything you wish to come back on?*

Glossary for the second part

Clinical interoperability:	The ability of two or more clinicians in different care teams to transfer patients and provide seamless care to the patient.
Semantic interoperability	Ensures that each system has the ability to understand the information received from others without ambiguity.
Syntactic interoperability	Refers to implementing and adhering to standards and ensures that structured data can be exchanged over the technical operability infrastructure.
Technical interoperability	The ability of moving data between two systems, not dependent on the type of information being moved, neutralizing the effects of distance.
Authentication	The process or action of verifying the identity of a user or process.

Appendix B2 Information Letter & Consent

The goal of this interview is to collect information about the validity of the framework for Interoperability that was developed from existing theory and aimed at healthcare ecosystems. The value of this framework is to add knowledge in this field by providing a framework for healthcare organizations dealing with the complexity around interoperability.

The information will be collected by interviewing an intersection in a healthcare organization, from higher management, middle management, IT and with healthcare practitioners. By doing so we hope to collect data from all relevant perspectives, creating an overall picture how a healthcare organization perceives benefits, barriers and challenges regarding interoperability and thus validating and refining our framework.

The interviews will take about 1,5 hours and will be held live or via MS Teams. We kindly ask you to consent with a recording of the interview for further data processing reasons. The recording will be deleted when processing is complete. You, the interviewee, will receive a copy of the transcription for factual checking. Any information that can point to you personally, will be removed from the transcription and resulting analysis, making sure you can answers in anonymity.

On the next page you will find a consent form in which we ask for your permission to use and analyse the given information for the purpose of completing the case study research.

Consent Form

Research project: *Benefits, barriers and challenges when implementing interoperability in healthcare ecosystems*

Researcher: FW Keus

- I have been informed about the research. I have read the written information Letter.
- I have been given the opportunity to ask questions about the study.
- I have been able to think about my participation in the study.
- I understand that I can withdraw from the study at any time and I do not need to give a reason for doing so.
- I consent to the use of the data collected during this study for the purposes of this scientific research and I can withdraw this consent at any time.
- I understand that any information I provide in connection with this research will be collected anonymously and will not trace back to me or my organization.
- I understand that the data collected (anonymized) will be kept in a secure manner by the Open University for 10 years.

If you have read the above points and agree to participate in the study, please sign this consent form below.

Name:

Function:

Place and Date:

_____

Signature:

Appendix C Embedded case description

In an embedded case study more than one sub-unit is used for analysis. An embedded case study provides means to integrate qualitative and quantitative data in a research. For this study we searched for an elderly care ecosystem consisting of two elderly care organizations, a general practitioner and a (large) regional hospital. The organizations used in this case are part of a real life ecosystem, working together on a daily base.

Healthcare organization A is an elderly care organization with approximately 1500 employees (700fte). There services consist of nursing homes, revalidation units, day-care, home care and primary care.

Healthcare organization B is a general practitioner. The doctor we interviewed was an acting practitioner for 35 years and previously with her own practice for 25 years. General practitioners are usually relatively small organizations from a single doctor to approximately 20-25 employees.

Healthcare organization C is an elderly care organization with approximately 4000 employees (2000fte). There services consist of nursing homes, revalidation units, day-care, home care and primary care. This organization is located in an adjacent area to organization A. Organization A & C share a nursing home with each different floors, but most of their nursing homes are exclusive to each organization.

Healthcare organization D is a large hospital with 10.000+ employees. Organization D is an academic hospital with a wide variety of specialisms. The interviewee is part of the information department responsible of the information exchange in transmural cure and care.

Appendix D Transcriptions interviews (Dutch)

D1 Interview 1

Datum: 15 maart 2022 11.30- 12.45

Interviewde: M. organisatie A.

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Teamleider ICT, afdeling ICT*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *2 jaar*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *2 jaar*
4. *Wat is uw opleidingsniveau?*
    - *HBO*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Bekend van o.a. Zorgmail, applicaties die in staat zijn veilig te communiceren met andere applicaties zonder menselijke tussenkomst.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Niet deskundig maar binnen de organisatie wel bovengemiddelde kennis. Er kan in mijn rol nog wel wat bijgespijkerd worden.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Lastig in te schatten, kan hier alleen iets over zeggen voor wat betreft de applicaties die in beheer van ICT vallen en minder voor wat betreft de applicatie die onder Informatiemanagement vallen of zelf buiten de deur staan. Organisatie als geheel moeilijk te bepalen in hoeverre ze interoperabel is.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Grootste voordelen dat ondanks verschillende systemen, medewerkers wel dezelfde informatie tot hun beschikking hebben zonder opnieuw invoeren. Levert tijdwinst op maar ook voordeel dat organisaties die verbonden zijn in het werk over dezelfde informatie beschikken.*

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Barriers in kennis en informatie over hoe systemen met elkaar 'praten'. Zijn erg afhankelijk van leveranciers om informatie te delen. Vanuit de NEN zijn er vereisten dat diensten met elkaar samenwerken maar om die aan elkaar te verbinden is nogal een uitdaging. Met name budget om deze verandering te realiseren is soms lastig om te vinden. We zijn afhankelijk van externe leveranciers om ' koppelingen' te realiseren waar wij verantwoordelijk zijn voor de informatieoverdracht.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Met name de IT infrastructuur en de applicatie laag;*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld wordt" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, mee eens.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, klinkt als een voorwaarde die er moet zijn. Uitdaging zal zijn welke vrijheden organisaties hebben wanneer standaarden 'verplicht' worden gesteld. Dat zien we met de NEN norm bijvoorbeeld ook gebeuren.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, klinkt logisch.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is een enorm risico. Rondom Covid regelmatig gehoord dat cliënten besmet binnenkwamen en dat de overdracht daarvan pas later volgde.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens. Het klinkt voor de hand dat dit een belangrijk voordeel is.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, die begrijp ik. We hebben een ECD waar cliënten in kunnen meelezen. Dit levert echter ook weer extra vragen op wanneer cliënten meelezen vanwege de specifieke taal die zorgmedewerkers spreken. Van belang om goede afspraken te maken over hoe informatie wordt vastgelegd voor het begrip van cliënten;*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, precies wat ik zojuist aangaf*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisaties op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dit grijpt terug op het organisatiebeleid en de uitdaging die daar genoemd wordt. Als er op nationaal niveau geen standaarden worden bepaald en organisaties de vrijheid hebben om op een eigen manier in te vullen zal dat ten koste gaan van het succes van interoperabiliteit. Ik zie daarin vicieuze cirkel wanneer organisaties worden gehouden om aan standaarden te voldoen, levert dat op allerlei vlakken uitdagingen terwijl het ontwerpen van standaarden geen core business is.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, je wil een nationale standaard tegen een commerciële partij aanhouden. Dat is inderdaad uitdagend.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, wederom zien we bv bij ONS terugkomen dat er op voorhand wordt aangegeven dat zij connectoren beschikbaar hebben om met andere applicaties te verbinden.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, begrijpelijk.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ook hier eens*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat zou op de korte termijn zijn. Ik vraag me wel af of standaarden er op termijn niet voor zouden kunnen zorgen dat de kosten gereduceerd worden. Op korte termijn zijn de kosten zeker hoog. Dat zien we nu ook dat conversies en connectoren duur zijn wanneer je voorop loopt, en zorgt ervoor dat zorgorganisaties in de breedte een afwachtende houding aannemen. Daarnaast het risico dat organisaties blijven hangen bij bestaande oplossingen en nieuwe/ betere oplossingen weinig kansen krijgen.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens..*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens. Voor onszelf al een uitdaging. Niet zozeer voor ons in de techniek maar wel om te organiseren.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, logisch en eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook hier eens. Naast zorgen over privacy soms ook het ontbreken van kennis wat, wanneer vastgelegd mag worden. Een ander beveiligingspunt is nu al welke informatie medewerkers mogen zien. Wanneer er nog maar 1 bron is, wordt uitdagend wie er bij de informatie mag als er nog geen behandelrelatie is. Hoe te borgen dat er alleen toegang is wanneer het ook echt een patiënt is van de behandelaar.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat we moeten toewerken naar meer inhoudelijk eigenaarschap van de patiënt zelf. Het is zijn/ haar data maar beveiliging is moeilijk bij patienten zelf neer te leggen.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, waar we mee begonnen.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ook eens.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*

- *De stellingen zijn aannemelijk en logisch als voordelen en barrières en uitdagingen.*

35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is de bruikbaarheid? Graag uw motivatie.*
    - *Dit dekt zo wel de lading.*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Nee, niet specifiek. Een andere uitdaging die ik zie ligt volgens mij nog in huidige wet- en regelgeving over bv toegang tot data, terwijl er nog geen afspraken over hoe toegang te krijgen. Een algehele zorg vanuit ICT is als deze data ergens gehost moet worden, de overheid ook een rol heeft om dat goed te organiseren; en overheid en ICT gaan vaak niet goed samen. Niet het meest vlotte orgaan. Keerzijde om over te laten aan Big Tech is nog zorgelijker omdat mensen vaak onvoldoende bewust zijn wat ze al delen met grote bedrijven. Bijvoorbeeld via gezondheidsapps. Vraag is wanneer Apple of Meta software gaan aanbieden en nu al reeds een profiel kunnen maken en zouden delen met een ziektekosten verzekeraar. Het zal op lange termijn lastig te beïnvloeden zijn als patiënt en hoop ik dat het risico uiteindelijk toch lager zal worden dan de 80%. En hoe kwetsbaar is het als het op 1 plek staat en niet te bereiken is.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Het helpt om te weten welke voordelen er zijn. Om te beginnen of de baten voor de kosten uitgaan. Kostenvoordelen zullen een belangrijke factor zijn terwijl efficiënter werken ook een besparing oplevert maar vooralsnog erg moeilijk om in kaart te brengen. Waar ik bang voor zou zijn is wanneer de besparing gezocht zou worden in personele inzet.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *In de twee jaar dat ik hier werk heb ik de indruk dat vooral de kosten doorslaggevend zijn.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Ik vrees dat primair kosten het zwaarst wegen. Ik zie dat terug in zaken die vanuit regelgeving verplicht worden en toch een lagere prioriteit krijgen in de begroting.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Zie tabel met alle uitkomsten hiervan)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Nee.*

D2 Interview 2

Datum: 16 maart 2022 09.00- 10.15

Interviewde: W. organisatie A

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Functioneel beheerder ECD, afdeling informatiemanagement;*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *6 jaar;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *13 jaar*
4. *Wat is uw opleidingsniveau?*
    - *MBO*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Het uitwisselen van gegevens tussen organisaties en hun applicaties.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Bekend met de functionele kant van het onderwerp maar de techniek erachter wat minder.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Niet, dit is beperkt. Het lijkt erop dat andere type organisaties hierin verder zijn. Wij zijn meer bezig met het ontvangen van informatie; verzenden ervan is nog heel beperkt.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Minder foutgevoelig en een administratie lastenverlichting. Foutgevoeligheid zit in de overdracht die we vanuit bv het ziekenhuis ontvangen en we moeten overtypen, of op moeten wachten voordat die wordt ontvangen.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Bewustzijn binnen de organisatie van het belang van dit onderwerp en wat we ermee kunnen winnen. Vooral een verschil tussen het operationele niveau en management waarbij de operatie vooral de knelpunten in de huidige werkwijze ervaart.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Zorgproces, Informatie en applicatie laag.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Deels, de verwachting is er wel maar op operationeel niveau hoeft er geen samenwerking te zijn wanneer gegevens gedeeld worden, bv labuitslagen. Gegevensuitwisselling kan goed werken maar hoeft niet te leiden tot een betere samenwerking. Met ziekenhuizen kan dat weer wel het geval zijn wanneer we allemaal naar dezelfde gegevens kijken.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *100% mee eens. Hierbij opgemerkt dat ook interne uitwisseling soms een uitdaging kan zijn, bijvoorbeeld door het gebruik van verschillende plan systematiek die niet uitwisselbaar zijn.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Durf niet te zeggen dat het een administratieve last kan zijn. Zorg is daar nu nauwelijks mee bezig tijdens het werk zodat ik me afvraag of dat met interoperabiliteit wel zo zou*

zijn. Vooral het opnieuw invoeren zorgt voor administratieve last. Een arts kan dit beter uitleggen in zijn/ haar relatie.

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, niet aan toe te voegen.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, en in het kader van ouderenzorg nog eerder familie participatie.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Correct.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is misschien nog wel het lastigste aan het hele onderwerp. We zien bij NNN dat we een versie in gebruik hebben terwijl de volgende al beschikbaar is. Hoe gaan we om met onze huidige doelen terwijl de wetenschap zegt dat die al verouderd zijn?*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Herkenbaar.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, herkenbaar. In de scholing laten we medewerkers de werking van onze systemen zien maar we doen op dit moment nog weinig met alle informatie die nu beschikbaar is. We verzamelen veel informatie van cliënten maar doen er vervolgens weinig mee. Ook in de applicaties is er weinig beschikbaar voor analyse doeleinden.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens. Zorgorganisaties zijn hier nauwelijks mee bezig, de bereidheid om hier tijd en geld in te investeren in een onderwerp waar ze niet dagelijks mee bezig zijn.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, klopt.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ook eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Correct.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja… (twijfel)*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens, het is onduidelijk hoe hoog de administratieve lasten zijn obv het overnemen van gegevens en hoe verhoud de tijd van medewerkers tov de inspanning die nodig is voor interoperabiliteit?*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Ik vind hem behoorlijk compleet. Ik vraag me wel af wat een zorgmedewerker nou echt heeft aan al die zorgdata. We zeggen dat het een voordeel is, maar blijkt dat nou uit de literatuur. Het is belangrijk om dat denk ik ook meetbaar te maken om aan te kunnen tonen dat interoperabiliteit ook echt waarde toevoegt. SMART inzage in bv de tijdwinst zou goed kunnen helpen.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Helder zo.*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Zie vraag 34.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Dat zou zeker van grote invloed kunnen zijn. Het is nu toch een beetje een black box voor diegene die de besluiten nemen. Helemaal zeker is dit niet; medewerkers in de zorg weten dat ze een hoge administratieve last hebben. De pijn daarvan wordt wel gevoeld maar ontbreekt het aan een overzicht van deze voordelen.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Op organisatie niveau zit het vooral in de kosten en toch ook in de kosten die ermee gemoeid zijn. Invloed om standaarden hebben we minder invloed op.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37 en 38*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(in aparte tabel met alle uitkomsten)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Betere analyses maken uit hetgeen we vastleggen van cliënten. Voor intern onderzoek maar wellicht ook voor de wetenschap nog veel onontgonnen rijkdom beschikbaar in ECD's. Voorwaarde dat we dan zelf ook meer gestructureerd zaken gaan vastleggen. Nu verzamelingen vooral voor kwaliteitsindicatoren die we extern aanleveren maar doen daar zelf weinig mee. Hierin ligt een grote kans/ voordeel.*
    - *In de GRZ wordt nu bijna standaard een aanvraag gedaan voor het clientportaal maar ben eigenlijk wel benieuwd of dat scheelt in het aantal vragen op een afdeling.*
    - *De tijdsinvestering mis ik nog wel wat. Duidelijker maken van de voordelen in de tijd zou mooi zijn.*

D3 Interview 3

Datum: 16 maart 2022 13.15- 14.15

Interview: R. organisatie A.

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Manager paramedische dienst en medisch psychosociale dienst ai.*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *10 jaar*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *30 jaar*
4. *Wat is uw opleidingsniveau?*
    - *HBO*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Moeilijk onderwerp, heeft vooral te maken met koppelingen tussen systemen.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Bekend als gebruiker.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Alleen op het medische gebied van Point en Zorgdomein. Wordt nog niets rechtstreeks ingelezen in ons ECD;*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Ik verwacht dat je dan uiteindelijk kunt werken met 1 hoofd systeem waar alle andere systemen onder draaien. Ofwel, dat we vanuit het ECD andere systemen kunnen benaderen in plaats van inloggen in verschillende applicaties. Wanneer we een brief naar een externe verwijzer versturen we daar geen aparte applicatie nodig hebben om te versturen. Het voordeel is om dan in 1 systeem te kunnen blijven werken en niet meerdere werkwijzen hoeft te hanteren. Dat bevorderd de snelheid en kwaliteit. Mooiste zou zijn dat de gegevens rechtstreeks worden ingeladen in het ECD.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*

- *Voor de organisatie is het de vraag of we het ècht willen en of we de kennis hebben om zoiets op te tuigen. Het start bij de wil om het medewerkers zo makkelijk mogelijk te maken om liefst met 1 systeem te werken. (" wat houdt ons nu tegen?") . Het is een onderwerp dat gemakkelijk onderop de stapel komt. Ik denk dat de zaken die we nu oppakken, de volgende dag een positief of negatief effect hebben en met dit onderwerp 'gaat' het ook zoals we het nu doen. Ik denk dat we nog een te abstract idee hebben hoe het ons kan helpen en nog niet concreet kunnen maken hoe het helpt en wat het oplevert in geld. Medewerker tevredenheid is een belangrijk aspect waar dit enorm in zou kunnen helpen maar de meeste software die we gebruiken is onvoldoende aan elkaar verbonden zodat het tijd kost om data over te nemen. Tevredenheid is ook moeilijk meetbaar om hier aandacht voor te krijgen.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Organisatiebeleid als leidinggevende en zorgproces en informatie als fysiotherapeut.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld wordt" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, anders krijg je extra handelingen om informatie op te halen.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Klopt en daarom is het landelijk EPD er vermoedelijk ook niet gekomen..*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook waar.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat kan maar daar moeten we het met elkaar over hebben. Risico van doorschieten in alles vastleggen. Dokter: " ik heb meer inkt aan mijn handen dan bloed".*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat lijkt me zinnig. Geldt niet alleen in de digitale wereld.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Helemaal mee eens.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Een vrij tekst veld heeft geen vooraf bepaald doel en dan kan de lezer het anders interpreteren dan de schrijver heeft beoogd en dat wil je dus niet.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik en moet je continu doen om te voorkomen dat er lege velden worden gecommuniceerd. Het is daardoor ook lastig wanneer ziekenhuizen met allemaal verschillende systemen werken.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is zo en helpt niet.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Klopt, net over gehad, hadden ze in 2011 moeten doorzetten.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Door het verminderen van de verschillen tussen de systemen, ga ik er vanuit dat de infra ook vereenvoudigd kan worden. Zijn er straks nog maar enkele EPD's dan zijn er wellicht minder data centra nodig.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, in sommige dossiers kunnen patienten al hun eigen behandelteam samenstellen.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Een behandelrelatie is voorwaardelijk maar soms is dat pas op het laatste moment duidelijk, bijvoorbeeld met een nieuwe medewerker of uitzendkracht. Door een client daarin een rol te geven zou hierin kunnen helpen. Voor acute situaties is in dat geval wel een uitweg nodig.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Helemaal mee eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te*

hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?

- *Ja, het is belangrijk dat de informatie up-to-date is. Dat geldt voor alle disciplines. Het gaat om goede, actuele en tijdige informatie. Wanneer de client door de klapdeur komt moet alle informatie beschikbaar zijn.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zeker waar. We zijn mede verantwoordelijk dat we in de keten goed afspraken hebben en zekerheden inbouwen om verlies van data te voorkomen.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, absoluut waar.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat ze (MT) het niet weten. Ik denk dat dat nu niet meer dan een gevoel is omdat we anders eerder ja zouden zeggen tegen een subsidiepot zoals van VIPP Inzicht. Maar wanneer niemand dat heeft doorgerekend en concreet gemaakt wordt het lastiger om daar beslissingen over te kunnen nemen. Als duidelijk was geweest hoeveel het had kunnen opleveren was er vermoedelijk een andere keuze geweest. Nu (waarschijnlijk) vanuit onwetendheid over de kosten gekozen om het uit te stellen.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Persoonlijk onderschrijf ik dat deze systemen aan elkaar gekoppeld moeten worden met alle veiligheidsmaatregelen maar dat nu nog te abstract is om organisaties te overtuigen er op korte termijn iets mee te moeten. Het is van belang om meer harde data, liefst in euro's te overleggen, willen ze in de hectiek van hun agenda hier mee aan de slag gaan. Of, laten weten wat er nu steeds fout gaat. Bijvoorbeeld in de medicatieoverdracht is dat*

enorm met een verkeerde of ontbrekende overdracht. En toch is dat tot nu toe niet genoeg geweest om het op te lossen.

35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Niet het idee dat ik er een mis, maar misschien niet voldoende kennis.*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Nee.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Als ik de discussies volg, dan denk ik dat we bijna verlamd zijn door de veelheid aan systemen. Zelfs in onze (kleine) regio werken we met verschillende systemen voor hetzelfde doeleinde wat niet helpt om hierin te investeren. Ondanks dat we wel zien dat een systeem als Point wel werkt hoewel dit nog een systeem in het midden is en we daar wel het voordeel van zien. Het landschap is nu nog zo versnipperd en complex om het op de agenda te zetten?*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Uitdagingen die medewerkers zouden kunnen helpen hoor ik weinig over, maar gaat het over informatieveiligheid, dan worden mensen wel direct zenuwachtig. Efficiënter werken, volledigheid hoor ik weinig over. Nog te zeer angst gestuurd.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37 en 38.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(aparte tabel met uitkomsten van alle interviews)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Neen*

D4 Interview 4

Datum: 18 maart 2022 12.15- 13.15

Interview: G. organisatie 1

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Coördinator Zorgadministratie, - declaratie van de afdeling Informatiemanagement*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *Ruim 10 jaar*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Ruim 10 jaar*
4. *Wat is uw opleidingsniveau?*
    - *HBO*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Ik vind het een moeilijk begrip maar volgens mij heeft het vooral te maken met het beschikken over en delen van informatie tussen verschillende partijen in een keten.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Enigszins omdat we binnen de administratie ook informatie delen met anderen in de keten.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *In de kinderschoenen.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Het kan het primair proces ondersteunen wanneer de juiste informatie op de juiste plek op het moment beschikbaar is. Dit zal ook gelden voor de administratieve afdelingen die hierin ondersteunen. Dat scheelt oa ook tijd aan administratie.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Belangrijkste uitdaging zit hem in de techniek en het maken van afspraken over informatie delen in de keten.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Met name de Applicatie en Informatie laag, soms ook wet- en regelgeving maar gaat meer over andere onderwerpen.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ook eens.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook eens.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook in de bedrijfsvoering en administratie speelt dit. Het lijkt me een terechte barrière.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik geloof echt wel dat dit iets is om kien op te zijn zodat dat in balans blijft in het contact tussen arts en patiënt.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*

- *Ja, zeker.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ik vraag me af of iedereen die behoefte heeft. Sommigen zullen meer behoefte hebben om van een arts of specialist te horen wat er aan de hand is; die zullen niet in hun dossier kijken. Zou deels een voordeel kunnen zijn.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is een van de grotere uitdagingen verwacht ik.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is zeker een belangrijk onderdeel waarom we nog niet zover zijn. Daarvoor zijn er te veel verschillende belangen.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat is natuurlijk erg belangrijk en voorwaardelijk om gegevens te kunnen delen.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zeker weten!*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, daar zit inderdaad een moeilijkheid omdat we geld maar een keer kunnen uitgeven. Aanhaken in de keten op het juiste moment is erg belangrijk.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, voor een groot deel wel.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, van belang dat er goede afspraken zijn over verlenen van toestemming en delen van informatie.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker. Er is altijd wel een risico maar geldt ook voor het delen in onze eigen organisatie. Uitgangspunt moet kunnen zijn dat informatie klopt en betrouwbaar is.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, terecht.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*

- *Ja, eens. Eigenaarschap dreigt dan meer door elkaar te lopen zodat dit een relevant aspect is.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zeker.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, denk niet alleen een kosten aspect maar speelt zeker mee in de afweging.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Algemene indruk van het raamwerk is dat wanneer interoperabiliteit goed wordt neergezet het veel voordelen kan opleveren maar dat er ook veel variabelen zijn en het heel ingewikkeld is om dit te implementeren in een keten waarin zoveel partijen een rol spelen. Er zijn veel aspecten zoals juridische en financiële maar ook dat Zorg een bijzondere markt is die vanuit publiek geldt wordt gefinancierd maar ook de rol die verzekeraars spelen. Vanuit de zorg begrijp ik heel goed dat er behoefte is aan een model en dat informatie altijd op een juiste wijze wordt gedeeld en voorhanden is maar in de praktijk denk ik dat er nog een enorme lange weg te gaan is om dat goed voor elkaar te krijgen. Het lastige is ook dat de overheid hier een centrale rol in zou moeten spelen maar er iedere vier jaar wisselingen in zijn waardoor soms andere (beleids-)keuzes worden gemaakt. Dit onderwerp vraagt een veel langere termijn in het denken en een markt die ook toegankelijk is. Dus niet een systeem en infra die zo complex wordt dat toetreden haast onmogelijk wordt. Het is een ingewikkeld en complex vraagstuk. (" Zou dit raamwerk helpen in de complexiteit?") Zeker, zou een van de eerste stappen moeten zijn om te weten welke elementen er liggen. Nu ik dit zo zie, realiseer ik me nog meer hoe complex het is en hoeveel variabelen er zijn die een rol spelen en ergens moeten samenkomen. Het helpt dan wel als er subsidietrajecten zijn, hoewel die nu nog erg lijken op 'proefballonnen', helpt dat uiteindelijk wel om het in beweging te krijgen. Ervaring op doen waar we tegenaan lopen en hoe het werkt in de keten. Verder ontwikkeld de techniek zich ook razendsnel en komen er uit die hoek nog nieuwe oplossing zoals AI wat een rol zou kunnen gaan spelen.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Ik mis nu niets..*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*

- *Vooral de techniek en infra die belangrijk is en waar we nu niet goed in vooruit kunnen kijken, kan misschien wel een 'gamechanger' worden in het model en de aanpak. Ontwikkelingen in de techniek en de zorg (nieuwe behandelmethoden) lijkt me een grote klus om in het model te gieten en heel ver vooruit te denken. Nieuwe methoden en processen in de zorg moeten snel in deze modellen opgenomen kunnen worden en zie ik als risico voor het slagen van dit traject.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Besluitvorming is vaak vooral een kosten- baten verhaal maar het belangrijkste toch hoe dit het zorgproces zou kunnen verbeteren. Voor de medewerkers en organisatie van belang om onderdeel te zijn van een keten en daarin een 'commercieel' voordeel te halen. (" Hebben we de voordelen nu voldoende bewust?") Ik denk dat veel beslissingen nu niet altijd op inhoud worden genomen maar helaas soms ook vanuit emotie en politiek wordt meegewogen. Lijkt me van belang dat de beslissers ook verantwoordelijkheid nemen om zich in de inhoud te verdiepen. Het moet ook wel wat in het proces opleveren en zal met name voor zorg veel kunnen opleveren en om die reden goed om dat deel heel helder te hebben.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Die zijn allemaal wel herkenbaar en terecht. In de praktijk te maken met allemaal korte termijn zaken en geld wat we maar een keer kunnen uitgeven en dan nu misschien liever vastgoed dat een nieuwe server. Het vraagt volgens mij een lange termijn visie die ik nu beperkt zie binnen de overheid en bedrijven wat het erg lastig maakt. Als organisatie kunnen we deelnemen aan subsidietrajecten maar zijn de voordelen nu nog moeilijk inzichtelijk te maken en misschien ook wel marginaal. En de vraag of het na zo'n traject iets blijft staan of dat het een losse steen is die blijft liggen.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37 en 38.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(in aparte tabel met alle waarden gevoegd)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Ingewikkeld onderwerp!*

D5 Interview 5

Datum: 20 maart 2022 16.30 – 17.30

Interview: M. organisatie B.

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Waarnemend huisarts sinds twee jaar en daarvoor 25 jaar praktijk houdend.*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *27 jaar*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *35 jaar*
4. *Wat is uw opleidingsniveau?*
    - *Academisch;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Het uitwisselen van gegevens tussen specialisten, ziekenhuizen, GGZ, verpleeghuizen, apotheek en laboratorium. Ofwel, alle partijen in de keten.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Niet heel bekend. In het werk houdt ik me wel bezig met gegevensuitwisseling bijvoorbeeld via Zorgdomein.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Die zijn daar allemaal mee bekend als gebruikers en werken met die structuren;*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Dat we de informatie op onze computer binnenkrijgen en rechtstreeks in het dossier van patienten kunnen plaatsen. Dat we voor verwijzingen delen van het dossier, gestandaardiseerd mee kunnen geven. Dat kost nu nauwelijks moeite of tijd meer. Wat we ook graag willen is uitwisseling via het LSP, dat geld nog niet voor iedere patiënt omdat die daar toestemming voor moet geven. Het LSP helpt met de inzage op een huisartsenpost in het dossier van patienten als de patiënt dat heeft opengesteld. Ofwel, gemakkelijk gegevens binnenkrijgen, stukken kunt versturen en dat we inzicht hebben in een relevant deel van het dossier wat van belang is als andere zorgverlener.*

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Soms is er ineens iets mis met de systemen waardoor we niet bij de gegevens kunnen. Met het LSP moeten patienten worden gevraagd of ze mee willen doen en hen motiveren en dat kost tijd. Hoeft niet direct een barrière te zijn maar er moet wel iets voor worden georganiseerd.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Een zorggroep van huisartsen houdt zich bezig met het organisatiebeleid. De zorgprocessen en informatie laag hebben huisartsen het meest te maken maar afspraak daarover worden in de regel via een zorggroep gemaakt. Sommige huisartsen zijn zelf slim in het beheer van applicaties of hebben daar beheerders voor in dienst, soms ook via een zorggroep. Voor de IT infrastructuur bellen we Promedico (helpdesk). Als huisartsen groep hebben we wel te maken met de kosten, bijvoorbeeld voor de keuze van een HIS.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat dat in principe waar is maar wel moet waken voor privacy van patienten.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Het lijkt me meer een voorwaarde. Het is in ieder ook geval een uitdaging.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik wel.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Geen idee of dat zo is. Ik kan me wel voorstellen dat je goed moet luisteren, het staat soms ook niet of niet goed op papier, zaken worden dan dubbel of niet goed gedaan. Ik kan me dat goed voorstellen.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *We moeten ook wel steeds meer noteren. Vroeger wisten we alles uit het hoofd maar dat is nou eenmaal niet meer zo, dat kan niet meer anders. Het moet, vaak ook om juridische redenen. Tijdens het consult schrijf ik wel wat maar leg dat da uit aan de patiënt maar probeer vooral ook na het consult vast te leggen.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, in principe is dat zo.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik ook wel. Ik zie mensen dat ook doen, geïnteresseerd in hun dossier.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik ook wel.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisaties op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat heb je wel nodig een standaardisering.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is wel een uitdaging, zeker.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, hopeloos. Dat is bijvoorbeeld al met een HIS als Promedico, Medicom en CGM en naar gelang ik ergens werk kunnen het verschillende systemen zijn. En die 'praten' helaas nog steeds niet met elkaar.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat is zo. Wanneer huisartsen zijn aangesloten bij Promedico staat alles in de cloud. Wanneer je Promedico gebruikt, dan is dat allemaal hetzelfde voor alle praktijken, dacht ik. Alle Huisartsen die CGM hebben, hebben ook hetzelfde beeld.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat zou fijn zijn.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, want dat is natuurlijk ook niet altijd zo dat iedereen dat accepteert.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik wel. Geldt ook niet voor iedereen maar gemiddeld gezien denk ik wel dat dat waar is.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat wordt uiteindelijk wel een voordeel. Het vraagt ook wel wat met inloggen en wachtwoorden die telkens veranderd moeten worden. Een Uzi pas valt hier ook onder.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, denk ik.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat snap ik wel.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Nou, dat denk ik zeker want dat scheelt enorm veel tijd.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Heel herkenbaar. Wanneer je dit soort zaken wilt implementeren moet er ook ruimte voor zijn. Niet alleen financieel (je kunt daarmee natuurlijk ook mensen inhuren) maar in kleinere organisaties spelen er vaak zoveel zaken dat dit tot een tijdtekort leidt en waar haal je iemand vandaan die dat erbij kan doen. Mensen met visie die zijn soms in staat om daar op door te pakken waar de harde werkers al aan het buffelen zijn en het 'er weer bij' komt. Niet alleen geld maar ook visie speelt dus een rol die zou je moeten zien te mobiliseren.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*

- *Moeilijke vraag. Wat ik nu net zei speelt altijd wel een rol. Dat het nuttig is, is helder maar hoe doe je het? Bijzonder ook dat in een relatief grote organisatie waar jullie werken toch ook nog onvoldoende capaciteit hiervoor te vinden is. Terwijl in een kleine praktijk waar ik in werkte we dat voortdurend tegenkwamen. Hele nuttige initiatieven maar waar halen we de tijd vandaan om het allemaal te organiseren. Dan merk ik dat mensen met visie daar overheen kunnen stappen en met veel energie kunnen zeggen "kom, we gaan kijken hoe we dit kunnen gaan doen". Die mensen zijn echt nodig. Behalve voldoende geld heb je die mensen ook nodig.*

36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Nee, niet direct.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Ook, op het niveau waar dat soort zaken georganiseerd moeten worden. In een kleine praktijk denk ik wel zeker dat dat helpt en als er vanuit wet- en regelgeving wordt aangegeven dat het 'moet', dat gaat wel helpen. Met het traject VIPP Open werd gezegd dat het moest en was dat een voldoende prikkel om ermee aan de slag te gaan. Zonder enige dwang wordt het soms ook wel een heel langdurig traject.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Ja, dat denk ik wel. Door ze op te pakken, kunnen ze ook weer worden omgevormd in voordelen.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37 en 38.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Deze worden opgenomen in een aparte tabel met de waarden van alle geïnterviewden)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - .

D6 Interview 6

Datum: 21 maart 2022 15.30 16.45

Interview: H., organisatie 1

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Specialist ouderengeneeskunde, behandeldienst;*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *17 jaar;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Meer dan 17 jaar;*
4. *Wat is uw opleidingsniveau?*
    - *Academisch;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Een woord dat vrij nieuw voor me is maar waar ik wel van alles bij kan bedenken. Het gaat over samenwerken. Operabiliteit het werken en inter wat er tussen mensen gebeurt in de samenwerking.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *In een eerdere functie ben ik als ingenieur werkzaam geweest bij Unilever en daar geholpen een World sales database op te zetten waarbij het toen al ging over de complexiteit van gegevensuitwisseling tussen verschillende landen; een vorm van intra-operabiliteit. Maar, ook hier hebben we intensief samengewerkt aan het ECD en hoe gegevens daar wel/ niet in geladen kunnen worden uit andere systemen.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Nog in de kinderschoenen, dat heeft er o.a. mee te maken dat we relatief laat zijn overgegaan op volledig digitaal werken t.o.v. andere organisaties (behandeldienst). Doordat we een relatief kleine organisatie zijn, speelt mee dat we geneigd zijn om te wachten tot anderen dit hebben opgelost voor wij instappen.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Enorme foutvermindering en enorme tijdsbesparing als het goed wordt gedaan. De hoeveelheid tijd die ik kwijt ben, samen met de verpleging, fysio etc. om uit te zoeken*

waar een client vandaan komt, van welke afdeling en die dan telefonisch te pakken krijgen om informatie te verzamelen is enorm. Vervolgens moeten we 'alles' overtypen of voor wat betreft medicatie alles door mijn vingers laten gaan. Het zou wel veel fijner zijn om dat met een 'vinkje' over te kunnen nemen in het ECD. Bijvoorbeeld hele kleine dingen zoals 'medicatie een keer per week', op welke dag hebben ze die dan gekregen? Er zit heel veel tamelijk dom en foutgevoelig werk in het overnemen van data.

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *In de eerste plaats bewustwording van de mogelijkheden. Degene die de besluitvorming doen, hebben vermoedelijk geen idee wat we doen en hoe foutgevoelig overtypen is. Meestal goed het gaat, maar soms helaas ook niet. Ik denk dat het ook een barrière is dat zorgpersoneel in de regel niet heel innovatief is ingesteld, van management tot aan de werkvloer. En 'we zijn gewend om ons werk op een bepaalde manier te doen', dus bij nieuwe dingen hoor je vaak als eerste een 'Ja maar...', wat hier ook voor geldt. En als derde weet ik niet of alle systemen wel op elkaar zijn aan te sluiten of wanneer er gezegd wordt dat het kan, dat ook daadwerkelijk het geval is. Dat is vooral een barrière met medische gegevens want ik typ liever waarbij ik weet wat ik invul, dan dat er onzekerheid is of datgene wat binnenkomt klopt of wanneer er geen informatie is, er ook daadwerkelijk niets was en niet dat het niet is doorgekomen.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Zorgproces en informatie.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Vermoed van wel, zou niet weten waarom het zou zijn.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens, geen twijfel. Zou haast het regionale weghalen.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja! Zou wel nog steeds fijn zijn om een naam te hebben om te overleggen.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, hoewel dit niet alleen gaat om of het klopt maar ook dat het volledig is. Voor wat betreft de tijdigheid zou je kunnen onderzoeken of het aantal MIC meldingen omlaag gaat wanneer informatie eerder beschikbaar is. Ik herken wel dat het een van de meest kwetsbare momenten is.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Nee, dit heeft denk ik niet zozeer te maken met een EMR of interoperabiliteit maar meer met controlezucht. Of je dat nou op papier doet of digitaal kost dit veel tijd. Er heeft in die zin een verschuiving plaatsgevonden in het vertrouwen en moet alles worden vastgelegd. Met digitaal werken, is het wel makkelijker om nog een vragenlijst te maken om gegevens vast te leggen. In het verpleeghuis doen we bovendien het meeste lopend en achteraf de administratie (itt huisartsen). Voor ons geldt dat we vooral bij opname veel tijd kwijt zijn met overnemen en als die informatie dan al beschikbaar zou zijn, zou ik alleen hoeven te lezen.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, helemaal waar en tegelijk (wat je misschien liever niet hoort) gaat dat niet lukken omdat artsen allemaal in hun eigen vakgebied werken. Mensen gaan afkorten in brieven en verschillende vakgebieden hebben en houden hun eigen afkortingen.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, bij ons merken we dat met name familie gebruik maakt van het clientportaal. Hierin heb ik echt wel een duidelijke verandering gezien; soms ten nadele maar meestal te voordele met een grotere betrokkenheid en geruststelling.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, absoluut. Dat gaat inderdaad soms fout maar gelukkig kunnen we nu veel opzoeken.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om*

zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisaties en waarom, graag motiveren?

- *Ten eerste denk ik dat het woord 'wet' hier niet klopt maar het grootste probleem zie ik in de geschreven teksten er omheen. Want daar wordt in afgekort waar geen wet- en regelgeving tegenop zou kunnen. Deze herken ik niet vanuit de praktijk; het zou mooi zijn als dat uiteindelijk wel zo zou zijn, maar lijkt me een hele lange weg. Wet- en regelgeving zou zelfs wel eens averechts kunnen werken. Blijft waarschijnlijk nog heel lang een uitdaging.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Wat ik ervan merk, denk ik dat dit klopt. Snel naar elkaar wijzen en met verschillende versies van de standaard werken. Of dat nou komt door competitieve industrie weet ik niet, zou ook kunnen dat ze gewoon heel slechts zijn in samenwerken. Dat het niet eenvoudig gaat, dat herken ik.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Een dikke Ja.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, absoluut.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, met heel veel muren er omheen.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, en zou hier ook de factor tijd in benoemen. Wanneer een organisatie iets aan zijn infra heeft gedaan, zijn ze niet voor de komende jaren klaar als andere in die periode ook een ontwikkeling doormaken. Afstemming hierin is dan dus ook van belang tussen organisaties.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ik denk dat maar een klein deel dit daadwerkelijk zal doen en het merendeel de schouder ophaalt. Wat ik er ingewikkeld aan vind, is dat ik tijdens een dienst soms toegang tot een dossier nodig heb, terwijl de patiënt mijn naam niet kent of herkent wanneer die (bv in het LSP) wordt opgezocht. Dan lijkt het misschien snuffelen maar is het wel degelijk terecht gebruik.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, maar wel op een manier die werkzaam blijft zonder al te veel obstakels. In samenwerking met medewerkers ontwikkelen om te voorkomen dat het aanzet tot ongewenst gedrag vanwege de obstakels.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *De eerste zin is helder met als toevoeging dat ik ook graag een signaal ontvang wanneer er nieuwe informatie aan het dossier is toegevoegd. Het andere, dat als er niets is, er ook daadwerkelijk geen informatie is. De tweede zin is mij wat onduidelijk in relatie met de eerste. Wanneer het gaat om het vertrouwen in andere artsen dat zij op dezelfde wijze omgaan met vertrouwelijke informatie en niet bv met de voedingsdienst delen, dan wel herkenbaar.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Het eerste deel van de zin ja. Het tweede deel van de zin roept vragen op t.a.v. de rechtvaardiging van de besluitvorming. Het is niet zozeer dat het niet klopt maar de woorden zijn wel wat groot in verhouding.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*

- *Het maakt voor mij niet zozeer uit of het in de Cloud is maar dat wordt vastgelegd wie toegang heeft gehad. Intuïtief lijkt me een cloudoplossing zelfs beter dan rechtstreekse communicatie naar de EPD van andere aanbieders.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker! En dan nog niet eens meegenomen de kosten voor het herstellen van (bijna) fouten.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, en vanwege onwetendheid over de verborgen kosten. Ik denk niet dat het MT weten hoeveel tijd ik besteed aan het overtypen en welke kosten daaraan verbonden zijn.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Ik denk dat het expliciet maakt wat mensen bij dit onderwerp bedenken. Wanneer het niet je vak is, helpt het enorm om deze onderwerpen uit elkaar te halen en te ordenen. Het gaat over al deze facetten waarbij sommige (semantiek) heel mooi zouden zijn maar waarschijnlijk voorlopig niet gaan gebeuren. En dan nog is het goed om ze in kaart te brengen en het risico te weten. Het helpt in de bewustwording voordat we van start gaan met ontwikkelen.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Ik mis er nu niet een (bespreken mogelijkheid van toevoegen van Governance)*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Tijd en verborgen kosten. Tijd, dat infra niet alleen complex is maar risico dat het in horten en stoten wordt ontwikkeld.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Het helpt om de voordelen en uitdagingen in kaart te brengen maar een term als semantische interoperabiliteit zou ik vermijden. Er is dan nog wel een vertaalslag nodig maar het uiteenrafelen uit welke facetten de diamant bestaat, denk dat het een heleboel spraakverwarring zou kunnen wegnemen. Binnen onze organisatie en breder in de zorg*

wordt ICT als eng gezien maar door er op deze manier naar te kijken, kunnen we er ook wat van vinden en kan er een beter gesprek over gevoerd kunnen worden.

38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Zie 37.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Wil je dit operabel maken moet er wel een enorme vertaalslag worden gemaakt en helpt een verdere concretisering. Het zou ook helpen met andere standaardiseren omdat ik specifieker met ICT-ers kan overleggen over de onderdelen waar ik aandacht voor wens.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(In aparte tabel met antwoorden van alle geïnterviewden weergegeven)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Mag ik een kopie ontvangen van het eindverslag? Wat heb je er zelf tot nu toe uitgehaald? We hebben verder gesproken over het hoge aggregatieniveau van dit model tov een verdere concretisering om daarmee inzichtelijk te maken hoe groot de voordelen zouden kunnen zijn in tijd, kwaliteit en geld. Verder gesproken over het belang van interoperabiliteit voor wetenschappelijk onderzoek van ziektebeelden en patiënt populaties. Tot slot geeft de interviewde aan in een klankbordgroep 'leren met data van Verenso. Als we het over standaardiseren hebben en gebruik van data is er heel veel gesproken maar wordt ook daar uiteindelijk om dezelfde redenen een beperkte dataset gebruikt vanwege de complexiteit. Wat het heel ingewikkeld en daarom gaf ik ook aan dat de semantiek vermoedelijk niet gaat lukken, dan moet alles in een vakje en geen enkele patiënt past in een vakje. Dus als ik geen ruimte heb voor een vrij tekst veld, is dat niet te doen. Bij lab en diagnoses kunnen een heel eind komen zolang er maar ruimte is voor vrije toelichting.*

D7 Interview 7

Datum: 23 maart 2022 15.00- -16.00

Interview: W., organisatie A & C

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *CISO, onderdeel F&I maar ook een zelfstandige rol in de organisatie.*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *Vanaf 1 januari gestart in deze functie;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *8 jaar*
4. *Wat is uw opleidingsniveau?*
    - *HBO*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Samenwerken tussen zorginstellingen en daar samen voordeel uit halen voor cliënten;*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Mijn directeur is nauw betrokken in de regio en hebben daar vaak gesprekken over. Mijn eigen deskundigheid is gemiddeld op het onderwerp maar wel bovengemiddeld in de organisatie.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Kan ik nog niet goed zeggen omdat ik recent gestart ben in deze organisatie.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Vanuit de client dat hij/zij niet meer hoeft te wachten en de zorgmedewerker direct aan de slag kan gaan. Vanuit business aspect is data 'goud waard'. Hoe meer data je kunt verzamelen hoe beter de zorg is die geleverd kan worden. Maar ook voor het opleiden van zorgmedewerkers van belang om goede informatie te hebben.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Ego. Elke organisatie denkt het beter te weten en er op een eigen manier invulling aan te kunnen geven. Hoe specifieker de data hoe belangrijker het wordt om goede afspraken te maken zodat het in de uitwisselingop elkaar afgestemd kan worden. Iedereen richt*

zich op zichzelf binnen de eigen organisatie en zolang organisatie A & B zich niet aan elkaar willen aanpassen blijft dit een probleem.

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Informatie en applicatie indirect, maar vooral beveiliging en wet- en regelgeving.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker wel mee eens. Wanneer een client van zorgorganisatie A naar B gaat en B beschikt al over voldoende informatie helpt dat enorm.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat klopt ook. Ik zie daarin een taak voor Den Haag die dat wat mij betreft onvoldoende invult en ten onrechte neerlegt bij organisaties.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Helemaal mee eens. Alleen al voor de doorlooptijd van belang dat het tijd scheelt wanneer informatie beschikbaar is.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook daarin zie je dat vooraf gedeelde informatie helpt in de zorgverlening.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Als de vragen al door de eerste arts zij n gesteld, is het jammer als die nog een keer herhaald worden. Geldt ook voor het toetsen van informatie die in het dossier staat.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, wel belangrijk dat een ieder dezelfde terminologie gebruikt om te communiceren.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Het is een onderwerp waar al lange tijd aandacht voor is om te organiseren. Het kan zeker toegevoegde waarde hebben door het bieden van transparantie. Tegenhanger is dat het tot discussie zou kunnen leiden wanneer het zou leiden tot meer vragen. In onze sector van belang omdat ook familieleden hierin meelezen.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *100%.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, daarin zie je wederom een taak voor Den Haag om aanbieders van EPD's op een lijn te krijgen en aanpassingen op elkaar af te stemmen. Wanneer daar geen controle en goede afspraken over zijn, die ook worden onderhouden, zijn we in een jaar terug bij af. ("regionale of nationale aanpak?") Om het goed te doen, denk ik dat Den Haag een belangrijke rol kan hebben, regionaal zou dat veel langer duren. Bijvoorbeeld om de beveiliging goed te organiseren. Het zou ook kunnen dat de grootste spelers de overhand krijgen en het alsnog snel gaat. Den Haag zou daarin o.a. verantwoordelijkheid moeten nemen t.a.v. de verdienmodellen van softwareleveranciers.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Als EPD's allemaal met elkaar kunnen praten, kun je ook makkelijker wisselen zoals met energie. Daarin ligt wel een risico voor commerciële bedrijven.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook daarin zijn afspraken nodig. Dat valt samen met het definiëren van de data zelf en de wijze hoe een Api is gebouwd.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Een aantal grote softwareleveranciers krijgen langzaam de overhand waar met name grote zorgaanbieders in lijken te volgen. Kleinere organisaties zullen nog steeds wel on-prem blijven draaien en die kunnen niet gedwongen worden. Niet alleen verschillende EPD's maar ook daarbinnen verschillende versies.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, techniek heeft daar de oplossing voor geboden. Het kan ook steeds groter en sneller en daarmee de frequentie van uitwisseling worden vergroot.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, nog niet iedereen heeft glasvezel liggen en een IT afdeling die dit kan organiseren. Voordeel van verSaaSen lost dit wel langzaam aan op. Deze barrière wordt verkleind door verder verSaaSen van applicaties.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik ben benieuwd of ze die toegang kunnen bepalen. Ik denk dat hier bewustwording in van belang is voor patienten om hier bewuste keuzes in te maken. In onze sector geldt dit met name voor familie en minder voor cliënten.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat wordt wel een van de grotere uitdagingen. Hoe meer er wordt gedeeld, hoe groter de kans is dat het een keer misgaat. Helaas wordt dit meest nog veroorzaakt door het object tussen het scherm en het toetsenbord.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Kan me voorstellen dat dit nogal een uitdaging is. Ruimte voor aannames wordt wel groter.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, duidelijke afspraken maken is zeker nodig.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, 100% eens. Als cliënt ben je eigenaar maar wanneer jouw gegevens bij meerdere type zorginstellingen staan, moeten die dat allemaal op orde hebben.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens. Recent gewisseld van tandarts en moest zelf kosten betalen voor het overzetten van de informatie. Daarmee kan de administratief medewerker worden betaald. Dus zou zeker kosten kunnen besparen.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, de leverancier moet investeren en zal de kosten doorbelasten aan de zorgaanbieder.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Er zijn veel instanties betrokken bij dit onderwerp wat de uitdaging des te groter maakt. Ik vrees dat de ego's, het denken vanuit het belang van de eigen organisatie dit probleem alleen maar groter zal maken. Anders was het er allang geweest, denk ik. Het sluit, met een aantal nieuwe inzichten, aan bij hoe ik er naar kijk.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*

- *De dimensie client zou er misschien nog wel bij mogen omdat hij/zij de eigenaar van de data is. Zou een afweging kunnen zijn om die een aparte plaats te geven.*

36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Nee, geen aanvullingen.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Ik mag hopen dat het vaker op deze manier wordt aangepakt omdat het een veel beter beeld geeft zodat wanneer je tijdens het proces tegen barrières aanloopt en je deze vooraf al gedefinieerd hebt, dan kun je er beter op acteren. Toetsen in alle lagen van de organisatie draagt ook bij aan het bepalen van de impact en de acceptatie. Goed om zo een beeld van beide te geven (voordelen en uitdagingen)*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Zie 37*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(wordt in aparte tabel weergegeven van alle interviews)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Ik denk dat het belangrijk is om te benadrukken wat cliënten het meeste helpt als dit goed georganiseerd is. Omdat de zorg over een paar jaar niet meer betaalbaar is, van belang om ook ruim aandacht voor kosten te hebben. Ik hoop dat we ooit zover gaan komen maar heb er wel een hard hoop in; het zijn een hele hoop uitdagingen om te nemen.*

D8 Interview 8

Datum: 24 maart 2022 08:00 – 09:00

Interview F., organisatie A

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Bestuurder van een VVT organisatie;*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *4 jaar;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Meer dan 30 jaar;*
4. *Wat is uw opleidingsniveau?*
    - *Academisch plus;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Wat het bij mij oproept is “samenhang”; de samenhang der zaken en hoe je die bij elkaar kunt brengen. Het kan om informatie gaan maar ook om andere zaken waarin je vanuit een breed perspectief kijkt naar samenwerking. Waarbij het niet alleen gaat om zorgverlening maar bijvoorbeeld ook over preventie, ofwel in de brede zin van het woord. Het gaat om hoe we in de zorg met elkaar samenwerken en wat we daarin willen realiseren.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Als het gaat om het woord wat jij gebruikt niet zo, maar als het gaat om samenwerken met andere organisaties en het versterken van de samenwerking, dan heb ik daarin een duidelijke en actieve rol, zelfs als dat zou betekenen dat wij zouden moeten snijden in onze dienstverlening heb ik de bereidheid daarin een afweging te maken omwille van de samenwerking en belang van cliënten. Niet vanuit concurrentie naar elkaar kijken maar vanuit de maatschappelijke verantwoordelijkheid die we samen hebben. Zo kijk ik ook naar mijn rol als bestuurder.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *(Niet uitgevraagd.)*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*

- *Wij vragen heel veel dezelfde informatie aan dezelfde persoon en het zou mooi zijn om door te kunnen gaan op reeds beschikbare informatie. Dat neemt niet weg dat we zelf ook een toets moeten doen op hetgeen er aan informatie wordt overgedragen. Ik kan me voorstellen dat je een eigen kleur wilt geven aan de informatie en dan is het goed om die te toetsen en zo nodig dieper uit te vragen. Het zou voor mij een groot voordeel zijn wanneer we zouden kunnen steunen op informatie die elders al is verzameld en dan te toetsen of jouw interpretatie klopt. Het is goed om te vertrouwen op de informatie die we ontvangen maar vanwege de eigen bril wel te toetsen bij de bron.*

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Systemen die nog niet op elkaar aansluiten, dat lijkt me een randvoorwaarde. Het vraagt om te vertrouwen in de informatie die we van anderen ontvangen. Vervolgens moeten we leren om informatie eenduidig vast te leggen omdat we nu nog zo gewend zijn om dat in vrije tekst te omschrijven. Vraagt ook een andere mindset om op die manier te kijken naar informatie. Het zegt iets over gedrag, afspraken maken met anderen (wie legt welke informatie op welke manier vast) en het zegt iets over systemen.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Organisatiebeleid: Dat doe ik best veel als je kijkt naar de tijd die ik daarvoor buiten de deur besteed. We zijn nog zo bezig met hoe we gaan samenwerken dat we nog maar nauwelijks toe zijn aan het delen van informatie. Ik lees dat jij het al hebt over een ecosysteem, ik merk dat we in de gezondheidszorg zo nog niet denken. We denken nu nog vooral in kolommen, de acute zorg of de care en cure, terwijl een ecosysteem meer uitgaat van het elkaar beïnvloeden of effect hebben op elkaars diensten en ben 'ik' bereid om daar voor een ander de kosten voor te dragen. Zo ver zijn we zelfs nog niet in de VVT, daar vinden we het al moeilijk om tot goede afspraken te komen, bijvoorbeeld met een actuele casus over het aantal revalidatieplekken in de regio. Ook als het gaat om informatie uitwisselen, zoals in het Inzicht traject, begint het met de vraag of we met elkaar overtuigd zijn om deze stap te zetten. Kost nog veel tijd, in mijn agenda bijna dagelijks mee bezig: Rotterdamse zorg, Conforte, Capelle en Krimpen verbonden, etc. verschillende groepen die bij elkaar komen en op verschillende thema's nadenken over hoe we het zouden kunnen organiseren. Beveiliging is ook een thema wat mij bezighoudt met de CISO die we recent hebben aangenomen en natuurlijk ook de kosten.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld wordt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, daar kan ik me heel goed in vinden maar ik vind het ook belangrijk dat we wel zorgvuldig met informatie omgaan.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *De volgorde kan ik me voorstellen waarbij de ontwikkeling vooral regionaal voor nationaal zou moeten zijn. Onze regio is echt anders dan andere regio's en ik zou het belangrijk vinden dat daar aandacht voor is op de vlakken waarin we verschillen. Ik geloof in de kracht van het herkennen en duiden van informatie en denk dat het belangrijk is dat we er achter staan. En als het nationaal georganiseerd wordt en we staan er niet achter, dan werkt dat niet. Standaardiseren in de zorg vraagt echt een andere mindset omdat we dat niet gewend zijn.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat geloof ik echt. Als de ander kan zien wat er gebeurt is wanneer een client voor de balie staat, helpt dat enorm zowel de client als in de kosten.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zoals het nu gaat eens. Hoe vaak gebeurt het niet rondom medicatie dat de lijst al is uitgedraaid en er dan toch nog wijzigingen in worden aangebracht en in het systeem uiteindelijk niet staan. Ik ben het er absoluut mee eens dat hierin veel misgaat en we onvoldoende toetsen of het klopt. Hoe concreter we worden hoe meer het ons zal helpen. En, goede afspraken over wie waarvoor verantwoordelijk is.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik kan me dat voorstellen dat het een groot risico is. Volgens mij moet je dat verwerken in het arbeidsproces door bijvoorbeeld van te voren informatie te verzamelen en niet tijdens het consult. Ik denk dat het een rol speelt en vind dat we onszelf moeten scholen om het te integreren in het werk.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Het vraagt om het toetsen van informatie die wordt ontvangen. Een eenduidige interpretatie kan in het geval van diagnoses maar als het gaat om beleving en de zorgmedewerker daar iets van vindt, is het goed om bewust te zijn dat het een subjectieve mening kan betreffen en die te toetsen. Ik denk dat heel moeilijk wordt om hier afspraken over te maken als het gaat om een interpretatie die we doen vanwege het verschil in kleuring die we kunnen doen. Zelfs binnen de standaarden is er ruimte voor*

interpretatie zoals bij NNN. Je kunt het uiteindelijk (gelukkig) niet zo maar zwart wit maken. Zoals bij Covid hebben de cliënten allemaal positieve test maar de uitwerking ervan is voor iedereen verschillend.

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat is afhankelijk van de persoon. Ik denk dat het heel belangrijk is met welke beelden cliënten oud zijn geworden of zij daarin behoefte of waarde zien. Bovendien zijn onze systemen vaak moeilijk te doorgronden voor buitenstaanders. In onze doelgroep horen mantelzorgers daar ook bij maar zal nog steeds niet voor iedereen gelden dat dit waarde heeft. Als we het makkelijk kunnen maken om in te zien, helpt dat.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ingewikkeld. Het ligt eraan wie de tekst leest. Wil je leren en werken aan voorspelbaarheid, heb ik van jou geleerd, dan zul je toch iets met standaarden moeten doen. Het gaat er ook om met welk doel informatie wordt vastgelegd. Voor de gelaagdheid in de informatie (harde en zachte data) moet aandacht zijn.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat wet- en regelgeving het vooral 'oplegt'. Ik zou het veel mooier vinden als we dat samen weten te bereiken. Dat wij nu overgaan op ONS betekent dat we dichter bij elkaar komen en hoe mooi zou het zijn als we dat met elkaar vaker vanuit een intrinsieke motivatie zouden kunnen doen. Of we daar komen, durf ik over te twijfelen.. hebben we de overheid nodig met een stok? Ook bestuurders denken nog te vaak vanuit hun eigen organisaties en niet vanuit de gezamenlijke verantwoordelijkheid voor het ecosysteem. Het zou krachtiger zijn als we dit zelf konden en als dat niet lukt, dan is misschien soms nog de stok van wet- en regelgeving nodig.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Op het moment dat we allemaal met dezelfde applicaties werken zou ons dat kunnen helpen. Ik geloof tegelijk ook dat concurrentie kan helpen in het beter worden van systemen. Het heeft iets goeds wanneer we eenduidig met elkaar aan de slag gaan en voor dezelfde systemen kiezen maar ook eng wanneer de positie en het eigenbelang van leveranciers te sterk wordt. Ook hierin is de hiërarchie in de gezondheidszorg weer terug te zien. Ik vind dat wij daar als VVT ook wat aan mogen doen. Wij laten de ziekenhuizen ons hart zijn maar wij zijn wel de aorta. Als de aorta het niet aankan heeft het hart een probleem.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat dat belangrijk is om te doen.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat zal een uitdaging zijn.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, hier volg ik jou gelijk in.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, niets aan toe te voegen.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ligt aan het mensbeeld en waar je bent opgevoed. Vraagt veel meer dan de aanname dat het zo is.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens, van belang om zorgvuldig met privé gegevens om te gaan.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, maar dat vind ik nu ook.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, als besproken. Dit is dus inderdaad belangrijk. Als we hier onvoldoende aandacht aan geven wordt het geen succes.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Je hoort mij zuchten omdat ik dit ingewikkeld vind. Er zitten in dit zinnetje zoveel elementen waar je anders naar kunt kijken. Het zijn grote thema's zoals hier beschreven. Ik denk dat iedereen hier wat van gaat zuchten omdat het gaat over de manier waarop we naar zorg zouden willen kijken. Hier is nog wat uitwerking nodig...*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Weet ik te weinig van.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Denk dat dat absoluut een rol speelt. Een ECD is zichtbaar maar wat jij aan het doen bent, is veel minder zichtbaar.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Het is heel complex en dat blijkt maar uit alle elementen die je benoemd. Met het raamwerk wil je het versimpelen maar het blijft nog steeds een grote complexiteit behouden.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*

- *Ik geloof niet dat ik wat mis. Gevoelsmatig zitten de belangrijkste onderdelen erin.*

36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Dat het ook leuk is om met zo'n ontwikkeling bezig te zijn! Ik vind het ook echt zinnig.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Wat het doet door de versimpeling helpt altijd. Om van een complex vraagstuk te weten of alle elementen zijn benoemd en voldoende bij stil te staan. Het is niet voor niets complex zodat je altijd moet afvragen of versimpeling recht doet aan de complexiteit.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Zie 37.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Voor mij gaat het om de toegevoegde waarde en die mag best verder in de toekomst liggen ook al moeten we er dan wel flink doorheen worstelen. Het lonkend perspectief maakt de weging voor mij van belang. De intrinsieke motivatie er iets moois van te maken hoeft niet in het hier en nu te liggen.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Uitwerking van alle scores komt in een gezamenlijke tabel)*
41. *Is er iets waar u nog op wenst terug te komen?*

D9 Interview 9

Datum: 24 maart 13:00 – 14:15

Interview M., organisatie A

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Medewerker AO/IC en Functionaris gegevensbescherming, afdeling Financiën en informatie.*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *Ruim 4 jaar, FG ongeveer 3 maanden;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Ongeveer 6 jaar;*
4. *Wat is uw opleidingsniveau?*
    - *Academisch;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Samenwerken in de operatie. Vanuit het proces met elkaar samenwerken, ervaringen delen, evalueren.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Niet zo bekend;*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Denk dat het er wel is omdat we in het werk met elkaar te maken hebben maar dat dit nog wel verder kan worden uitgedacht (sinds 5 maanden in dienst).*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Het lijkt me goed om een completer beeld van de client te krijgen en de zorg daar beter op te laten aansluiten.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Veiligheid lijkt een groot aandachtspunt. Hoe en wat kunnen we delen over onze cliënten en mag dat ook.*

Deel twee: *Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)*

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *Wet- en regelgeving is wel de basis van de functie(-s) die ik heb.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld wordt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat denk ik zeker. Daarin zal het ook tijd schelen om informatie te verzamelen die elders al beschikbaar is.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat zou ik wel een uitdaging vinden om het internationaal in te richten. Regionaal en nationaal eerder hoewel ook nationaal wel uitdagend zal zijn. Je moet aan alles denken als het om verschillende regio's gaat. Ik denk dat het anders te basaal blijft als het te groot wordt opgepakt.*

Zorgproces Voordelen - Klinische Interoperabiliteit*:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, het zet mogelijk ook de deur open dat anderen zich gaan 'bemoeien' met de zorg die elders geleverd wordt. De autonomie van instellingen moet wel bewaakt worden.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, het is nu vooral een risico wat met interoperabiliteit verminderd zou kunnen worden.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Als het goed is, zou dit meer tijd en aandacht te weeg moeten brengen voor cliënten. De client zal niet weglopen en cliënten zullen ook ervaren dat als zij minder formulieren hoeven in te vullen, hen dat zal helpen.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat is belangrijk. Uniformiteit is sowieso altijd beter.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja en nee, dat ligt aan de patiënt. Voor onze doelgroep geldt dat wellicht minder. En als cliënten dit niet meer kunnen bijhouden, krijgt familie dan inzage in alle zorg van alle jaren? Is dat wel wenselijk? Niet heel duidelijk een voordeel zoals hier weergegeven.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zeker.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *De mate waarin standaarden worden uitgewerkt en verplicht gesteld is daarin wel bepalend. Wie het bepaald en of het voor iedereen een verplichting wordt. Toetsing via een keurmerk en of auditen vraagt ook veel van organisaties. Wat doen we met de instellingen die niet kunnen of willen aansluiten. Toegankelijkheid is van belang voor een grote groep en niet alleen zij die er de middelen voor hebben.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, want zij moeten het ook faciliteren.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dit gaat ook weer over uniform werken. Gaat ook over welke gegevens wel en niet worden meegenomen.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, maar ik zie daar ook de andere kant van dat cliënten de toegang weigeren terwijl die informatie wel nodig is. Ik denk dat mensen hier wel terughoudend in kunnen zijn en belangrijk om hen daarin mee te krijgen. Artsen zouden niet te afhankelijk moeten worden van informatie die er wel is maar niet beschikbaar vanwege de toestemming van cliënten. De meest relevante gegevens moeten altijd wel beschikbaar zijn.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, van de zomer bevallen in het ziekenhuis en van te voren bij het aanmelden bleek dat de meeste informatie behoorlijk verouderd was. Het is wel belangrijk wie er verantwoordelijk is voor het actueel houden van de informatie. Belangrijk om daar goede*

afspraken over te maken. De vraag wie is waar verantwoordelijk voor en tot waar reikt die verantwoordelijkheid in geval van overdracht van zorg.

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker. Of in ieder geval hoe we met gegevens om mogen gaan. Wanneer we het regionaal organiseren is er wel meer ruimte dan wanneer het landelijk wordt georganiseerd. Nationaal regelen geeft wel wat meer vertrouwen mee in wat er verwacht wordt en wat de werkwijze is.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Voorkomen moet worden dat commerciële bedrijven of verzekeraars toegang krijgen tot de informatie van cliënten en premies daar op zouden kunnen worden bepaald.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Kosten maar ook middelen zoals tijd.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Het lijkt me redelijk compleet. Bij de voordelen kan er ook een nadeel aan kleven zonder dat het direct een barrière of uitdaging hoeft te zijn. Verder uitwerken en verdieping is denk ik wel nodig. De patiënt of de client mis ik hier nog wel in, zou een aparte dimensie mogen zijn.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Toevoegen van de dimensie client. Mogelijk bij de voordelen ook evt nadelen erbij benoemen. Stel je doet dit op een uniforme wijze, wat zouden we dan missen of wat raken we dan kwijt. Zou kunnen om in de discussie wel aandacht aan te geven; hoeft misschien dan niet in het raamwerk.*

36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Meeste tussendoor wel besproken.*

Deel vier: *Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.*

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Het klinkt bijna te mooi. Ik verwacht dat hier nog wel een behoorlijk tijd over heel zal gaan voor we er zijn. Toewerken naar wat er op korte termijn mogelijk is, zou wellicht helpen.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Opsplitsen in wat er op korte termijn gedaan kan worden, zou kunnen helpen. Een groeimodel of volwassenheidsmodel zou een volgende uitwerking kunnen zijn. Zo is het nog behoorlijk abstract en vermoed ik dat het resultaat nog ver weg zal zijn.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37-38. Bespreken dat dit soort projecten voor het type en de omvang van dit soort organisaties erg groot is om over jaren uit te spreiden. Interviewde geeft aan dat een regionale aanpak daarin kan helpen. Gezien het landschap in de zorg zou een gefaseerde aanpak kunnen helpen. Zo weten organisaties nauwelijks waar te beginnen vanwege verschillen in de volwassenheid op dit onderwerp.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Uitwerking van alle scores komt in een gezamenlijke tabel)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Ben benieuwd naar de uitkomsten van je onderzoek.*

D10 Interview 10

Datum: 28 maart 2022 16:00 – 17:00

Interview: S., organisatie 1

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Manager Financiën en ICT, lid van het MT*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *In deze functie binnen de organisatie een half jaar;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Ongeveer 18 jaar;*
4. *Wat is uw opleidingsniveau?*
    - *HBO;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *In hoeverre applicaties met elkaar kunnen communiceren binnen en tussen organisaties. Koppelingsvragenstukken spelen hierin een belangrijke rol.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Ik denk dat ik goed kan mee praten op de concepten en in de besluitvorming of we er wel/niet iets mee zouden moeten doen vanuit de organisatie.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Het gaat bij ons vooral om de communicatie met de eerste lijn, ziekenhuizen en andere VVT. Ik denk dat we al het een en ander doen maar zeker nog niet een volwassenheidsniveau hebben bereikt. We zijn vooral volgend en de vraag is hoe de regio hierin georganiseerd is t.o.v. ons.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *Dat het veel administratieve lasten scheelt. Het werk van medewerkers wordt er makkelijker van, cliënten kunnen sneller doorstromen en minder verlies van data. Wachtlijstbemiddeling die sneller kan en snellere plaatsing van cliënten.*
9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*

- *Verschillende systemen met verschillende inrichting waardoor koppelingsvraagstukken ontstaan in de gegevensuitwisseling.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *In mijn rol nog het meest beveiliging via de AO/IC, kosten vanuit de FA en control, het applicatie en informatie deel via jou en het zorgproces vanuit de systemen. Bij het beleid zou ik in betrokken kunnen zijn vanuit het MT. Nu geen expliciet beleid. Vraag van interviewde: "waar zouden we dit onderwerp nou het beste kunnen beleggen binnen de organisatie vanuit alle facetten waaruit het bestaat?" Het zijn wel goed assen (dimensies) om iets van te vinden. Het zijn mooie lagen om na te denken over de inrichting van onze eigen informatievoorziening.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld wordt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Samenwerken is denk ik niet het primaire doel. Het gaat in de eerste plaats om doorstroming van cliënten en daarnaast de samenwerking.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, lijkt me een randvoorwaarde om dit te regelen hoewel hieruit nog niet direct blijkt om welke standaarden het gaat. Waar ligt nou de verantwoordelijkheid voor het organiseren van standaardiseren. Hoe verder we gaan met standaarden hoe meer we ons vastzetten in de keuze van bv leveranciers. Daarmee kan vernieuwing ook worden doodgeslagen en neemt de afhankelijkheid van leveranciers toe. (bespreken de rol van Governance in het vormgeven van de keten). Als je het hebt over interoperabiliteit, dan gaat dat boven het beleid van de organisatie. Er zit nog een niveau tussen om het te organiseren en initiëren, dat gaat niet via wetten. Wat wordt de rol en het mandaat van regionale samenwerkingsverbanden zoals Conforte en de ICT adviesraad. Verbanden vinden en met elkaar successen boeken.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat lijkt me logisch dat het dossier en afspraken daarover worden afgestemd.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Volgens mij zijn daar voldoende onderzoeken voor dat het dossier niet compleet is bij opname. In ieder geval in ziekenhuizen is hier al veel onderzoek naar gedaan.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ik denk dat daar altijd wel een risico in zit. De computer zal gebruikt blijven worden en tijd voor het goede gesprek blijft nodig. Goed om hier een maatregel op te treffen.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ik denk dat dat waar is maar ook afhankelijk van de clientpopulatie. Bij onze populatie valt het mee maar voor de partner of omgeving helpt het wel.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens, en kost ook geld. Ook handmatig werken speelt hierin aanvullend een rol. Bij de verkeerde client inscannen of onjuist overnemen van gegevens.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Volgens mij zeg je hier twee dingen die met elkaar verband houden.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dat zit er ook tussen. Tegelijk willen we ook verschillende leveranciers omdat concurrentie goed is voor ontwikkeling en de prijs.*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, klinkt ook logisch want maakt koppelingen ook weer makkelijker om te ontwikkelen.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Vanuit marktperspectief wil je verschillende systemen maar wel met dezelfde syntax. In de regio maken alle ziekenhuizen gebruik van Hix, niet het meest vernieuwende systeem.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, herkenbaar.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, helder. Het veranderkundige procesdeel is complex. Moeilijk vak heb je gekozen ;)*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, kan ook lastiger zijn. Een kans..*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, duidelijk.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, helder.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, fantastisch en als je nou ook nog even aangeeft waar we de besparing kunnen halen. Hoe kunnen we de investeringen terugverdienen van dit soort trajecten. Of verlagen we de werkdruk hiermee? Scheelt het wanneer we minder medewerkers nodig hebben voor het overtypen of een bureaubesparing over alle afdelingen verdeeld.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *We hebben zeker wat aan het raamwerk voor de inrichting van dit onderwerp en hoe wij dit hebben belegd. Ook als je alle applicaties hiernaast legt. * bespreken de rol van Zorgdomein en Point als postbode met brokerfunctie* . Zeker een compleet beeld maar de finesse zit vaak in de processen. Ook de menselijke component, hoe worden de veranderingen gerealiseerd. De factor mens als medewerker en client.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Factor medewerker en client mogelijk nog toe te voegen.*

36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Of het compleet is zou ik nu zo niet durven zeggen. Devil is vaak in de detail.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Als een toetssteen helpt het om te controleren of je compleet bent. Al deze onderdelen zijn van belang. Ook de vraag waar je het beheer zou neerzetten, is daarin van belang. * bespreken de plaats in een organisatie en tussen organisaties waarin governance belegd zou kunnen worden. * Ziekenhuizen, VVT en ook verzekeraars hebben elkaar hierin nodig.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Zie 37 en eerder.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Zie 37 en eerder.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Uitwerking van alle scores komt in een gezamenlijke tabel)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Praten na over het resultaat van de gesprekken tot nu toe en hoe organisaties van onze grootte maar moeilijk capaciteit kunnen organiseren om dit te realiseren. Kunnen we dit soort ontwikkelingen vanuit de huidige formatie laten komen en als er extra formatie nodig is waar betalen we die dan van. Helpt het de kwaliteit van de zorg of de druk op de zorgmedewerkers.*

D11 Interview 11

Datum: 13 april 2022 Tijd: 15.30 – 17.00

Interview: F., organisatie C

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Directeur bedrijfsvoering, verantwoordelijk voor financiën en ICT.*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *Ruim 10 jaar.*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *Ook tien jaar.*
4. *Wat is uw opleidingsniveau?*
    - *Academisch.*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Interactie tussen systemen waarbij uitwisseling van gegevens plaatsvindt tussen die systemen. Zoals bij een ziekhuis informatiesysteem en een huisarts informatiesysteem. Van belang dat de data die verstuurd wordt dezelfde waarde blijft houden en dezelfde dingen blijft zeggen. Relevante informatie waar je later weer wat mee kunt doen.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Binnen de organisatie redelijk deskundig op dit gebied. Het is niet dat ik er uitgebreid studie van heb gemaakt maar ik streef hierin vooral naar praktische toepasbaarheid. Binnen de organisatie hebben we bv de uitwisseling tussen het behandeldossier en zorgdossier georganiseerd.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Als ambitie zeker maar "It takes two to tango". Er is samenwerking nodig met andere organisaties, zeker ook omdat onze cliënten nog wel eens tijdelijk worden opgenomen in het ziekenhuis. Het is ook een thema dat de laatste vijf jaar meer op de agenda is gekomen. Daarvoor was de informatievoorziening meer vanuit de eigen wereld en blik naar binnen gericht.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*

- *Eenmalige vastlegging van data en over dezelfde informatie beschikken aan de zorgverlenerskant. Dit bespaart tijd, geld, energie en misverstanden. Ik denk dat het ook minstens zo belangrijk is voor de patiënt of client dat zij niet iedere keer dezelfde vragen hoeven te beantwoorden. Heel veel vragen zijn voor een patiënt bij opname ook niet relevant zoals wie is je huisarts en bij wie ben je verzekerd. Het zou fijn zijn als al die gegevens dan al beschikbaar zijn. Dat er nog wat vragen ter verificatie worden gesteld lijkt me logisch maar veel is toch vaak al in de keten bekend.*

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
   - *Het zit op heel veel dimensies. Vertrouwen de partijen elkaar, kennen en snappen ze elkaar wereld. In overleg met een ziekenhuis (M) hebben we gesproken over saturatiewaardes. Bij een waarde van 97% gaan in het ziekenhuis alarmbellen af terwijl dat voor onze cliënten soms een topdag kan zijn. Het gaat niet alleen maar over het uitwisselen van data maar ook het gesprek over de betekenis daarover. De processen zullen ook goed op elkaar moeten aansluiten. Als wij in Fahrenheit meten en de ander in Celsius levert dat problemen op, ofwel de eenheid van taal. Ik denk dat daaronder ook de applicatie lagen goed op elkaar afgestemd moeten worden, bijvoorbeeld door gebruik van zibbs. Partijen moeten daar ook mee willen werken. Daar zien we soms ook concurrentieachtige verschijnselen en het 'wie voegt zich naar wie?' Is dat op basis van wie de grootste is, klassiek het ziekenhuis? Ik voorzie daarin wel een kanteling van de cure naar de care. De care krijgt daarin steeds meer een dominante rol en durft ook steeds meer een positie in te nemen. We zullen daarin een optimum moeten vinden voor de hele keten. Misschien dat ziekenhuizen op termijn zorg moeten gaan inplannen op basis van de capaciteit in de thuiszorg. Het belang om het hele logistieke proces goed te organiseren neemt alleen maar toe.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *De kracht van het Nictiz model ligt in de samenhang en betrokkenheid op alle dimensies. In het dagelijks werk houd ik me het meest bezig met het organisatiebeleid maar niet zonder ook betrokken te zijn en kennis te nemen van de andere dimensies. Analytisch kan het uit elkaar worden gehaald, maar in werkelijkheid zitten deze onderdelen aan elkaar vast en wordt dat onderscheid niet zo duidelijk gemaakt.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens, ik zie een toenemende samenwerking met het Ziekenhuis (M) waarbij zij graag snel cliënten aan ons overdragen. Hoe meer we vooraf van cliënten weten hoe beter we kunnen inspelen op die vraag. Betere informatie leidt dan tot betere afstemming, keuzes en interoperabiliteit.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik aarzel op het woord regionaal. Volgens mij is Nederland klein genoeg om het nationaal te organiseren. We zullen op nationaal niveau afspraken moeten maken in welke eenheden we informatie communiceren. Als er geen eenheid van taal is, spreken we te gemakkelijk langs elkaar heen. Geldt ook voor opleidingsinstituten dat zij studenten hetzelfde leren. ("zijn wij als instellingen is staat om dit regionaal te organiseren of hebben wij de overheid hierin in meer of mindere mate nodig?"). Ik denk dat we dit op landelijke schaal zouden moeten organiseren. De grote softwareleveranciers zullen echt niet speciaal voor de regio Rijnmond gaan ontwikkelen dus die wereld is zo klein dat dit best landelijk wordt opgepakt. Hebben wij zelf voldoende power om dit te organiseren, vind ik wel echt spannend. Tegelijk zie ik er ook wel tegenop dat de rijksoverheid hierin bepalend gaat zijn, want inbreng vanuit de praktijk is echt nodig. De hele zibb beweging helpt enorm maar tegelijk komt dit in belangrijke mate vanuit de ziekenhuizen en wordt de care 'lastig gevallen' met ingewikkeldheden en past dat op dit moment wel binnen de langdurige zorg. We hebben het debacle gehad met het landelijk EPD en nu wil de overheid zich er niet meer rechtstreeks in mengen maar het wel stimuleren. Ik denk dat er na de stimulerende fase ook een verordenende fase zal moeten komen waarin wordt afgedwongen dat we het op dezelfde manier gaan doen.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, uiteraard, dat helpt. Daarboven ook het belang om op zoek te gaan naar de juiste zorg op de juiste plek. Wanneer we beter naar elkaars data kunnen kijken kan die beoordeling ook beter plaatsvinden.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *In de overdrachten ontstaan ook in andere processen vaak de meeste fouten. Door het transparant en eenduidig maken van informatie kunnen de grenzen van afdelingen en organisaties beter worden beslecht. Er is een groot risico op die momenten, zeker wanneer het ziekenhuis 'duwt' op opnames. Dus hoe interoperabeler organisaties zijn, hoe kleiner de risico's. Ik denk dat dat dus helpt.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dubbel. In de demografie is het een maatschappelijk gegeven dat we ouder worden. Ik denk dat het streven zou moeten zijn dat we zelfstandigheid van cliënten nog meer*

bevorderen zodat een arts aandacht kan besteden aan waar dat echt nodig is. Wel een risico dat er steeds meer naar de werkelijkheid van het scherm zal worden gekeken en de patiënt zich niet gehoord voelt.

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zelfs noodzakelijk. Op de informatie laag moeten we semantisch interoperabel zijn.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Sommigen wel en sommige niet. Er is echt wel een doelgroep die er veel waarde aan kan hebben. Voor mensen die van specialist naar specialist gaan kan het waardevol zijn om alles te volgen, bijvoorbeeld ook voor chronisch zieken (COPD of diabeten) die ook aan zelfmonitoring doen. Er zijn doelgroepen waar ik erin geloof maar niet allemaal.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat is een risico hoewel niet alles te vangen zal zijn in standaarden. Het is geen verboden gebied om gebruik te maken van vrije tekst om een client te beschrijven. Er is te veel in het lichaam, toestand of omgeving wat relevant is maar moeilijk te kwantificeren. Vergt daarom een warme overdracht. Ook terug te zien in een SOEP rapportage waar daar ruimte voor is.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk inderdaad dat dat zo is. Misschien dat er op enig moment kansen ontstaan om over vak grenzen heen standaarden te ontwikkelen waar dat nu nog ingewikkeld is. Daar is ook zeker wet- en regelgeving nodig om willekeur te voorkomen. Hoop toch dat het CIZ in Groningen en Limburg op dezelfde manier indiceert.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk juist dat de industrie nu juist niet competitief is. Ik vind het risico behoorlijk groot dat het (per sector) nogal monopolistisch aan het worden is. Juist omdat het niet echt competitief is, is de samenwerking nog steeds erg uitdaging. Daarin zou de overheid kunnen kiezen om meer op te leggen, bijvoorbeeld rondom het open zijn en delen van*

informatie. "Massa is kassa", wat op zich nog niet erg is zolang er geen asociaal hoge winsten worden behaald en het samenwerken en open standaarden niet in de weg staat.

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja eens.*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat is denk ik voor een deel waar. Als het gaat om medische hulpmiddelen is dat best een beperkte set. Er zijn vast uitzonderingen maar het helpt enorm om meer te standaardiseren. Liefst wel vanuit inhoud gedreven. Het zal ook niet een oneindige omvang hebben, zolang er maar ruimte blijft voor non-standaards buiten de zibbs.*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, ik denk dat dat waar is.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ook helemaal eens. Infra is hartstikke duur.*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik ziet hier wat dubbel in. De ontwikkeling naar PGO's vind ik heel mooi waarin je zelf eigenaar bent van je eigen data. Ook dat je bepaald wie er wel of geen toegang tot jouw gegevens hebben. Maar, wanneer er een huisarts is die je niet aardig vindt en je de toegang ontzegt, ben ik wel blij dat hij zijn eigen HIS heeft met informatie om zijn medische verantwoordelijkheid te nemen. Ik ben voor transparantie op dit thema maar er kunnen ook situaties zijn waarin zorgorganisaties hun eigen dossier goed moeten beschermen.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, heel de wet- en regelgeving zoals AVG duidt die kant op. En los daarvan is het ook gewoon terecht.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Twijfel.. Ik weet niet precies om wat soort standaarden het dan zou gaan. Het helpt wel enorm om afspraken te hebben over het verkeer tussen arts en patiënt. Stel dat er sprake is van vermoedens, in hoeverre zouden die dan gedeeld kunnen worden of niet met andere artsen. Ik denk dat patienten het recht hebben te vragen wat er wordt vastgelegd en wat daarmee gedaan wordt.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Vanuit de functie van arts lijkt het me van belang te weten wat de laatste metingen zijn geweest, door wie er gemeten is en helder moet zijn dat er op een veilige en uniforme manier gemeten is. Nodig om betekenis te geven aan de waarden die er staan. Van een collega arts wordt dit misschien wel makkelijker vertrouwt dan metingen van cliënten. De trend lijkt mij daarin nog het meest van belang.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Dat helpt enorm wanneer er een derde onafhankelijke partij is die meekijkt en beoordeeld dat we onze zaken op orde hebben. Voor het vertrouwen tussen partijen zou dat enorm helpen en zeker wanneer daar een juridisch kader voor is.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Een cloudoplossing is niet veel meer dan een computer die ergens anders staat. Ik denk niet dat cloudoplossingen specifieke juridische problemen zouden opleveren. Misschien is een cloudopstelling nog wel veiliger dan on prem. In deze trigger ik op het woord 'Cloud'. Als dat minder relevant is in deze stelling dan eens. Het delen van informatie tussen verschillende entiteiten levert inderdaad juridische problemen op, los van dat dat in de Cloud gebeurt. Organisatiegrenzen komen ook steeds meer te vervagen wanneer we cliënten en behandelresultaten met elkaar delen. De vraag 'Van wie is de patiënt?', wordt steeds lastiger te beantwoorden. Geldt ook steeds meer voor medewerkers dat daarin de grenzen langzaamaan diffuus worden. Het gaat steeds meer om wat een patiënt nodig heeft en wij daaromheen kunnen organiseren.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *En de betreffende software partijen geen woekerwinsten behalen. Er zullen zeker besparingen zijn omdat overtypen wordt voorkomen en we beter kunnen vertrouwen op de kwaliteit.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik denk dat er ook wel enige terughoudendheid is wie in charge is, vergelijkbaar met wet- en regelgeving. Het tussengebied is nu van niemand en hoe organiseren we dat nu met elkaar. Ik denk dat hierin nog wel een flinke uitdaging zal liggen. Wie pakt de lead en hoe gaan we dat dan doen. Ik denk dat dit ook wel een reden is waarom het moeilijk op gang komt. De opbrengst ligt in de toekomst en is nu moeilijk te cashen. Ik geloof er wel in. Zeker op het logistieke stuk is echt snel voordeel te behalen. Alleen al door te voorkomen dat een arts '24' instellingen moet bellen om een client geplaatst te krijgen. Bij verwijshulp 010 heeft dat een ligduur verkorting van 1,4- 1,5 dag opgeleverd. Dat is werkelijk gigantisch en dat is vrij eenvoudig om te rekenen naar geld. Voor de doorontwikkeling van verwijshulp 010 in het tussengebied wel van belang om met elkaar de groei te bepalen.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Ik vind het sowieso leuk om het onderwerp in al z'n elementen uit te raffelen. Het is best een veelomvattend onderwerp wat niet vandaag op morgen is in te voeren. Bij mijn start hier was er nog sprake van een papieren dossier. Toen goed begonnen om dat te digitaliseren. Vervolgens stopte de leverancier en hebben we via een selectietraject een andere ECD leverancier gevonden. Vervolgens kwamen we erachter dat we nog steeds werken zoals met papier maar dat we dat nu digitaal doen. De focus is ook lang intern geweest en pas de laatste periode dat de blik naar buiten gericht is. In gesprek met ziekenhuizen in de regio blijkt vaak hetzelfde nl. dat de keuze voor een EPD vooral intern gericht is en de buitenwereld nog weinig relevant. Langzaam komen we erachter dat we ook iets met elkaar moeten doen. In die fase zitten we denk ik nu dat we dat met elkaar in Nederland aan het ontdekken zijn; en sommige zullen daarin verder zijn dan andere. Wat ik het mooie vind aan de Vipp Inzicht regeling, en tegelijk ook wel wat frustrerend, is dat het de enige regeling is die verplicht om transmuraal samen te werken. Tot voor kort was het ondenkbaar dat operaties zouden worden uitgesteld omdat er te weinig capaciteit in de thuiszorg zou zijn. Het denken in wat er in de hele keten nodig is, is echt anders. Dat vergt dat we naar het ecosysteem kijken. Dat moet gaan leiden tot lagere kosten en hogere kwaliteit.*

35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
    - *Nee, ik vind het mooi dat je een kosten laag heb toegevoegd, je zou er ook nog een opbrengsten laag aan kunnen toevoegen. Het levert nl. ook op. Het model van Nictiz brengt een gelaagdheid aan in de werkelijkheid die best kan helpen voor begripsvorming. Of onderdelen nou precies in de ene of de andere laag horen, maakt voor mij dan niet zo uit.*
    - *(vraag na over een dimensie voor Governance). Wat mij betreft kan dat onder organisatiebeleid. In een plaat vanuit Nictiz wordt het model tussen organisaties naast elkaar gezet en komt dat via een zandloper bij elkaar. Het laat zien dat organisaties dit met elkaar hebben te organiseren. Eens dat Governance er moet zijn en goed vorm gegeven moet worden en dat start denk ik vooral op regio niveau omdat we elkaar daar het meest tegenkomen. Rond organisatiebeleid hoort denk ik ook de Governance en hoe het samenspel met elkaar zal worden geregeld.*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*
    - *Ik denk dat het redelijk compleet is.*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
    - *Niet gesteld.*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
    - *Niet gesteld.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Wat zeker zinvol is, is dat je woorden geeft aan wat er gaande is en zou moeten gebeuren. Juist door er op verschillende niveaus naar te kijken, heb je de mogelijkheid om verschillende mensen te bereiken. Voor artsen zullen een aantal zaken niet relevant zijn en datzelfde geldt voor ICT-ers en bestuurders, terwijl ze elkaar wel allemaal nodig hebben. Wat je hiermee zichtbaar maakt, is dat er op al deze niveaus goede afspraken nodig zijn. Wat je hiermee doet, is dat je de complexiteit uiteen raffelt. Hoewel het een moeilijk woord is om uit te spreken, helpt het om het ver-weg-verhaal dichtbij te brengen. Het is geen IT verhaal maar een zorg verhaal.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Uitwerking van alle scores komt in een gezamenlijke tabel)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Benieuwd naar de uitkomst van het onderzoek en hoe de anderen de stellingen gescoord hebben.*

D12 Interview 12

Datum: 11 mei 2022 14.00 – 15.00

Interview E., organisatie D

Introductie:

Het doel van dit interview is informatie te verzamelen over hoe zorgorganisaties omgaan met de complexiteit rondom interoperabiliteit. Middels dit interview wensen we een diepgaand begrip te krijgen van de overwegingen die zorgorganisaties maken wanneer zij met interoperabiliteit worden geconfronteerd en om ons initiële raamwerk voor interoperabiliteit te valideren met daarin de voordelen, barrières en uitdagingen die zijn afgeleid van een gestructureerd literatuuronderzoek. Het interview begint met een korte introductie over het onderwerp, de onderzoeksdoelstellingen en -doelen.

Openingsvragen:

De onderzoekers wensen vast te stellen dat de geïnterviewden een juiste doorsnede van de organisatie(s) bevatten.

1. *Wat is uw functie en tot welke afdeling behoort u?*
    - *Informatiemanager transmurale zorg;*
2. *Hoeveel jaar ervaring heeft u in deze functie?*
    - *5 jaar;*
3. *Hoeveel jaar werkervaring heeft u in de zorg?*
    - *19 jaar;*
4. *Wat is uw opleidingsniveau?*
    - *Bachelor;*

Deel een:

Het doel van deze vragen is om via een open discussie inzicht te krijgen in de bekendheid van de geïnterviewden met het onderwerp.

5. *Hoe zou u interoperabiliteit definiëren?*
    - *Het model van Nictiz is daarvoor ontwikkeld als handvat. Interoperabiliteit raakt meerdere lagen zoals infrastructuur, informatie, proces en het beleid wat we met elkaar moeten afspreken. Ik bekijk het onderwerp vanuit de breedte van al deze lagen.*
6. *In hoeverre acht u zichzelf bekend of deskundig met het onderwerp?*
    - *Binnen de organisatie gezien als deskundig op dit onderwerp.*
7. *In hoeverre acht u uw organisatie als interoperabel? Is er documentatie om dat te ondersteunen?*
    - *Ik denk dat we als Academisch Ziekenhuis daarin een voortrekkersrol hebben en nemen in de regio. Zoals bij de Vipp Inzicht regeling gaan we daar bijna automatisch in mee en proberen we in de voorhoede te acteren. Zijn we er dan, zeker nog niet. We weten ook nog niet welke kant het op gaat en zijn we ook maar 1 van de 75 ziekenhuizen om dit te regelen. (bespreken bericht vanuit Europa in verhouding tot WEGIS). Europese regelgeving gaat uiteindelijk voor op landelijk.*
8. *Wat zijn volgens u de belangrijkste voordelen van interoperabiliteit en kunt u dat toelichten?*
    - *De belofte van technologie, als opgeleid technisch bedrijfskundige, is het een middel om naar oplossingen te zoeken. En als we kijken naar het medisch proces zien we dat dat nu op een manier gaat waarbij technologie een aanjager kan zijn om beter en sneller te kunnen werken. Kwaliteit van zorg kan erdoor worden verbetert, de opgaaf waar we*

allemaal voor staan in de arbeidsvraag (in 2060 zou 1:3 in de zorg moeten werken). We zullen met technologie oplossingen moeten vinden om hier mee om te gaan. Ofwel, reductie van administratieve lasten die nu geschat worden op 45% van de tijd. Voor mij ligt daarin een opgave maar ook in het domein van transmurale zorg, daar zal ik de winst moeten laten zien.

9. *Wat zijn volgens u de belangrijkste barrières en uitdagingen die voortkomen uit interoperabiliteit en kunt u die toelichten?*
    - *Kijkend naar de vijf lagen blijkt het als eerste organisatiebeleid ingewikkeld te zijn. Als regio hebben we de afgelopen jaren flink geïnvesteerd in governance. Op sector niveau zijn de stakeholder gebundeld in samenwerkingsverbanden zoals Conforte, Rijnmond dokters en SRZ. In de afgelopen jaren hebben we daar voor digitaal verwijzen (in mijn rol als programmamanager namens de ziekenhuizen), een stuurgroep voor opgetuigd die sturing geeft aan deze projecten. Als je kijkt naar de processen zoeken we elkaar ook steeds meer op in werkgroepen waarin we aan de slag zijn gegaan met procesvoorbereidingen, toestemmingen. Een belangrijke barrière is om goed met elkaar af te spreken wat we naar elkaar sturen en hoe. Zit daar een verwijsbrief in, wel of geen OK-verslag, contactgegevens van mantelzorgers. Op data niveau, welke technische standaarden gebruiken we met elkaar. Als jullie werken met FHIR en wij nog met CDA of HL7 v2 dan gaat het nooit 'met elkaar praten' en daar hebben we zo onze weg in gevonden. Op applicatieniveau zien we dat we standaardiseren op de applicaties zoals met Point in de gegevensuitwisseling met de VVT. En dan nog infrastructureel, obstakels die deels konden worden weggenomen door te standaardiseren op de applicaties om tot interoperabiliteit te komen.*

Deel twee:

Het doel van de vragen in dit deel is om het initiële raamwerk te valideren en te verfijnen. Wij zijn benieuwd in hoeverre u de stellingen in het raamwerk relevant acht voor uw organisatie/in uw vak en zijn benieuwd naar uw motivatie daarbij. We willen graag iets langer stilstaan bij de niveaus die relevant zijn in uw dagelijks werk. (een kopie van ons raamwerk zal voor dit deel worden gepresenteerd)

10. *Met welke van de acht niveaus in ons raamwerk heeft u in uw werk het meeste te maken (een toelichting op het raamwerk en afleiding van het model vanuit Nictiz wordt hier toegelicht).*
    - *In mijn rol op alle onderdelen van het raamwerk, afhankelijk wat er dan nodig is. In 2018 zijn we met chipsoft gestart met zorgplatform in de applicatie/infrastructuur laag. In 2019 kwam de samenwerking beschikbaar om vervolgens aan de slag te gaan met informatie en proceslaag.. Het is dus wat afhankelijk van de projecten die spelen, hoe rijp is de technologie en daardoor situationeel.*

Organisatiebeleid Voordelen- Samenwerking tussen zorgorganisaties

11. *"Samenwerking tussen zorgorganisaties zal verbeteren wanneer informatie in een open en interoperabele omgeving gedeeld" In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens met de stelling maar daarmee nog niet heel operationeel. We kunnen nu met een aantal instellingen digitaal verwijzen wat direct al zorgt voor een betere samenwerking. Het helpt maar vooraf is vertrouwen nodig om tot samenwerking te komen.*

Organisatiebeleid – barrières en uitdagingen - Reguleren van standaardisatie

12. *"Het is van belang dat op regionaal en nationaal niveau beleid wordt ontwikkeld over het gebruik van standaarden in de zorg om interoperabiliteit van systemen te verzekeren." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

***Zorgproces Voordelen - Klinische Interoperabiliteit**:*

13. *"Het delen van informatie tussen clinici over de grenzen van de organisatie heen zal het leveren van de best mogelijke zorg bevorderen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zonder meer waar. Kwaliteit van zorg komt daarin naar voren. Technologie zou daarin ook volgend moeten zijn.*

Zorgproces Barrières en uitdagingen - Overdracht van zorg

14. *"Tijdens de overdracht van zorg (en informatie) zijn de risico's het grootst. Geschat wordt dat 80% van ernstige medische fouten het gevolg is van miscommunicatie tijdens deze overdrachten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, dan heb je het over de klassieke vorm van overdracht van zorg, daar waar we zien dat we steeds meer overgaan naar netwerkzorg waarbij een client voor verschillende zorg en behandelvragen bij verschillende instellingen in zorg is.*

Zorgproces Barrières en uitdagingen - Arts- patiënt relatie

15. *"De verschuiving naar EMR en interoperabiliteit kan een bedreiging vormen voor de arts-patiëntrelatie en een administratieve last zijn voor het zorgstelsel." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Nee, deze onderschrijf ik niet. Het is een uitdaging dat men 45% kwijt is aan administratie maar hoeft niet direct de relatie te schaden.*

Informatie Voordelen - Semantische Interoperabiliteit

16. *"Semantische interoperabiliteit zorgt voor zinvol en betrouwbaar gebruik van informatie die uit andere systemen wordt ontvangen ten behoeve van de gezondheid van patiënten door een betere gegevenskwaliteit en consistentie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ik heb er wat moeite mee omdat het weinig concreet en tastbaar is. Er is altijd veel over te doen maar heb er in de praktijk weinig last van gehad. Tot op heden in transmurale uitwisseling is het prettig als het in standaarden wordt uitgewisseld maar is de zorgmedewerker al blij als het ongestructureerd binnenkomt. Dus ja, zeker zinvol maar zit in volwassenheidsniveau 3-4-5 in de ontwikkeling.*

Informatie Voordelen - Patiënt participatie

17. *"Patiënten zullen meer betrokken zijn bij hun gezondheid wanneer zij toegang hebben tot hun eigen patiëntendossier (PHR)." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Voor bepaalde groepen is dat zeker relevant.*

Informatie Barrières en uitdagingen - Non-standard formats

18. *"Het delen van gegevens in niet-standaard formaten kan veel tijd kosten om te begrijpen en kan leiden tot interpretatiefouten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*

- *Oneens. Dit is geen causaal verband. Het digitaal uitwisselen van ongestructureerde medische gegevens zou de zorg ook al verbeteren. Het ontvangen van informatie gaat voor aan de standaard waarin.*

Informatie Barrières en uitdagingen - Ontwikkelen en onderhouden van standaarden

19. *"Het ontwikkelen en onderhouden van standaarden vereist een fundamenteel begrip van de beschikbare informatie. Zonder wet- en regelgeving zal het buitengewoon moeilijk zijn om zorgorganisatie op één lijn te brengen bij het kiezen en gebruiken van dezelfde standaarden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, moet wel duidelijk zijn waar we het met elkaar over hebben.*

Informatie Barrières en uitdagingen - Concurrerende industrie

20. *"HIT-aanbieders werken in een competitieve industrie, wat samenwerking tussen deze aanbieders uitdagend maakt." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, maakt het uitdagend. Het is niet per definitie zo dat ze niet met elkaar willen samenwerken, zoals te zien rondom NUTS. Vooral een vraagstuk van capaciteit en inzet ook bij leveranciers..*

Applicatie Voordelen - Syntactische interoperabiliteit

21. *"Syntactische interoperabiliteit standaarden maken het delen van gegevens via de technische interoperabiliteitsinfrastructuur mogelijk." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zeker*

Applicatie Barrières en uitdagingen – Non-standard EHR's

22. *"Veel zorgorganisaties hebben verschillende EPD-systemen met verschillende (syntactische) standaarden in gebruik." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Er is weinig verscheidenheid in het aantal EPD's . Op dit moment Chipsoft, Epic, en een klein beetje Nexus en Siemens-SAP. Wat er in de bestuurskamers werd verkocht was dat er geen problemen zouden zijn met de uitwisseling tussen ziekenhuizen die van hetzelfde EPD gebruik maken. Desondanks, toch nog steeds een punt van zorg gebleken (..)*

Applicatie Barrières en uitdagingen – Data silos

23. *"Het merendeel van alle zorgdata staat nog immer in datasilo's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, kun je wel stellen.*

IT infrastructuur Voordelen – Technische interoperabiliteit

24. *"Dankzij technische interoperabiliteit standaarden kunnen gegevens over een infrastructuur tussen twee systemen worden verplaatst." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, volledig mee eens.*

IT Infrastructuur Barrières en uitdagingen – Complexiteit van de infrastructuur

25. *"Infrastructuurontwikkelingen zijn kostbaar en complex. Voor het succes van interoperabiliteit is brede acceptatie nodig van deze platformen zodat organisaties bereid zijn hiermee te werken." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*

- *Ja, eens*

Beveiliging Voordelen – Eigendom van de gegevens van de patiënt

26. *"Wanneer patiënten (meer) eigenaar worden van hun gezondheidsdossiers, kunnen ze hun gezondheidsgegevens beter beheren en keuzes maken in het verlenen van toegang aan derden." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Daar zitten wel wat aannames in.. uiteindelijk is dit een waarheid als een koe. Als ze het kunnen beheren, kunnen ze ook toegang verlenen. Als zorgverleners zouden we echter niet afhankelijk mogen zijn van de toegang die patienten hebben ingesteld omdat dit de kwaliteit van zorg in gevaar kan brengen. Sommige collega's zitten wel op de leest dat cliënten dit mogen bepalen maar als SEH's geen toegang hebben tot informatie is dat wel een ding. Er is daarin een parallel met een reanimatieverklaring.*

Beveiliging Barrières en uitdagingen – Authenticatie en Identificatie

27. *"Zorgorganisaties en individuen moeten zorgvuldig worden geauthentiseerd en geïdentificeerd voordat ze toegang krijgen tot medische informatie." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Beveiliging Barrières en uitdagingen – Patiënten vertrouwen

28. *"Om schade aan de arts-patiëntrelatie te voorkomen, moeten er standaarden voor het delen van informatie zijn." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, eens.*

Beveiliging Barrières en uitdagingen – Arts vertrouwen

29. *"Artsen moeten erop kunnen vertrouwen dat hun informatie up-to-date is, zelfs als de update elders heeft plaatsgevonden. Zorgen over privacy en veiligheid lijken een negatieve invloed te hebben op de implementatie van EPD's." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, zondermeer waar.*

Wet- en regelgeving Voordelen – Besluitvorming rechtvaardigen

30. *"De goedkeuring van standaarden ondersteunt het wettige gebruik van het elektronische patiëntendossier en een betere rechtvaardiging van de besluitvorming in de gezondheidszorg." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Eens.*

Wet- en regelgeving Barrières en uitdagingen – Toegankelijkheid en eigendom

31. *"Het delen van medische informatie in cloudoplossingen brengt juridische problemen met zich mee over toegankelijkheid en eigendom." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Nee, hoeft niet per definitie waar te zijn. Daar maak je afspraken over met elkaar. Een cloudoplossing is een middel maar er komen ook andere aspecten bij kijken. Het delen van informatie on premise levert ook juridische vraagstukken op. Dat dat problemen zijn, ben ik het niet mee eens. Dat men daar mogelijk onvoldoende kennis van heeft maakt misschien wel dat het wordt geproblematiseerd.*

Kosten Voordelen – Verwachte besparingen

32. *"Kostenbesparingen worden verwacht wanneer (semantische) standaarden worden gebruikt, behandelaars hetzelfde EPD gebruiken en er een eenmalige invoer van gegevens is, waardoor herhaald werk (overtypen) wordt voorkomen." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Zeker.*

Kosten Barrières en uitdagingen – Hoge initiële kosten

33. *"Zorgorganisaties zijn terughoudend zich te committeren aan een implementatie van Interoperabiliteit vanwege de initiële kosten." In hoeverre acht u deze stelling relevant voor uw organisatie en waarom, graag motiveren?*
    - *Ja, en vlak de structurele kosten niet uit.*

Deel drie:

Het doel van deze vragen is om inzicht te krijgen in de algemene indruk van ons raamwerk en om de mogelijkheid te geven ontbrekende elementen in het raamwerk en elementen daarbinnen aan te wijzen.

34. *Wat is uw algemene indruk, gelet op ons raamwerk en de aspecten die in de literatuur zijn gevonden? Graag uw motivatie.*
    - *Ik denk dat het zo behoorlijk compleet is. Door het uitwerken langs het vijflagen model gewoon heel goed gedaan. Zo raak je alle punten van het onderwerp aan. Dat maakt het bruikbaar. (zou er nog een aparte laag moeten zijn voor governance of de patiënt?) We hebben daar in het verleden wel uitgebreid over gesproken maar het op dit model gehouden. Er zijn verschillende aspecten die altijd terugkomen. Om het als aparte laag op te nemen voegt het denk ik niets toe. Wat mogen de praatclubjes kosten..? maar wel degelijk van belang om in de gaten te houden. Ook een aparte kosten laag zou ik niet voor pleiten. Governance zit eigenlijk ook wel met zoveel worden in de beleid laag.*
35. *In hoeverre acht u de acht niveaus in het initiële kader voldoende; wat is het bruikbaarheid? Graag uw motivatie.*
36. *Zijn er ontbrekende voordelen, barrières en uitdagingen die we volgens u moeten overwegen toe te voegen aan ons raamwerk?*

Deel vier:

Het doel van deze vragen is inzicht te krijgen hoe zorgorganisaties omgaan met de aspecten uit ons raamwerk bij het implementeren van interoperabiliteit.

37. *Hoe beïnvloeden de voordelen van interoperabiliteit de implementatie van interoperabiliteit in uw organisatie?*
38. *Hoe beïnvloeden de barrières en uitdagingen de implementatie van interoperabiliteit in uw organisatie? Motiveer alstublieft.*
39. *In hoeverre beïnvloeden deze aspecten de besluitvorming in uw organisatie?*
    - *Het moet een model zijn dat je ter hand kunt nemen om te toetsen of je volledig bent. Als model is het een prima uitwerking. Ja, de vraag is of het tot referentie te verheffen is. Zou je allicht een artikel van kunnen maken of het ook bruikbaar is.*
40. *Rangschik aub de voordelen, barrières en uitdagingen in de onderstaande tabellen van 1-5. Waarbij 5 het grootste voordeel of uitdaging is en 1 een laag voordeel of uitdaging.*
    - *(Uitwerking van alle scores komt in een gezamenlijke tabel)*
41. *Is er iets waar u nog op wenst terug te komen?*
    - *Praten nog even door over Vipp Inzicht en moment waarop organisaties aansluiten.*

Appendix E Data Extraction and Analysis (English)

E1 Analysis Interview 1

Question	Answer
○ *01 Wat is your position?*	ICT team leader, ICT department
○ *02 How many years of experience in this position?*	2 years
○ *03 How many years in Healthcare?*	2 years
○ *04 What is your education level?*	HBO
○ *05. How would you define Interoperability*	Applications that are able to communicate securely with other applications without human intervention. Known from Zorgmail.
○ 06. Are you familiar with Interoperability?	Not an expert but within the organization above average knowledge. There is still room for improvement in my role.
○ 07. How is the organizational maturity on Interop.?	Difficult to estimate, I can only say something about the applications that fall under the management of ICT and less so with regard to the applications that fall under Information Management or are outside the organization. Our organization as a whole; difficult to determine to what extent it is interoperable.
○ 08. Your view on the main benefits?	Biggest advantages is that despite different systems, employees will still have the same information at their disposal without re-entering. This saves time.
○ 09. Your view on the main barriers and challenges	Barriers in knowledge and information how systems 'talk' to each other. The budget to realize this change is sometimes difficult to find. We depend on external suppliers to establish 'links' where we are responsible for the transfer of information.
○ 10. What is your stakeholder level?	In particular the IT infrastructure and the application layer;

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Yes, agree.	a) Yes, this is relevant.	Positive	2	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	Yes, sounds like a **condition** that must be there. The challenge will be what freedom an organizations has when standards are made 'mandatory'. We can see this (not) happening with the NEN standard, for example.	a) Yes, this is relevant.	Positive		Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, sounds logical.	a) Yes, this is relevant.	Positive	3	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	Yes, **that's a huge risk**. Heard it regularly around Covid that clients came in infected and that the transfer information did not follow until later.	a) Yes, this is relevant.	Positive		Yes
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	Yes, agree.	a) Yes, this is relevant.	Positive	5	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, agree. It sounds obvious that this is an important advantage.	a) Yes, this is relevant.	Positive	4	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	Yes, I can understand that. We have an PHR in which clients can read along. However, **this also raises additional questions whether clients can understand their PHR because of the specific language that healthcare workers use.** It is important to make good agreements about how information is recorded for the understanding of clients;	a) Yes, this is relevant.	Positive		Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Yes, exactly what I just said	a) Yes, this is relevant.	Positive	1	No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Yes, this harks back to the organizational policy level and the challenges mentioned there. **If no standards are set at a national level and organizations have the freedom to implement them in their own way, this will be at the expense of the success of interoperability.** I see a vicious circle in this. When organizations are held to comply with standards, this presents challenges in all kinds of areas, while designing standards is not a core business.	a) Yes, this is relevant.	Positive		Yes
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, you want to maintain a national standard against a commercial party. That is indeed challenging.	a) Yes, this is relevant.	Positive		No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, once again we see, for example, ONS that it is indicated in advance that they have connectors available to connect with other applications.	a) Yes, this is relevant.	Positive		No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Yes, understandable.	a) Yes, this is relevant.	Positive		No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, here too	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	**Yes, that would be in the short term. I do wonder whether standards could in the long run ensure that costs are reduced**. In the short term, the costs are certainly high. We now also see that conversions and connectors are expensive when you are at the forefront, and ensures that healthcare organizations across the board adopt a wait-and-see attitude. In addition, there is the risk that organizations will stick to existing solutions and that new/better solutions will have few opportunities.	b) Yes, some relevance, but.	Positive	3	Yes
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	yes, agree	a) Yes, this is relevant.	Positive		No
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Yes, agree. Already a challenge for ourselves. Not so much for us in technology, but for organizing.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, logically and agree.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Agree here too. In addition to concerns about privacy, sometimes there is also a lack of knowledge of what can be recorded and when. Another security point is already what information employees are allowed to see. When there is only 1 source, it becomes challenging who can access the information if there is no treatment relationship yet. How to ensure that access is only available when it is actually a patient of the practitioner.	a) Yes, this is relevant.	Positive		No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	yes, agree	a) Yes, this is relevant.	Positive	1	No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	**I think we should work towards more substantive ownership of the patient himself.** It is his/her data, but security is difficult for patients themselves.	b) Yes, some relevance, but.	Positive		Yes
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Yes, which we started with.	a) Yes, this is relevant.	Positive	5	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, agree.	a) Yes, this is relevant.	Positive	2	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	The propositions are plausible and logical as benefits and barriers & challenges.	No
○ *35. Are the eight levels in the initial framework sufficient?*	This covers the subject.	No
○ *36. Any missing Benefits, barriers & challenges?*	No, not specifically. In my opinion, another challenge that I see still lies in current legislation and regulations about access to data, for example, while there are still no agreements about how to gain access. **A general concern from ICT is if this data has to be hosted somewhere, the government also has a role to organize this properly; and government and ICT often do not go well together.** Not the fastest organ. The downside of leaving it to Big Tech is even more worrisome because people are often insufficiently aware of what they already share with big companies. For example through health apps. The question is when Apple or Meta will offer software and can already create a profile and share it with a health insurer. It will be difficult to influence as a patient in the long term and I hope that the risk will eventually fall below 80%. And how vulnerable it is if it is in one place and cannot be reached.	Yes
○ *37. Do these benefits influence implementation?*	It helps to know what benefits there are. To start with, **whether the benefits outweigh the costs**. Cost advantages will be an important factor, while working more efficiently also yields savings, but for the time being very difficult to map. What I would be afraid of is if the savings would be sought in personnel deployment.	Yes
○ *38. Do these barriers & challenges influence implementation?*	In the two years that I have been working here, I have the impression that costs are the decisive factor.	No
○ *39. Do these aspects Influence decision making?*	I fear that primary costs weigh the heaviest. I see this reflected in matters that are required by regulations and yet are given a lower priority in the budget.	No

E2 Analysis Interview 2

Question	Answer
○ *01 Wat is your position?*	Functional manager ECD, information management department;
○ *02 How many years of experience in this position?*	6 years
○ *03 How many years in Healthcare?*	13 years
○ *04 What is your education level?*	MBO
○ *05. How would you define Interoperability*	Exchanging data between organizations and their applications.
○ *06. Are you familiar with Interoperability?*	Familiar with the functional side of the subject but less so with the technology behind it.
○ *07. How is the organizational maturity on Interop.?*	No, this is limited. It seems that other types of organizations are farther along in this regard. We are more concerned with receiving information; sending is still very limited.
○ *08. Your view on the main benefits?*	Less error-prone and an administrative burden reduction.
○ *09. Your view on the main barriers and challenges*	Awareness within the organization of the importance of this topic and what we can gain from it. .. where the operation now mainly experiences the bottlenecks in the current working method.
○ *10. What is your stakeholder level?*	Care process, Information and application layer.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Partly, the expectation is there, but at an operational level there does not have to be cooperation when data is shared, eg lab results. Data exchange can work well but does not have to lead to better collaboration. With hospitals, that can be the case again when we all look at the same data.	b) Yes, some relevance, but.	Positive	2	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	100% agree. It should be noted here that internal exchange can also be a challenge, for example due to the use of different plan systems that are not interchangeable.	a) Yes, this is relevant.	Positive		No
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	Yes, agree.	a) Yes, this is relevant.	Positive		No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	Can't say that it can be an administrative burden. **Healthcare (elderly) is now hardly involved in this during work,** so that I wonder whether that would be the case with interoperability. Retyping in particular creates an administrative burden. A doctor can explain this better in his/her relationship.	c) No, only little relevance.	Negative		Yes

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, nothting to add.	a) Yes, this is relevant.	Positive	5	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Yes, and in the context of elderly care even more family participation.**	b) Yes, some relevance, but.	Positive	3	Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Correct.	a) Yes, this is relevant.	Positive	2	No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	**Yes, this might well be the most difficult part of the whole subject.** We see at NNN that we have one version in use while the next one is already available. How do we deal with our current goals when science says they are already outdated?	a) Yes, this is relevant.	Positive		Yes
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Agreed	a) Yes, this is relevant.	Positive		No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	yes, agree	a) Yes, this is relevant.	Positive		No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Recognizable.	a) Yes, this is relevant.	Positive	1	No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, recognizable. In the training, we show employees how our systems work, but at the moment we do little with all the information that is now available. We collect a lot of information from clients but then do little with it. Also in the applications there is little available for analysis purposes.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, agree.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, agree. Care organizations are hardly involved in this, the willingness to invest time and money in a subject that they do not deal with on a daily basis.	a) Yes, this is relevant.	Positive	4	No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Agreed.	a) Yes, this is relevant.	Positive	1	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	That's right.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, agree.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Correct.	a) Yes, this is relevant.	Positive	3	No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	**Yes… (doubt about the complex nature of the description)**	b) Yes, some relevance, but.	Positive		Yes
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Agree	a) Yes, this is relevant.	Positive		No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	yes, agree	a) Yes, this is relevant.	Positive		No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Agree, it is unclear how high the administrative burden is based on the transfer of data and how does the time of employees relate to the effort required for interoperability?	a) Yes, this is relevant.	Positive	5	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	I think it's pretty complete**. I wonder what a healthcare employee really gains from all that healthcare data. We say it's an advantage, but that's what the literature shows.** I think it is also important to make **that measurable in order to demonstrate that interoperability really adds value**. SMART insight into, for example, the time savings could be helpful.	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	Clear like that.	No
○ *36. Any missing Benefits, barriers & challenges?*	See question 34.	No
○ *37. Do these benefits influence implementation?*	That could certainly have a major impact. It is now a bit of a black box for those who make the decisions. This is not entirely certain; healthcare workers know that they have a high administrative burden. The pain of this is felt, but there is a lack of an overview of these benefits.	No
○ *38. Do these barriers & challenges influence implementation?*	At the organizational level, it is mainly **in the costs** and yet also in the costs involved. We have less influence on standards.	Yes
○ *39. Do these aspects Influence decision making?*	See 37 and 38	No

E3 Analysis Interview 3

Question	Answer
○ *01 Wat is your position?*	Medical, paramedical and psychosocial manager
○ *02 How many years of experience in this position?*	10 years
○ *03 How many years in Healthcare?*	30 years
○ *04 What is your education level?*	HBO
○ *05. How would you define Interoperability*	Difficult subject, mainly has to do with information exchange between systems.
○ 06. Are you familiar with Interoperability?	Known as user.
○ 07. How is the organizational maturity on Interop.?	Only in the medical field of Point and Zorgdomein. Nothing is read directly into our ECD yet;
○ 08. Your view on the main benefits?	That we can access other systems from our EPD instead of logging in to different applications. The advantage is to be able to continue working in 1 system and not have to use multiple methods. This promotes speed and quality.
○ 09. Your view on the main barriers and challenges	The question for the organization is whether we really want it and whether we have the knowledge to set up such a thing. It starts with the will to make it as easy as possible for employees to work with one system. ...
○ 10. What is your stakeholder level?	Organizational policy as a manager and care process and information as a physiotherapist.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Yes, otherwise you will get extra actions to retrieve information.	a) Yes, this is relevant.	Positive	4	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	**That is correct and that is probably why the national EPD has probably not been established.**	a) Yes, this is relevant.	Positive	3	Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	yes, agree	a) Yes, this is relevant.	Positive	5	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	Also true.	a) Yes, this is relevant.	Positive	5	No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	That's possible, but we have to talk about that. Capturing the risk of overshooting in everything. Doctor: “I have more ink on my hands than blood”.	b) Yes, some relevance, but.	Positive	4	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, that makes sense to me. Doesn't just apply in the digital world.	a) Yes, this is relevant.	Positive	2	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	Totally agree.	a) Yes, this is relevant.	Positive	3	No
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	A free text field has no predetermined purpose and then the reader can interpret it differently than the writer intended and you do not want that.	a) Yes, this is relevant.	Positive		No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Yes, I think that that is true and you should do that continuously to prevent empty fields from being communicated. It is therefore also difficult when hospitals work with all kinds of different systems.	a) Yes, this is relevant.	Positive		No
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, it is and does not help.	a) Yes, this is relevant.	Positive		No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, agree.	a) Yes, this is relevant.	Positive		No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	That's right, just talked about it, they should have persevered in 2011.	a) Yes, this is relevant.	Positive	2	No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, agree.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Agreed	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	**By reducing the differences between the systems, I assume that the infrastructure can also be simplified.** If there will be only a few EPDs in the future, fewer data centres may be needed.	b) Yes, some relevance, but.	Positive		Yes
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Yes, in some EMR patients can already put together their own treatment team.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	A treatment relationship is conditional, but sometimes this is only clear at the last minute, for example with a new employee or temporary worker. Giving a client a role in this could help. In that case, a way out is necessary for acute situations.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Totally agree.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, it is important that the information is up to date. That applies to all disciplines. It is about good, current and timely information. When the client comes through the swinging door, all information must be available.	a) Yes, this is relevant.	Positive	1	No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes, agree.	a) Yes, this is relevant.	Positive		No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Certainly true. We are jointly responsible for having good agreements in the healtcare chain and incorporating certainties to prevent loss of data.	a) Yes, this is relevant.	Positive		No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Yes, absolutely true.	a) Yes, this is relevant.	Positive	1	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	I think they (Management) don't know. I think that it's now no more than a feeling because otherwise we would sooner say yes to a subsidy such as VIPP Inzicht. But when no one has calculated this and made it concrete, it becomes more difficult to make decisions about it**. If it had been clear how much it could have yielded, there would probably have been a different choice**. Now (probably) chosen to postpone it out of ignorance of the cost.	a) Yes, this is relevant.	Positive		Yes

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	Personally, I agree that these systems must be linked together with all security measures, but that it is still too abstract to convince organizations to do something with them in the short term. **It is important to submit more hard data, preferably in euros, if they want to work with this in the hectic schedule of their agenda**. **Or, let us know what keeps going wrong. In the case of medication transfer, for example, this is huge with a wrong or missing transfer. And yet so far that hasn't been enough to solve it**.	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	Not the idea that I'm missing one, but maybe not enough knowledge.	No
○ *36. Any missing Benefits, barriers & challenges?*	No.	No

○ *37. Do these benefits influence implementation?*	Following the discussions**, I think we are almost paralyzed by the multiplicity of systems**. Even in our (small) region we work with different systems for the same purpose, which does not help to invest in this. Although we do see that a system like Point does work, although this is still a system in the middle and we do see the advantage of that. The landscape is still so fragmented and complex to put it on the agenda?	Yes
○ *38. Do these barriers & challenges influence implementation?*	I don't hear much about challenges that could help employees, but **when it comes to information security, people immediately get nervous**. Working more efficiently, I don't hear much about completeness. Still too much fear driven.	Yes
○ *39. Do these aspects Influence decision making?*	See 37 and 38.	No

E4 Analysis Interview 4

Question	Answer
○ *01 Wat is your position?*	Care Administration Coordinator, Declaration of the Information Management Department
○ *02 How many years of experience in this position?*	10 years
○ *03 How many years in Healthcare?*	10 years
○ *04 What is your education level?*	HBO
○ *05. How would you define Interoperability*	I find it a difficult subject, but I think it mainly has to do with the availability and sharing of information between different parties in a healthcare chain.
○ 06. Are you familiar with Interoperability?	Somewhat because we also share information with others in the healthcare chain within the administration.
○ 07. How is the organizational maturity on Interop.?	In its infancy.
○ 08. Your view on the main benefits?	It can support the primary process when the right information is available in the right place at the right time. This will also apply to the administrative departments that support this.
○ 09. Your view on the main barriers and challenges	The main challenge lies in technology and making agreements about sharing information within the healthcare domain.
○ 10. What is your stakeholder level?	In particular the Application and Information layer, sometimes also legislation and regulations, but is more about other topics.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Agreed	a) Yes, this is relevant.	Positive	4	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	Yes, agree.	a) Yes, this is relevant.	Positive		No
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Also agree.	a) Yes, this is relevant.	Positive	5	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	This also applies to business operations and administration. Seems like a real barrier to me.	a) Yes, this is relevant.	Positive		No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	I do believe that this is something to be aware of so that there is a balance in the contact between doctor and patient.	a) Yes, this is relevant.	Positive		No
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, of course	a) Yes, this is relevant.	Positive	1	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Yes, I wonder if everyone needs it. Some will have a greater need to hear from a doctor or specialist what is going on**; they won't look in their file. Could be partly an advantage.	b) Yes, some relevance, but.	Positive	3	Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Yes, of course.	a) Yes, this is relevant.	Positive		No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Yes, that's one of the bigger challenges I expect.	a) Yes, this is relevant.	Positive	5	No
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, that's certainly an important part of why we're not there yet. There are too many different interests for that.	a) Yes, this is relevant.	Positive	1	No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	This is of course very important and **conditional** to be able to share data.	a) Yes, this is relevant.	Positive		Yes
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Sure!	a) Yes, this is relevant.	Positive	4	No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, agree.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, there is indeed a difficulty because we can only spend money once. Joining that chain at the right time is very important.	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Yes, for the most part it is.	a) Yes, this is relevant.	Positive		No
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Yes, of course.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, it is important that good agreements are made about granting permission and sharing information.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, of course. There is always a risk, but this also applies to sharing in our own organization. The basic principle must be that information is correct and reliable.	a) Yes, this is relevant.	Positive	3	No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes, rightly so.	a) Yes, this is relevant.	Positive		No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Yes, agree. Ownership threatens to become more mixed up so this is a relevant aspect.	a) Yes, this is relevant.	Positive		No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Secure.	a) Yes, this is relevant.	Positive	2	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, don't just think of a cost aspect, but certainly play's a part in the consideration.	b) Yes, some relevance, but.	Positive	2	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	**The general impression of the framework is that when interoperability is set up properly it can yield many benefits, but that there are also many variables and it is very complicated to implement this in a healthcare chain in which so many parties play a role.** There are many aspects, such as legal and financial, but also that healthcare is a special market that is **financed from public funds, but also the role that insurers play**. From a healthcare perspective, I understand very well that there is a need for a model and that information is always shared and available in the right way, but in practice I think there is still a very long way to go to get that right. **The tricky part is that the government should play a central role in this, but there are changes every four years, which sometimes means that different (policy) choices are made. This subject requires much longer thinking and a market that is also accessible**. So not a system and infrastructure that becomes so complex that entry becomes almost impossible. It is a complicated and complex issue. **("Would this framework help with the complexity?") Sure, one of the first steps should be to know what elements are there. Seeing this makes me realize even more how complex it is and how many variables there are that come into play and have to come together somewhere.** It does help if there are subsidy programs, although they are still very similar to 'trial balloons', it does eventually help to get things moving. Gain experience of what we encounter and how it works in the chain. Furthermore, the technology is also developing at lightning speed and new solutions such as AI are emerging from that corner, which could play a role.	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	I'm not missing anything now..	No
○ *36. Any missing Benefits, barriers & challenges?*	Especially the technology and infrastructure that are important and where we cannot look ahead well at the moment, may well become a 'game changer' in the model and the approach. Developments in technology and care (new treatment methods) seem to me to be a big job to put into the model and to think very far ahead. **New methods and processes in healthcare must be able to be quickly incorporated into these models and I see them as a risk to the success of this process.**	Yes
○ *37. Do these benefits influence implementation?*	**Decision-making is often mainly a cost-benefit story, but the most important thing is how this could improve the care process**. It is important for employees and the organization to be part of a chain and to gain a 'commercial' advantage in this. ("Are we sufficiently aware of the benefits?") I think that many decisions are not always made on the basis of content, but unfortunately are sometimes also taken into account based on emotion and politics. I think it is important that the decision-makers also take responsibility for diving into the content. It must also yield something in the process and will be able to yield a lot, especially for care and for that reason it is good to have that part very clear.	Yes

○ *38. Do these barriers & challenges influence implementation?*	They are all recognizable and rightly so. **In practice we have to do with all kinds of short-term business goals and money that we can only spend once and then perhaps prefer real estate to a new server**. I think it requires a long-term vision that I now see limited within government and companies, which makes it very difficult. As an organisation, we can participate in subsidy processes, but the benefits are still difficult to make clear and perhaps even marginal. And the question is whether it remains standing after such a trajectory or whether it is a loose stone that remains.	Yes
○ *39. Do these aspects Influence decision making?*	See 37 and 38.	No

E5 Analysis Interview 5

Question	Answer
○ *01 Wat is your position?*	Acting general practitioner for two years and previously in practice for 25 years.
○ *02 How many years of experience in this position?*	27 years
○ *03 How many years in Healthcare?*	35 years
○ *04 What is your education level?*	Academic
○ *05. How would you define Interoperability*	The exchange of data between specialists, hospitals, mental healthcare, nursing homes, pharmacy and laboratory. In other words, all parties in the healthcare chain.
○ 06. Are you familiar with Interoperability?	Not a very well-known subject for me. But, in my line of work I am involved in data exchange, for example via Zorgdomein
○ 07. How is the organizational maturity on Interop.?	They are all familiar with that as users and work with those structures;
○ 08. Your view on the main benefits?	That we will receive the information on our computer and can put it directly in the patient's file. Easily receive data, send documents and that we will have an insight into a relevant parts of the EMR that is important as another healthcare provider.
○ 09. Your view on the main barriers and challenges	With the LSP, patients have to be asked if they want to participate and motivate them and that takes time. Doesn't have to be a barrier immediately, but something has to be organized for it.
○ 10. What is your stakeholder level?	A care group of general practitioners is concerned with organizational policy. The care processes and information layer have the most to do with general practitioners, but agreements about this are usually made via a care group. Some GPs are smart in managing applications themselves or employ administrators for this, sometimes also through a care group. For the IT infrastructure we call Promedico (helpdesk). As a group of GPs, we do have to deal with the costs, for example for the choice of a HIS.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	I think that is in principle true, but we have to watch out for the privacy of patients.	b) Yes, some relevance, but.	Positive	2	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	It seems more like a **condition** to me. In any case, it is a challenge.	a) Yes, this is relevant.	Positive		Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes I think so.	a) Yes, this is relevant.	Positive	4	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	No idea if that is the case (percentage), but I can imagine that you have to listen carefully, it is sometimes not or not well written on paper, things are then done twice or not properly. I can well imagine that.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	**We also have to record more and more**. We used to know everything by heart, but that is no longer the case, there is no other way. **It is necessary, often for legal reasons**. During the consultation I do write something but explain that to the patient but especially try to record it after the consultation.	b) Yes, some relevance, but.	Positive		Yes
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, in principle it is.	a) Yes, this is relevant.	Positive	1	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	Yes, I think so too. I see people doing that too, interested in their file.	a) Yes, this is relevant.	Positive	3	No
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Yes, I think so too.	a) Yes, this is relevant.	Positive	5	No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Yes, you do need a standardization.	a) Yes, this is relevant.	Positive	4	No
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, it's a challenge, for sure.	a) Yes, this is relevant.	Positive	3	No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, I think so.	a) Yes, this is relevant.	Positive		No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Yes, hopeless. For example, this is already the case with a HIS such as Promedico, Medicom and CGM and depending on where I work, there can be different systems. And unfortunately they still don't 'talk' to each other.	a) Yes, this is relevant.	Positive	2	No
	Data silos	The majority of the data continue to be confined in data silos.	That's true. When GPs are affiliated with Promedico, everything is in the cloud. When you use Promedico, it's all the same for all practices, I thought. All GPs who have CGM also have the same picture.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, that would be nice.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, because that is of course not always the case that everyone accepts that.	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	**Yes I think so. Doesn't apply to everyone, but on average I think that's true.**	a) Yes, this is relevant.	Positive		Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Yes, that will eventually be an advantage. It also demands what to do with logins and passwords that have to be changed every time. This also includes an Uzi pass.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, agree.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, agree.	a) Yes, this is relevant.	Positive		No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes I think.	a) Yes, this is relevant.	Positive	5	No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Yes, I understand.	a) Yes, this is relevant.	Positive	1	No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Well, I certainly think so, because that saves a lot of time.	a) Yes, this is relevant.	Positive		No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, agree.	a) Yes, this is relevant.	Positive		No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	Very recognizable. **If you want to implement these kinds of things, there must also be room for it. Not only financially (you can of course also hire people), but in smaller organizations there are often so many issues that this leads to a shortage of time** and where do you get someone who can do that. People with vision who are sometimes able to pick up where the hard workers are already struggling and it comes back 'again'. Not only money but also vision plays a role that you should try to mobilize.	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	Difficult question. What I just said always plays a role. It is clear that it is useful, but how do you do it? It is also special that in a relatively large organization where you work, there is still insufficient capacity for this. While in a small practice I worked in we encountered that constantly. Very useful initiatives, but where do we find	No

	the time to organize it all? Then I notice that people with vision can step over that and say with a lot of energy "come, let's see how we can do this". Those people are really needed. In addition to sufficient money, you also need those people.	
○ *36. Any missing Benefits, barriers & challenges?*	No, not directly.	No
○ *37. Do these benefits influence implementation?*	Also, at the level where that sort of thing has to be organised**. In a small practice I certainly think that helps and if legislation and regulations indicate that it 'must', that will help.** With the VIPP Open process it was said that it had to be done and that was a sufficient incentive to get started. **Without any regulatory demand, it sometimes turns out to be a very long process.**	Yes
○ *38. Do these barriers & challenges influence implementation?*	Yes I think so. Picking them up can also transform them back into benefits.	No
○ *39. Do these aspects Influence decision making?*	See 37 and 38.	No

E6 Analysis Interview 6

Question	Answer
○ *01 Wat is your position?*	Specialist geriatric medicine
○ *02 How many years of experience in this position?*	17 years
○ *03 How many years in Healthcare?*	17 years
○ *04 What is your education level?*	Academic
○ *05. How would you define Interoperability*	A word that is fairly new to me, but which I can think of all kinds of things. It's about working together. Operability is working and inter what happens between people in the collaboration.
○ 06. Are you familiar with Interoperability?	In a previous position I worked as an engineer at Unilever and helped set up a World sales database that already dealt with the complexity of data exchange between different countries; a form of intra-operability. However, also in this organization we have worked closely together on the ECD and how data can be loaded into it from other systems.
○ 07. How is the organizational maturity on Interop.?	Still in our infancy, this is partly due to the fact that we switched to fully digital working relatively late compared to other organizations (medical teams). Because we are a relatively small organization, we tend to wait until others have solved this before we step in.
○ 08. Your view on the main benefits?	Huge error reduction and huge time saver when done right. The amount of time I spend, together with the nurses, physio, etc. to find out where a client comes from, from which department and then get hold of them by phone to collect information is enormous.
○ 09. Your view on the main barriers and challenges	In the first place awareness of the possibilities. Decision makers probably have no idea what we're doing and how error-prone retyping is. I think it is also a barrier that healthcare staff are generally not very innovative, from management to the workplace. And thirdly, I do not know whether all systems can be connected to each other. This is especially a barrier with medical data because I still prefer to type, knowing what is entered than dealing with the uncertainty whether what was send was correct or when there is no information, there was actually nothing and not that it didn't get through.
○ 10. What is your stakeholder level?	Care process and information.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Suspect so, wouldn't know why it wouldn't be.	a) Yes, this is relevant.	Positive		No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	Once, no doubt. Would almost remove the regional.	a) Yes, this is relevant.	Positive	4	No
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes! Would still be nice to have a name to discuss.	a) Yes, this is relevant.	Positive	5	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	Yes, although this is not just about whether it is correct but also whether it is complete. With regard to timeliness, you could investigate whether the number of MIC reports decreases when information is available earlier. I do recognize that it is one of the most vulnerable moments.	a) Yes, this is relevant.	Positive	5	No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	**No, I don't think this has so much to do with an EMR or interoperability, but more with control.** Whether you do this on paper or digitally, it takes a lot of time. In that sense, there has been a shift in trust and everything needs to be recorded. Working digitally makes it easier to create another questionnaire to record data. Moreover, in the nursing homes we are walking around all day and do most of the administrative work afterwards (unlike general practitioners). **For us, we spend a lot of time retyping, especially during intake, and if that information were already available, I would only have to read.**	d) No significant relevance.	Negative		Yes
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	**Yes, completely true and at the same time (which you might like not to hear) that won't work because all doctors work in their own field of expertise. People are going to abbreviate in letters and different medical fields will keep their own abbreviations.**	b) Yes, some relevance, but.	Positive	2	Yes
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Yes, we notice that especially family uses the client portal (PHR). I have really seen a clear change in this; sometimes to the detriment but usually to the advantage with greater involvement and reassurance.**	b) Yes, some relevance, but.	Positive		Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Yes absolutely. That does indeed sometimes go wrong, but luckily we can now look up a lot.	a) Yes, this is relevant.	Positive		No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	First of all, I think the word 'law' is wrong here, but I can see that the biggest problem is in the written texts around these standards. **Because there (free text fields) are going to be abbreviation that no laws and regulations could compete with.** I do not recognize this from practice; it would be nice if that would eventually be the case, **but it seems to me a very long way**. Laws and regulations could even have the opposite effect. It will probably remain a challenge for a long time to come.	b) Yes, some relevance, but.	Negative		Yes

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	From what I notice, I think this is correct. Quickly point at each other and work with different versions of the standard. I don't know whether that is due to the competitive industry, it could also be that they are just very bad at working together. I recognize that it is not easy.	b) Yes, some relevance, but.	Positive		No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	A big yes.	a) Yes, this is relevant.	Positive	3	No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Yes absolutely.	a) Yes, this is relevant.	Positive	1	No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, **with a lot of walls around it.**	a) Yes, this is relevant.	Positive		Yes
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, agree.	a) Yes, this is relevant.	Positive	1	No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, and would also mention the time factor in this. When an organization has done something about its infrastructure, they are not ready for the coming years if others also undergo development during that period. Coordination in this regard is therefore also important between organisations.	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	**Yes, I think only a small part will actually do this and the majority shrug**. What I find complicated is that I sometimes need access to a file during a shift, while the patient does not know or recognize my name when it is looked up (eg in the LSP). Then it may seem like sniffing, but it is indeed justified use.	b) Yes, some relevance, but.	Positive		Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	**Yes, but in a way that continues to work without too many obstacles**. Development in collaboration with employees to prevent it from inciting undesirable behaviour because of the obstacles.	a) Yes, this is relevant.	Positive		Yes
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	yes, agree	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	The first sentence is clear with the addition that I also like to receive a signal when new information has been added to the file. **The other, that if there is nothing, there really is no information.** The second sentence is a bit unclear to me in relation to the first. When it comes to trust in other doctors that they handle confidential information in the same way and do not share it with, for example, the food service, or recognizable.	b) Yes, some relevance, but.	Positive	2	Yes
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	The first part of the sentence yes. The second part of the sentence raises questions about the justification of the decision-making process. **It's not so much that it's not right, but the words are a bit large in proportion.**	c) No, only little relevance.	Negative		Yes
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	**It doesn't matter to me whether it is in the Cloud, but whether it is recorded and who has had access.** Intuitively, a cloud solution seems even better than direct communication to the EHR of other providers.	b) Yes, some relevance, but.	Positive		Yes
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	**Yes, of course! And that doesn't even include the costs of repairing (almost) errors.**	a) Yes, this is relevant.	Positive	4	Yes
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, and due to ignorance of the hidden costs. I don't think the MT know how much time I spend retyping and what the costs are.	a) Yes, this is relevant.	Positive	3	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	I think it makes explicit what people think of this topic. **When it's not your job, it helps a lot to separate and organize these topics**. It's about all these facets where some (semantics) would be very nice but probably not going to happen for a while. And even then it is good to map them out and to know the risk. **It helps in raising awareness before we start developing.**	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	I'm not missing one now (discussing possibility of adding Governance)	No
○ *36. Any missing Benefits, barriers & challenges?*	Time and hidden costs. Time, that infrastructure is not only complex, but there is a risk that it will be developed in bits and parts.	No
○ *37. Do these benefits influence implementation?*	It helps to map out the benefits and challenges, but I would avoid a term like semantic interoperability. **A translation is still needed, but unravelling which facets the diamond consists of, I think it could remove a lot of confusion of tongues**. Within our organization and more broadly in healthcare, ICT is seen as scary, but by looking at it in this way, we can also think something about it and a better conversation can be had about it.	Yes
○ *38. Do these barriers & challenges influence implementation?*	See 37.	No
○ *39. Do these aspects Influence decision making?*	If you want to make this operable, **an enormous translation has to be made and further concretization helps**. It would also help to standardize others because I can consult more specifically with IT staff about the parts I want attention to.	Yes

E7 Analysis Interview 7

Question	Answer
○ *01 Wat is your position?*	CISO, part of F&I, but also an independent role in the organization.
○ *02 How many years of experience in this position?*	Started in this position January 1;
○ *03 How many years in Healthcare?*	8 years
○ *04 What is your education level?*	HBO
○ *05. How would you define Interoperability*	Collaboration between healthcare organizations and the benefit from this for clients;
○ 06. Are you familiar with Interoperability?	My director is closely involved in the region and we often have discussions about it. My own expertise is average on the subject but above average in the organization.
○ 07. How is the organizational maturity on Interop.?	I can't say yet because I recently started in this organization.
○ 08. Your view on the main benefits?	From a patients perspective that he/she no longer has to wait and that the care worker can get to work immediately. From a business perspective, data is 'worth gold'.
○ 09. Your view on the main barriers and challenges	Ego, every organization thinks it knows best. The more specific the data, the more important it becomes to make good agreements, so that it can be coordinated in the exchange.
○ 10. What is your stakeholder level?	Information and application indirectly, but especially security and legislation and regulations.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Yes, definitely agree. When a client goes from care organization A to B and B already has sufficient information, it helps enormously.	a) Yes, this is relevant.	Positive	5	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	Yes, that's right. **This is a task for The Hague** that, as far as I am concerned, is not fulfilling this sufficiently and is wrongly handing it over to organizations.	a) Yes, this is relevant.	Positive	5	Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Totally agree. For the processing time alone, it is important that it saves time when information is available.	a) Yes, this is relevant.	Positive	3	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	This also shows that previously shared information helps in the provision of care.	a) Yes, this is relevant.	Positive		No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	If the questions have already been asked by the first doctor, it is a pity if they are repeated again. This also applies to checking information in the file.	b) Yes, some relevance, but.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, it is important that everyone uses the same terminology to communicate.	a) Yes, this is relevant.	Positive	1	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	It is a topic that has been the focus of attention for a long time. It can certainly add value by providing transparency. The opposite is that it could lead to discussion if it led to more questions. **Important in our sector because family members also read this.**	a) Yes, this is relevant.	Positive	2	Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	100%.	a) Yes, this is relevant.	Positive	1	No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	**Yes, here you can see another task for The Hague** to align providers of EPD's and to coordinate adjustments. If there is no control and agreements about these standards, which are also maintained, we will be back to square one in a year. (“regional or national approach?”) **To do it right, I think The Hague can play an important role, regionally it would take much longer**. For example, to properly organize security. It could also be that the biggest players gain the upper hand and things still go quickly. The Hague should, among other things, take responsibility with regard to the revenue models of software suppliers.	a) Yes, this is relevant.	Positive		Yes
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	If EPDs can all talk to each other, you can also switch more easily, such as with energy. Therein lies a risk for commercial companies.	a) Yes, this is relevant.	Positive	3	No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Agreements are also necessary for this. That coincides with defining the data itself and the way an API is built.	a) Yes, this is relevant.	Positive		No
Application Barriers & Challenges	Non-standard EHR’s	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	A number of large software suppliers are slowly gaining the upper hand, which especially large healthcare providers seem to be following. Smaller organizations will still continue to run on-prem and they cannot be forced. Not only different EPDs, but also different versions within them.	a) Yes, this is relevant.	Positive		No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, agree.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, technology has provided the solution. It will probably also become bigger and faster and thus the frequency of exchange can be increased.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, not everyone has fiberglass laying around and an IT department that can organize this. The advantage of verSaaSen is slowly solving this. This barrier is reduced by further SaaS-ing of applications.	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	**I wonder if they can control access. I think that awareness in this regard is important for patients to make conscious choices. In our sector, this is especially true for family members and less so for clients.**	b) Yes, some relevance, but.	Positive		Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	yes, agree	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	That will be one of the bigger challenges. The more that is shared, the more likely it is that things will go wrong. Unfortunately, this is most often caused by the object between the screen and the keyboard.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	I can imagine this is quite a challenge. There is room for assumptions, however.	a) Yes, this is relevant.	Positive		No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes, clear agreements are definitely necessary.	a) Yes, this is relevant.	Positive		No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Yes, 100% agree. As a client, you are the owner, but if your data is held by multiple types of healthcare institutions, they must all have their business in order.	a) Yes, this is relevant.	Positive	4	No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Yes, agree. Recently changed dentist and had to pay costs for transferring the information. This allows the administrative employee to be paid. So could definitely save costs	a) Yes, this is relevant.	Positive	4	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, the supplier has to invest and will pass the costs on to the healthcare provider.	a) Yes, this is relevant.	Positive	2	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	Many agencies are involved in this topic, which makes the challenge all the greater. I fear that the egos, thinking in the interest of one's own organization will only make this problem worse. Otherwise it would have been there long ago, I think. It ties in, with a number of new insights, with how I look at it.	No
○ *35. Are the eight levels in the initial framework sufficient?*	**The client level might still be allowed because he/she is the owner of the data**. Could be a consideration to give it a separate place.	Yes
○ *36. Any missing Benefits, barriers & challenges?*	No, no additions.	No
○ *37. Do these benefits influence implementation?*	**I hope it's approached this way more often because it gives a much better picture so that if you run into barriers during the process and you've already defined them in advance, you can act on them better.** Testing in all layers of the organization also contributes to determining the impact and acceptance. Good to give an idea of both (advantages and challenges)	Yes
○ *38. Do these barriers & challenges influence implementation?*	See 37	No
○ *39. Do these aspects Influence decision making?*	See 37.	No

E8 Analysis Interview 8

Question	Answer
○ *01 Wat is your position?*	Managing director
○ *02 How many years of experience in this position?*	4 years
○ *03 How many years in Healthcare?*	More than 30 years
○ *04 What is your education level?*	Academic
○ *05. How would you define Interoperability*	What it evokes in me is “coherence”; the coherence of things and how you can bring them together. It can be about information, but also about other matters in which you look at collaboration from a broad perspective. This does not only concern care provision, but also, for example, prevention, in the broad sense of the word. It is about how we work together in healthcare and what we want to achieve in this.
○ 06. Are you familiar with Interoperability?	When it comes to the word you're using (interoperability) not so much, but when it comes to working with other organizations and strengthening the collaboration, I have a clear and active role, even if it means cutting in our own organization, I am prepared to make a decision in this regard for the sake of collaboration and the interests of clients. We should not look at each other from the perspective of competition, but from the social responsibility that we have together. This is also how I view my role as a director.
○ 07. How is the organizational maturity on Interop.?	(Not asked)
○ 08. Your view on the main benefits?	It would be a great advantage to me if we could rely on information that has already been collected elsewhere and then test whether your interpretation is correct.
○ 09. Your view on the main barriers and challenges	Systems that do not yet connect to each other, that seems to me to be a precondition. It takes trust in the information we receive from others. We then have to learn to record information unambiguously because we are still so used to describing it in free text.
○ 10. What is your stakeholder level?	Organizational policy: I do that quite a lot if you look at the time I spend outside the door. We are still so involved in how we will work together that we are barely ready to share information. I read that you are already talking about an ecosystem, I notice that we do not yet think that way in healthcare. We now mainly think in columns, acute care or care and cure, while an ecosystem is more based on influencing each other or having an effect on each other's services and 'I' am prepared to bear the costs for this for someone else. We are not even that far yet in the VVT, where we find it difficult to come to good agreements, for example with a current case about the number of rehabilitation places in the region. Even when it comes to exchanging information, such as in the Insight project, it starts with the question whether we are convinced together to take this step. Still takes a lot of time, I am busy with it almost daily in my agenda: Rotterdam care, Conforte, Capelle and Krimpen connected, etc. different groups that come together and think about different themes about how we could organize it. Security is also a theme that concerns me with the CISO we recently hired and of course also the costs.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Yes, I can agree with that, but I also think it is important that we handle information with care.	a) Yes, this is relevant.	Positive	3	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	**I can imagine that the order in which the development would take place ideally take place regional before national**. Our region is really different from other regions and I would think it is important that attention is paid to that in the areas in which we differ. I believe in the power of recognizing and interpreting information and I think it is important that we stand behind it. **And if it's organized nationally and we don't support it, it won't work. Standardizing in healthcare really requires a different mindset because we are not used to it.**	a) Yes, this is relevant.	Positive	4	Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, I do believe that. If the person can see what has happened when a client is standing in front of the counter, it helps both the client and costs reduction enormously.	a) Yes, this is relevant.	Positive	5	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	As it is now, agreed. So often it happens around medication that the list has already been printed and changes are still made but ultimately not in the system. **I absolutely agree that a lot goes wrong here and we do not sufficiently test whether it is correct**. The more concrete we get, the more it will help us. And, good agreements about who is responsible for what.	a) Yes, this is relevant.	Positive		Yes
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	I can imagine that it is a big risk. I think you should organize this in the work process by, for example, collecting information in advance and not during the consultation. I think it plays a role and I think we need to educate ourselves to integrate it into the work.	a) Yes, this is relevant.	Positive		No
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	It requires testing information that is received**. An unambiguous interpretation is possible in the case of diagnoses, but when it comes to the perception of the care worker about the patient's condition, it is good to be aware that it may concern a subjective opinion and to test the perception**. I think it's going to be very difficult to come to an agreement on this when it comes to an interpretation that we do because of the difference in colouring that we do. Even within the standards there is room for interpretation as with NNN. In the end (fortunately) you can't just turn everything black and white. As with Covid, the clients all have positive tests, but the effect is different for everyone.	b) Yes, some relevance, but.	Positive		Yes

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	That depends on the person. I think it is very important with which images clients have aged whether they see need or value in them. **Moreover, our systems are often difficult to understand for outsiders. In our target group, informal carers are also part of this**, but it will still not apply to everyone that this has value. If we can make it easy to see, it helps.	b) Yes, some relevance, but.	Positive	2	Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	**Complicated**. **It depends on who reads the text. If you want to learn and work on predictability, I learned from you, then you will have to do something with standards.** It is also important for which purpose information was recorded. Attention must be paid to the layering in the information (hard and soft data).	b) Yes, some relevance, but.	Positive		Yes
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	**I think that legislation and regulations mainly 'impose' it. I would think it would be much better if we managed to achieve that together.** The fact that we are now switching to ONS means that we are coming closer to each other and how nice it would be if we could do this together more often from an intrinsic motivation. Whether we will get there, I dare to doubt.. do we need the government with a stick (laws)? Directors too often think from the perspective of their own organizations and not from the joint responsibility for the ecosystem**. It would be more powerful if we could do this ourselves, and if that doesn't work, we may still need a stick of legislation and regulations.**	b) Yes, some relevance, but.	Positive	3	Yes
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	If we all work with the same applications, that could help us**. At the same time, I also believe that competition can help improve systems**. There is something good when we work unambiguously together and opt for the same systems, but also scary when the position and self-interest of suppliers become too strong. Here too, the hierarchy in health care is reflected. I think that we as VVT should also do something about it. We let the hospitals be our heart, but we are the aorta. If the aorta can't handle it, the heart has a problem.	b) Yes, some relevance, but.	Positive		Yes
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	I think that's important to do.	a) Yes, this is relevant.	Positive		No
Application Barriers &	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Yes, that will be a challenge.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Challenges	Data silos	The majority of the data continue to be confined in data silos.	Agreed	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, I'm following you right here.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, nothing to add.	a) Yes, this is relevant.	Positive	1	No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Depends on the image of humanity and where you were raised. Requires much more than the assumption that it is.	c) No, only little relevance.	Negative	1	No
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Agree, it is important to handle private data with care.	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, but I think that is also now the case.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, as discussed. So this is indeed important. If we don't pay enough attention to this, it won't be a success.	a) Yes, this is relevant.	Positive	2	No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	**You hear me sigh because I find this complicated**. There are so many elements in this sentence that you can look at differently. They are big themes as described here. I think this is going to make everyone gasp because it's about the way we'd like to look at care. Needs some elaboration here...	c) No, only little relevance.	Negative		Yes
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	I know too little about it.	b) Yes, some relevance, but.	Positive		No
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Agreed	a) Yes, this is relevant.	Positive	4	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	I think that definitely plays a role. An ECD is visible but what you are doing is much less visible.	a) Yes, this is relevant.	Positive	5	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	**It is very complex and that is evident from all the elements you mention. With the framework you want to simplify it but it still retains a great complexity.**	Yes

○ *35. Are the eight levels in the initial framework sufficient?*	I don't believe I'm missing anything. Intuitively, the most important parts are there.	No
○ *36. Any missing Benefits, barriers & challenges?*	**It's also <u>fun</u> to be involved in such a development!**	Yes
○ *37. Do these benefits influence implementation?*	**What it does through the simplification always helps. To know whether all elements have been identified for a complex issue and to think about it sufficiently.** It understandably that it is complex, so you should always ask yourself whether simplification does justice to the complexity.	Yes
○ *38. Do these barriers & challenges influence implementation?*	See 37.	No
○ *39. Do these aspects Influence decision making?*	**For me it's about the added value and that may well lie further in the future**, even if we have to struggle through it quite a bit. **The appealing perspective makes the weighting important to me.** The intrinsic motivation to make something beautiful out of it does not have to lie in the here and now.	Yes

E9 Analysis Interview 9

Question	Answer
○ *01 Wat is your position?*	Internal Control and Data Protection Officer, Finance and Information Department
○ *02 How many years of experience in this position?*	Over 4 years, FG about 3 months
○ *03 How many years in Healthcare?*	About 6 years
○ *04 What is your education level?*	Academic
○ *05. How would you define Interoperability*	Working together in the operation. Working together from the process, sharing experiences, evaluating shared care.
○ 06. Are you familiar with Interoperability?	Not very well known;
○ 07. How is the organizational maturity on Interop.?	I think it is present because we have to work with other healthcare organization, but that it can be developed much more (since 5 months in service).
○ 08. Your view on the main benefits?	I think it would be good to get a more complete picture of the client and to have our care better aligned with it.
○ 09. Your view on the main barriers and challenges	Safety seems to be a major concern. How and what can we share about our clients and is that allowed
○ 10. What is your stakeholder level?	Legislation and regulations are the basis of the position(s) I have.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Yes, I certainly think so. It will also save time collecting information that is already available elsewhere.	a) Yes, this is relevant.	Positive	5	No
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	I would consider that a challenge to organize it internationally. **Regional and national rather, although also national will be challenging.** You have to think of everything when it comes to different regions. I think otherwise it will remain too basic if it is picked up too large.	a) Yes, this is relevant.	Positive	5	Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, it may also open the door for others to 'interfere' in the care that is provided elsewhere. However, the autonomy of institutions must be monitored.	a) Yes, this is relevant.	Positive		No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	Yes, it is now mainly a **risk** that could be reduced with interoperability.	a) Yes, this is relevant.	Positive		Yes
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	If interoperability goes well, this should bring more time and attention to clients. The client won't walk away and clients will also find that having less forms to fill out will help them.	b) Yes, some relevance, but.	Positive		No
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, that's important. Uniformity is always better anyway.	a) Yes, this is relevant.	Positive	3	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Yes and no, it depends on the patient. This may be less true for our target group.** And if clients can no longer keep up with this, will family be given access to all care from all years? Is that desirable? Not very clearly an advantage as shown here.	b) Yes, some relevance, but.	Positive		Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Certainly	a) Yes, this is relevant.	Positive		No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	**The extent to which standards are elaborated and made mandatory will be a determining factor in this regard.** Who determines it and whether it will become an obligation for everyone**. Testing via a quality mark and/or auditing also demands a lot from organizations**. What do we do with the institutions that are unable or unwilling to connect? Accessibility is important for a large group and not just those who have the resources.	b) Yes, some relevance, but.	Positive		Yes
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, because they also have to facilitate it.	a) Yes, this is relevant.	Positive	1	No
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, this is again about uniform work. It also concerns which data is and is not included.	a) Yes, this is relevant.	Positive	1	No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Agreed	a) Yes, this is relevant.	Positive		No
	Data silos	The majority of the data continue to be confined in data silos.	yes, agree	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, agree.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes.	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Yes, but I also see the other side of that, clients denying access even though that information is needed. I think that people can be hesitant about this and it is important to get them involved. **Physicians should not become overly dependent on information that is there but not available because of client consent.** The most relevant data should always be available.	b) Yes, some relevance, but.	Positive	2	Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	yes, agree	a) Yes, this is relevant.	Positive	4	No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes, agree.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, I gave birth in the hospital over the summer and when registering beforehand it turned out that most of the information was quite outdated. It is important who is responsible for keeping the information up to date. It is important to make good agreements about this. **The question of who is responsible for what and where does that responsibility extend in the case of transfer of care.**	a) Yes, this is relevant.	Positive		Yes
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes, of course. Or at least how we can handle data. When we organize it regionally, there is more room than when it is organized nationally. **National regulation does, however, give a little more confidence in what is expected and what the working method is.**	a) Yes, this is relevant.	Positive		Yes
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	**It must be prevented that commercial companies or insurers gain access to client information and that premiums could be determined on this basis.**	a) Yes, this is relevant.	Positive	3	Yes
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Yes.	a) Yes, this is relevant.	Positive	4	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	**Costs but also resources such as time.**	a) Yes, this is relevant.	Positive	2	Yes

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	It seems pretty complete to me. In addition to the advantages, there can also be a **disadvantage** without it having to be a barrier or challenge. **I think further elaboration and deepening is necessary**. **I still miss the patient or client in this, could be a separate level.**	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	**Add the client level**. Possibly also mention **disadvantages with the advantages**. Suppose you do this in a uniform way, what would we miss or what would we lose. Might be worth mentioning in the discussion; may not need to be in the framework.	Yes
○ *36. Any missing Benefits, barriers & challenges?*	Most have been discussed in between.	No
○ *37. Do these benefits influence implementation?*	It almost sounds too nice. I expect it will be quite some time before we get there. **Working towards what is possible in the short term might help**.	Yes
○ *38. Do these barriers & challenges influence implementation?*	Breaking it down into what can be done in the short term might help. A growth model or maturity model could be the next elaboration. It is still quite abstract and I suspect that the result will be far away	No
○ *39. Do these aspects Influence decision making?*	See 37-38. Discuss that these types of projects for the type and size of these types of organizations are very large to spread out over years. The interviewee indicates that a regional approach can help. Given the landscape in healthcare, a phased approach could help. **For example, organizations hardly know where to start due to differences in maturity on this subject.**	Yes

E10 Analysis Interview 10

Question	Answer
○ *01 Wat is your position?*	Manager Finance and ICT, member of the MT
○ *02 How many years of experience in this position?*	In this position within the organization for six months;
○ *03 How many years in Healthcare?*	18 years
○ *04 What is your education level?*	HBO
○ *05. How would you define Interoperability*	To what extent applications can communicate with each other within and between organizations. Information exchange issues play an important role in this.
○ 06. Are you familiar with Interoperability?	I think I have an understanding of the concepts and in the decision-making about whether or not we should do something with interoperability from within the organization.
○ 07. How is the organizational maturity on Interop.?	For us, it mainly concerns communication with primary care, hospitals and other VVT. I think we're already doing a few things, but certainly haven't reached maturity yet. We are mainly following others and the question is how the region is organized in this regard compared to us.
○ 08. Your view on the main benefits?	It saves a lot of administrative burden. It makes the work of employees easier, clients can be transferred faster and less data is lost.
○ 09. Your view on the main barriers and challenges	Different systems with different layout, resulting in issues in the data exchange.
○ 10. What is your stakeholder level?	In my role, the most security is via the AO/IC, costs from the FA and control, the application and information share via you and the care process from the systems. I could be involved in the policy from the MT. No explicit policy now. Question from interviewee: "where would we best invest this topic within the organization from all facets of which it consists?" They are good axes (levels) to make sense of. They are great layers to think about the organization of our own information provision.

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	I don't think collaboration is the primary goal. **In the first place it concerns the flow of clients (transfers) and, in addition, the cooperation.**	c) No, only little relevance.	Negative		Yes

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	Yes, this seems to me to be a **condition** for arranging this, although this does not immediately show which standards are involved. **Where does the responsibility for organizing standardization lie?** The further we go with standards, the more we commit ourselves to the choice of suppliers, for example. This can also kill innovation and increase dependence on suppliers. (discuss the role of Governance in shaping the chain). When you talk about interoperability, it takes precedence over organizational policy. There is another level in between to organize and initiate it, that is not done through laws. What will be the role and mandate of regional partnerships such as Conforte and the ICT advisory council? Finding connections and achieving success together.	a) Yes, this is relevant.	Positive	3	Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, it seems logical to me that the EMR and agreements on using the EMR should be carefully coordinated.	a) Yes, this is relevant.	Positive	5	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	In my opinion there are sufficient studies that the EMR is not complete at the time of admission. At least in hospitals, a lot of research has already been done on this.	a) Yes, this is relevant.	Positive	5	No
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	Yes, I think there is always a **risk** in that. The computer will continue to be used so time for a good conversation remains necessary. Good to take action on this.	a) Yes, this is relevant.	Positive	4	Yes
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Yes, I think that's true but also depends on the client population.** It is not so bad for our population, but it does help for the partner or environment.	b) Yes, some relevance, but.	Positive		Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Yes, agree, and also costs money. Manual work also plays an additional role in this. Scanning for the wrong client or incorrectly copying data.	a) Yes, this is relevant.	Positive		No
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	I think you're saying two things here that are related.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, that's in there too. **At the same time, we also want different suppliers because competition is good for development and the price.**	b) Yes, some relevance, but.	Positive		Yes
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, also makes sense because it also makes connections easier to develop.	a) Yes, this is relevant.	Positive	2	No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	From a market perspective you want different systems but with the same syntax. All hospitals in the region use Hix, which is not the most innovative system.	a) Yes, this is relevant.	Positive		No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, recognizable.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Yes, clear. The change management process part is complex. You chose a difficult subject ;)	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	Yes, can be more difficult. A chance..	a) Yes, this is relevant.	Positive	1	No
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Yes, clearly.	a) Yes, this is relevant.	Positive	1	No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	Yes.	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, clear.	a) Yes, this is relevant.	Positive		No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Yes.	a) Yes, this is relevant.	Positive		No
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Yes.	a) Yes, this is relevant.	Positive		No

Level/ dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	**Yes, fantastic and if you also indicate where we can get the savings**. How can we recoup the investments of these kinds of projects? Or do we reduce the workload with this? It makes a difference when we need fewer employees for retyping or a desk saving spread across all departments.	a) Yes, this is relevant.	Positive	3	Yes
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes	a) Yes, this is relevant.	Positive	2	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	The framework for structuring this subject and how we have invested in it certainly helps us. Even if you put all applications next to it. * discuss the role of Zorgdomein and Point as postman with broker function* . Certainly a complete picture, but the finesse is often in the processes. Also the human component, how are the changes realised. The human factor as employee and client.	No
○ *35. Are the eight levels in the initial framework sufficient?*	Factor employee and client may still be added.	No
○ *36. Any missing Benefits, barriers & challenges?*	I wouldn't say if it's complete. Devil is often in the detail.	No
○ *37. Do these benefits influence implementation?*	**Like a touchstone, it helps to check that you are complete**. All these parts are important. The question of where you would place the management is also important. * discuss the place in an organization and between organizations in which governance could be invested. * Hospitals, VVT and insurers need each other in this regard.	Yes
○ *38. Do these barriers & challenges influence implementation?*	See 37 and earlier.	No
○ *39. Do these aspects Influence decision making?*	See 37 and earlier.	No

E11 Analysis Interview 11

Question	Answer
○ *01 Wat is your position?*	Director of Operations, responsible for finance and IT.
○ *02 How many years of experience in this position?*	Over 10 years
○ *03 How many years in Healthcare?*	10 years
○ *04 What is your education level?*	Academic
○ *05. How would you define Interoperability*	Interaction between systems in which data is exchanged between those systems. Such as with a hospital information system and a general practitioner information system. It is important that the data that is send, keeps the same value and keeps saying the same things. Relevant information that you can use later.
○ 06. Are you familiar with Interoperability?	Fairly knowledgeable in this area within the organization. It is not that I have studied it extensively, but I mainly strive for practical applicability. For example, within the organization we have organized the exchange between the Care and Cure EPD.
○ 07. How is the organizational maturity on Interop.?	As an ambition certainly but “It takes two to tango”. Collaboration with other organizations is necessary, especially because our clients are sometimes admitted to hospital temporarily. It is also a theme that has been on the agenda more in the last five years. Before that, the provision of information was more focused on one's own world and inward.
○ 08. Your view on the main benefits?	One-time recording of data and access to the same information on the healthcare side. This saves time, money, energy and misunderstandings. I think it is just as important for the patient or client that they do not have to answer the same questions every time.
○ 09. Your view on the main barriers and challenges	It is on many levels. Do the parties trust each other, do they know and understand each other's world; but also about the meaning of data. Parties must also be willing to cooperate. There we sometimes also see competition-like phenomena and the 'who conforms to whom?'
○ 10. What is your stakeholder level?	The strength of the Nictiz model lies in the coherence and involvement on all levels. In my daily work I am most concerned with organizational policy, but not without being involved and taking note of the other dimensions. Analytically it can be taken apart, but in reality these parts are attached to each other and that distinction is not made so clearly.

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	**Agreed, I see an increasing collaboration with the Hospital (M) where they like to quickly transfer clients to us. The more we know about clients in advance, the better we can respond to that demand. Better information then leads to better coordination, choices and interoperability.**	a) Yes, this is relevant.	Positive	5	Yes

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	I hesitate on the word regional. **I think the Netherlands is small enough to organize it nationally. We will have to make agreements at national level in which standards we communicate information**. If there is no unity of language, we speak too easily past each other. It also applies to training institutes that they teach students the same. ("Are we as institutions able to organize this regionally or do we need the government to a greater or lesser extent?"). **I think we should organize this on a national scale.** The large software suppliers will really not develop especially for the Rijnmond region, so that world is so small that it is best to tackle this nationally. Do we have enough power to organize this ourselves, I think it's really exciting. **At the same time, I also dread the fact that the national government will be a determining factor in this, because input from practice is really necessary**. The entire zibb movement helps enormously, but at the same time this comes to a large extent from the hospitals and care is 'harassed' with complexities and that currently fits within long-term care. We have had the debacle with the national EPD and now the government no longer wants to intervene directly, but does want to stimulate it. I think that after the incentive phase, there will also have to be a regulatory phase that will force us to do it the same way.	b) Yes, some relevance, but.	Positive		Yes
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, of course it helps. In addition, **it is also important to look for the right care in the right place.** When we can look more closely in each other's data, that assessment can also take place more effectively.	b) Yes, some relevance, but.	Positive	2	Yes
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	During transfers, most errors occur, often in other processes as well. **By making information transparent and unambiguous, the boundaries of departments and organizations can be better resolved.** There is a great risk at those moments, especially when the hospital 'push' on admissions. **So the more interoperable organizations are, the smaller the risks. So I think that helps.**	a) Yes, this is relevant.	Positive		Yes

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	**Double.** In demography, it is a social fact that we grow older. **I think the aim should be that we promote independence of clients** even more so that a doctor can pay attention to where it is really needed. There is, however, a risk that clinicians will increasingly look at the reality of the screen and that the patient will not feel heard.	b) Yes, some relevance, but.	Positive		Yes
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Yes, even necessary. At the information layer, we need to be semantically interoperable.	a) Yes, this is relevant.	Positive	4	No
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	**Some do and some don't. There really is a target group that can have a lot of value from it.** It can be valuable for people who go from specialist to specialist to follow everything, for example also for chronically ill (COPD or diabetics) who also do self-monitoring. There are audiences I believe in, but not all.	b) Yes, some relevance, but.	Positive		Yes
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	That is a **risk**, **although not everything can be captured in standards. It is not a forbidden area to use free text to describe a client**. There is too much in the body, condition or environment that is relevant but difficult to quantify. Requires a warm transfer. Also reflected in a SOEP report where there is room for this.	a) Yes, this is relevant.	Positive	1	Yes
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	I do think it is. Perhaps at some point there will be opportunities to develop standards across professional boundaries where it is still complicated at the moment. **There is certainly also a need for legislation and regulations to prevent arbitrariness**. Hope the CIZ indicates in the same way in Groningen and Limburg.	a) Yes, this is relevant.	Positive	5	No
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	**I actually think that the industry is not competitive right now. I think the risk is quite high that it (per sector) is becoming rather monopolistic.** Precisely because it is not really competitive, the collaboration is still very challenging. In this, the government could choose to impose more, for example with regard to being open and sharing information. “Mass is cash register”, which in itself is not a bad thing as long as antisocially high profits are not achieved and cooperation and open standards do not stand in the way.	d) No significant relevance.	Negative	4	Yes
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes agree.	a) Yes, this is relevant.	Positive		No

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	**I think that's partly true.** When it comes to medical devices, this is quite a limited set. There are certainly exceptions, but it helps enormously to standardize more. Preferably driven by content. Nor will it be infinite in scope, as long as there is room for non-standards outside the zibbs.	b) Yes, some relevance, but.	Positive		Yes
	Data silos	The majority of the data continue to be confined in data silos.	Yes, I think that's true.	a) Yes, this is relevant.	Positive		No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Also agree.	a) Yes, this is relevant.	Positive	3	No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Also totally agree. Infrastructure is very expensive.	a) Yes, this is relevant.	Positive	2	No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	I can see a bit of both in this. I really like the development towards PHR's in which you are the owner of your own data. **Also that you determine who does or does not have access to your data. However, when there's a GP who doesn't like you and denies you entry, I'm glad he has his own HIS with information to help him take his medical responsibility.** I am in favour of transparency on this theme, but there may also be situations in which healthcare organizations must properly protect their own file.	b) Yes, some relevance, but.	Positive		Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Yes, all the laws and regulations such as AVG point in that direction. And apart from that, it's just right thing to do!	a) Yes, this is relevant.	Positive		No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	**Doubt**.. **I'm not exactly sure what kind of standards it would be. It does help enormously to have agreements about the communication between doctor and patient.** Suppose there are suspicions, to what extent could they be shared or not with other doctors. I think patients have the right to ask what is being recorded and what is done with it.	b) Yes, some relevance, but.	Positive		Yes
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	From the position of doctor, it seems important to me to know what the last measurements have been, who measured the measurements and it must be clear that measurements have been taken in a safe and uniform manner. Needed to give meaning to the values that are there. This may be easier to trust from a fellow doctor than measurements from clients. This trend seems to me to be the most important.	a) Yes, this is relevant.	Positive		No

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	**That helps enormously when there is a third independent party that monitors and assesses that we have our affairs in order.** This would help enormously for the trust between the parties, especially if there is a legal framework for this.	a) Yes, this is relevant.	Positive		Yes
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	A cloud solution is little more than a computer located somewhere else**. I don't think cloud solutions would pose any specific legal issues**. **Perhaps a cloud setup is even safer than on prem. In this one I trigger on the word 'Cloud'. If that is less relevant in this statement then agree.** Sharing information between different entities does indeed present legal problems, apart from the fact that it happens in the Cloud. Organizational boundaries are also increasingly blurred when we share clients and treatment results. The question 'Whose does the patient belong to?' is becoming increasingly difficult to answer. It is also increasingly true for employees that the boundaries are gradually becoming diffused. It is increasingly about what a patient needs and we can organize around it.	b) Yes, some relevance, but.	Positive		Yes
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	And the software parties concerned do not make enormous profits. There will certainly be savings because retyping is avoided and we can rely more on the quality.	a) Yes, this is relevant.	Positive	1	No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	**I think there is also some reluctance about who is in charge, comparable to legislation and regulations**. **The in-between area does not belong to anyone and how do we organize it together. I think this will still be a big challenge.** Who will take the lead and how are we going to do that? **I think this is also one of the reasons why it is difficult to get started.** The proceeds lie in the future and are now difficult to cash in. I do believe in it. **Certainly in the logistical area, benefits can be gained very quickly.** Just by preventing a doctor from having to call '24' institutions to get a client placed. In the case of referral aid 010, this resulted in a shortening of the length of stay of 1.4-1.5 days. That is really gigantic and that is quite easy to convert into money. It is important for the further development of referral aid 010 in the intermediate area to determine growth together.	a) Yes, this is relevant.	Positive	3	No

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	**Anyway, I like the subject in all its elements. It is quite a comprehensive subject that cannot be introduced today or tomorrow**. When I started here, there was still a paper file. Then started to digitize it well. Subsequently, the supplier stopped and we found another ECD supplier through a selection process. Then we found out that we still work like with paper but that we are now doing it digitally. The focus has also been internal for a long time and only in the last period that our vision has turned outward. In conversations with hospitals in the region, the same thing often emerges, namely that the choice for an EPD is primarily internally focused and of little relevance to the outside world. Slowly we find out that we also have to do something together. I think we are in that phase now that we are discovering that together in the Netherlands; and some will be further in that than others. What I find beautiful about the Vipp Inzicht scheme, and at the same time a bit frustrating, is that it is the only scheme that requires transmural cooperation. Until recently, it was unthinkable that operations would be postponed because there would be too little capacity in home care. Thinking in terms of what is needed in the entire chain is really different. That requires us to look at the ecosystem. **This should lead to lower costs and higher quality.**	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	"No, I think it's great that you have added a cost layer**, you could also add a yield layer to it. It also yields**. Nictiz's model adds a layer to reality that can best help for It doesn't really matter to me whether parts belong exactly in one or the other layer. o (inquire about a governance dimension). As far as I'm concerned, this is possible under organizational policy. In a plate from Nictiz, the model between organizations is placed side by side and that comes together via an hourglass. It shows that organizations have to organize this together. Agree that Governance must be in place and must be properly designed, and I think that starts mainly at regional level because that is where we encounter each other the most. I think that governance is also part of organizational policy and how the interaction with each other will be arranged."	Yes
○ *36. Any missing Benefits, barriers & challenges?*	I think it's pretty complete.	No
○ *37. Do these benefits influence implementation?*	Not asked.	No
○ *38. Do these barriers & challenges influence implementation?*	Not asked.	No
○ *39. Do these aspects Influence decision making?*	What certainly makes sense is that you put words to what is going on and what should happen. **Precisely by looking at it at different levels, you have the opportunity to reach different people**. A number of things will not be relevant for doctors, and the same applies to ICT professionals and administrators, while they all need each other. What you're make visible with this is that thorough agreements are needed at all these levels. What you're doing with this is that you're **shredding the complexity**. Although it's a difficult word to pronounce, it helps bring the far-away story closer. It is not an IT story but a care story.	Yes

E12 Analysis Interview 12

Question	Answer
○ *01 Wat is your position?*	Information manager transmural care;
○ *02 How many years of experience in this position?*	5 years
○ *03 How many years in Healthcare?*	19 years
○ *04 What is your education level?*	Bachelor
○ *05. How would you define Interoperability*	The Nictiz model has been developed as a tool for this. Interoperability affects multiple layers such as infrastructure, information, process and the policy that we have to agree on. I'm looking at the subject from the width of all these layers.
○ 06. Are you familiar with Interoperability?	Seen within the organization as an expert on this subject
○ 07. How is the organizational maturity on Interop.?	I think that we as a University Hospital have and take a leading role in this in the region. As with the Vipp Insight scheme, we almost automatically go along with it and try to act at the forefront. Are we there then, certainly not yet. We also don't know which way it is going yet and we are only 1 of the 75 hospitals to arrange this. (discuss message from Europe in relation to WEGIS). European regulations ultimately take precedence over national ones.
○ 08. Your view on the main benefits?	The promise of technology, as a trained technical business administration bachelor, is a means to search for solutions. And if we look at the medical process, we see that this is now being done in a way in which technology can act as a driver for working better and faster. The quality of care can be improved as a result, the challenge we all face in terms of labour demand (in 2060 1:3 should work in care). We will have to find solutions with technology to deal with this. In other words, reduction of administrative burdens that are currently estimated at 45% of the time. This is a challenge for me, but also in the field of transmural care, where I will have to show the benefits.
○ 09. Your view on the main barriers and challenges	Looking at the five layers, it turns out that organizational policy is the first to be complicated. As a region, we have invested heavily in governance in recent years. At sector level, the stakeholders are bundled in partnerships such as Conforte, Rijnmond doctors and SRZ. In recent years, we have set up a steering committee for digital referrals (in my role as program manager on behalf of the hospitals) that directs these projects. If you look at the processes, we also increasingly seek each other out in work groups in which we have started working on process preparations, permissions. An important barrier is to agree with each other what we send to each other and how. Does it contain a referral letter, whether or not an OR report, contact details of informal carers. On a data level, which technical standards do we use together. If you work with FHIR and we still work with CDA or HL7 v2, it will never 'talk to each other' and we have found our way in that. At the application level we see that we are standardizing on the applications, such as with Point in the data exchange with the VVT. And then there's infrastructure, obstacles that could partly be removed by standardizing the applications to achieve interoperability
○ 10. What is your stakeholder dimension?	In my role on all parts of the framework, depending on what is needed. In 2018 we started Chipsoft with a healthcare platform in the top layer application/infrastructure layer. The collaboration became available in 2019 to subsequently start working with information and the process layer. So it depends somewhat on the projects that are involved, how mature the technology is and therefore situational.

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Benefits	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Agree with the statement, but not yet very operational. We can now refer digitally with a number of institutions, which immediately ensures better cooperation. It helps, but trust is required beforehand to achieve cooperation.	a) Yes, this is relevant.	Positive	3	No

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Policy Barriers & Challenges	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.	yes, agree	a) Yes, this is relevant.	Positive	3	No
Health processes Benefits	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Yes, absolutely true. Quality of care comes is a part this. Technology should also follow suit	a) Yes, this is relevant.	Positive	5	No
Health processes Barriers & Challenges	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	**Yes, then you are talking about the classic form of transfer of care, where we see that we are increasingly switching to network care where a client is in care for different care and treatment questions at different institutions**.	a) Yes, this is relevant.	Positive		Yes
	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	No, I do not endorse this. **It is a challenge that 45% is lost on administration, but it does not have to directly damage the relationship.**	d) No significant relevance.	Negative		Yes
Information Benefits	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	I have some difficulty with it because it is not very concrete and tangible. **There is always a lot to do about it, but in practice I have had little trouble with it. Until now in transmural exchange it is nice if it is exchanged in standards, but the care worker is already happy if it comes in unstructured format**. So yes, it certainly makes sense, but is in development at maturity level 3-4-5.	b) Yes, some relevance, but.	Positive	4	Yes
	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).	That is certainly relevant for certain groups	a) Yes, this is relevant.	Positive		No
Information Barriers & Challenges	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Disagree. This is not a causal relationship. **The digital exchange of unstructured medical data would also improve healthcare. Receiving information takes precedence over the standard in which.**	c) No, only little relevance.	Negative		Yes
	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Yes, it should be clear what we are talking about.	a) Yes, this is relevant.	Positive	4	No
	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Yes, makes it challenging. It is not necessarily the case that they do not want to cooperate with each other, as can be seen with regard to NUTS. Mainly a question of capacity and commitment, also with suppliers.	a) Yes, this is relevant.	Positive		No

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Application Benefits	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Yes, of course	a) Yes, this is relevant.	Positive	2	No
Application Barriers & Challenges	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	There is little variety in the number of EPDs . Currently Chipsoft, Epic, and a little bit of Nexus and Siemens-SAP. What was sold in the boardrooms was that there would be no problems with the exchange between hospitals using the same EHR. Nevertheless, it has still been a matter of concern (..)	a) Yes, this is relevant.	Positive		No
	Data silos	The majority of the data continue to be confined in data silos.	Yes, you can say	a) Yes, this is relevant.	Positive	5	No
IT Infrastructure Benefits	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	Yes, completely agree	a) Yes, this is relevant.	Positive	1	No
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	yes, agree	a) Yes, this is relevant.	Positive		No
Security Benefits	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	There are some assumptions in that.. in the end this is a truth like a cow. If they can manage it, they can grant access too. However, as healthcare providers, **we should not be dependent on the access that patients have established as this can compromise the quality of care.** Some colleagues are on the line that clients are allowed to determine this, but if EDs do not have access to information, that is one thing. There is a parallel in this with a CPR statement.	a) Yes, this is relevant.	Positive		Yes
Security Barriers & Challenges	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	At sometime	a) Yes, this is relevant.	Positive	2	No
	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	yes, agree	a) Yes, this is relevant.	Positive		No
	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Yes, definitely true	a) Yes, this is relevant.	Positive		No
Legal Benefits	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	At sometime	a) Yes, this is relevant.	Positive		No

Level/ Dimension	Sublevel	Description	Answer	Qualification	Validation	Ranking	indication for refinement
Legal Barriers & Challenges	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	No, it doesn't necessarily have to be true. You make agreements about this with each other. A cloud solution is a means, but there are also other aspects involved. Sharing information on premise **poses also legal issues**. I disagree that those are problems. The fact that people may not have enough knowledge about this may make it problematic	b) Yes, some relevance, but.	Positive	1	Yes
Cost aspects Benefits	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Yes	a) Yes, this is relevant.	Positive		No
Cost aspects Barriers & Challenges	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Yes, **and don't rule out the structural costs**	a) Yes, this is relevant.	Positive		Yes

Question	Answer	Indication for refinement
○ *34. Your overall impression on the initial framework?*	I think it's so pretty complete. By working out along the five-layer model, it was simply done very well. In this way you touch all points of the subject. That makes it useful. (should there be a separate layer for governance or the patient?) **We've talked about that extensively in the past but kept it to this model. There are several aspects that always come back. I don't think it adds anything to include it as a separate layer. What may the "talk clubs" cost..? but important to keep an eye on. I wouldn't advocate a separate cost either. Governance actually comes with so much becoming in the policy layer**	Yes
○ *35. Are the eight levels in the initial framework sufficient?*	see 34	No
○ *36. Any missing Benefits, barriers & challenges?*	see 34	No
○ *37. Do these benefits influence implementation?*	see 39	No
○ *38. Do these barriers & challenges influence implementation?*	see 39	No
○ *39. Do these aspects Influence decision making?*	It must be a model that you can use to check whether you are complete. A**s a model it is an excellent effect. Yes, the question is whether it can be raised as a reference.** You could make an article for it to test its usability.	Yes

Appendix F Data Analysis Combined

F1 Part 1 Exploration

Interview	Q7. Organizational maturity
interviewee 01	Difficult to estimate, I can only say something about the applications that fall under the management of ICT and less so with regard to the applications that fall under Information Management or are outside the organization. Our organization as a whole; difficult to determine to what extent it is interoperable.
Interviewee 02	No, this is limited. It seems that other types of organizations are farther along in this regard. We are more concerned with receiving information; sending is still very limited.
Interviewee 03	Only in the medical field of Point and Zorgdomein. Nothing is read directly into our ECD yet;
interviewee 04	In its infancy.
Interviewee 05	They are all familiar with that as users and work with those structures;
interviewee 06	Still in our infancy, this is partly due to the fact that we switched to fully digital working relatively late compared to other organizations (medical teams). Because we are a relatively small organization, we tend to wait until others have solved this before we step in.
interviewee 07	I can't say yet because I recently started in this organization.
Interviewee 08	(Not asked)
interviewee 09	I think it is present because we have to work with other healthcare organization, but that it can be developed much more (since 5 months in service).
interviewee 10	For us, it mainly concerns communication with primary care, hospitals and other VVT. I think we're already doing a few things, but certainly haven't reached maturity yet. We are mainly following others and the question is how the region is organized in this regard compared to us.
interviewee 11	As an ambition certainly but "It takes two to tango". Collaboration with other organizations is necessary, especially because our clients are sometimes admitted to hospital temporarily. It is also a theme that has been on the agenda more in the last five years. Before that, the provision of information was more focused on one's own world and inward.
interviewee 12	I think that we as a University Hospital have and take a leading role in this in the region. As with the Vipp Insight scheme, we almost automatically go along with it and try to act at the forefront. Are we there then, certainly not yet. We also don't know which way it is going yet and we are only 1 of the 75 hospitals to arrange this. (discuss message from Europe in relation to WEGIS). European regulations ultimately take precedence over national ones.

Interview	Q8. Your view on the main benefits resulting from interoperability
interviewee 01	Biggest advantages is that despite different systems, employees will still have the same information at their disposal without re-entering. This saves time.
interviewee 02	Less error-prone and an administrative burden reduction.
interviewee 03	That we can access other systems from our EPD instead of logging in to different applications. The advantage is to be able to continue working in 1 system and not have to use multiple methods. This promotes speed and quality.
interviewee 04	It can support the primary process when the right information is available in the right place at the right time. This will also apply to the administrative departments that support this.
interviewee 05	That we will receive the information on our computer and can put it directly in the patient's file. Easily receive data, send documents and that we will have an insight into a relevant parts of the EMR that is important as another healthcare provider.
interviewee 06	Huge error reduction and huge time saver when done right. The amount of time I spend, together with the nurses, physio, etc. to find out where a client comes from, from which department and then get hold of them by phone to collect information is enormous.

interviewee 07	From a patients perspective that he/she no longer has to wait and that the care worker can get to work immediately. From a business perspective, data is 'worth gold'.
interviewee 08	It would be a great advantage to me if we could rely on information that has already been collected elsewhere and then test whether your interpretation is correct.
interviewee 09	I think it would be good to get a more complete picture of the client and to have our care better aligned with it.
interviewee 10	It saves a lot of administrative burden. It makes the work of employees easier, clients can be transferred faster and less data is lost.
interviewee 11	One-time recording of data and access to the same information on the healthcare side. This saves time, money, energy and misunderstandings. I think it is just as important for the patient or client that they do not have to answer the same questions every time.
interviewee 12	The promise of technology, as a trained technical business administration bachelor, is a means to search for solutions. And if we look at the medical process, we see that this is now being done in a way in which technology can act as a driver for working better and faster. The quality of care can be improved as a result, the challenge we all face in terms of labor demand (in 2060 1:3 should work in care). We will have to find solutions with technology to deal with this. In other words, reduction of administrative burdens that are currently estimated at 45% of the time. This is a challenge for me, but also in the field of transmural care, where I will have to show the benefits.

Interview	**Q9. Your view on the main Barriers & challenges resulting from interoperability**
interviewee 01	Barriers in knowledge and information how systems 'talk' to each other. The budget to realize this change is sometimes difficult to find. We depend on external suppliers to establish 'links' where we are responsible for the transfer of information.
interviewee 02	Awareness within the organization of the importance of this topic and what we can gain from it. .. where the operation now mainly experiences the bottlenecks in the current working method.
interviewee 03	The question for the organization is whether we really want it and whether we have the knowledge to set up such a thing. It starts with the will to make it as easy as possible for employees to work with one system. ...
interviewee 04	The main challenge lies in technology and making agreements about sharing information within the healthcare domain.
interviewee 05	With the LSP, patients have to be asked if they want to participate and motivate them and that takes time. Doesn't have to be a barrier immediately, but something has to be organized for it.
interviewee 06	In the first place awareness of the possibilities. Decision makers probably have no idea what we're doing and how error-prone retyping is. I think it is also a barrier that healthcare staff are generally not very innovative, from management to the workplace. And thirdly, I do not know whether all systems can be connected to each other. This is especially a barrier with medical data because I still prefer to type, knowing what is entered than dealing with the uncertainty whether what was send was correct or when there is no information, there was actually nothing and not that it didn't get through.
interviewee 07	Ego, every organization thinks it knows best. The more specific the data, the more important it becomes to make good agreements, so that it can be coordinated in the exchange.
interviewee 08	Systems that do not yet connect to each other, that seems to me to be a precondition. It takes trust in the information we receive from others. We then have to learn to record information unambiguously because we are still so used to describing it in free text.
interviewee 09	Safety seems to be a major concern. How and what can we share about our clients and is that allowed
interviewee 10	Different systems with different layout, resulting in issues in the data exchange.
interviewee 11	It is on many dimensions. Do the parties trust each other, do they know and understand each other's world; but also about the meaning of data. Parties must also be willing to cooperate. There we sometimes also see competition-like phenomena and the 'who conforms to whom?'
interviewee 12	Looking at the five layers, it turns out that organizational policy is the first to be complicated. As a region, we have invested heavily in governance in recent years. At sector level, the stakeholders are bundled in partnerships such as Conforte, Rijnmond doctors and SRZ. In recent years, we have set up a steering committee for digital referrals (in my role as program manager on behalf of the hospitals) that directs these projects. If you look at the processes, we also increasingly seek each other out in work groups in which we have started working on process preparations, permissions. An important barrier is to agree with each other what we send to each other and how. Does it contain a referral letter, whether or not an OR report, contact details of informal carers. On a data level, which technical standards do we use together. If you work with FHIR and we still work with CDA or HL7 v2, it will never 'talk to each other' and we have found our way in that. At the application level we see that we are standardizing on the applications, such as with Point in the data exchange with the VVT. And then there's infrastructure, obstacles that could partly be removed by standardizing the applications to achieve interoperability

Interview	Q10. Which dimension in our framework do you have to deal with most in your work?
interviewee 01	IT Infrastructure
interviewee 02	Application
interviewee 03	Policy
interviewee 04	Information
interviewee 05	Health processes
interviewee 06	Health processes
interviewee 07	Security
interviewee 08	Policy
interviewee 09	legal
interviewee 10	Cost
interviewee 11	Policy
interviewee 12	Policy

F2 Part 2 Validating the initial framework

Number of Interview	Positive		Negative		Total	Refinement		Total
Dimension - sublevel	**a) Yes, this is relevant.**	**b) Yes, some relevance, but.**	**c) No, only little relevance.**	**d) No significant relevance.**		**No**	**Yes**	
○ 11. Policy Benefits- Collaboration	9	2	1		12	10	2	12
○ 12. Policy Barriers & Challenges- Regulating standardization	11	1			12	4	8	12
○ 13. Health processes Benefits- Clinical interoperability	11	1			12	11	1	12
○ 14. Health processes Barriers & Challenges -Transition of care	12				12	7	5	12
○ 15. Health processes Barriers & Challenges - Doctor- patient relationship	4	5	1	2	12	6	6	12
○ 16. Information Benefits- Semantic Interoperability	9	3			12	9	3	12
○ 17. Information Benefits- Patient participation	5	7			12	3	9	12
○ 18. Information Barriers & Challenges- Non-standard formats	10	1	1		12	9	3	12
○ 19. Information Barriers & Challenges- Creating and maintaining standards	9	3			12	6	6	12
○ 20. Information Barriers & Challenges - Competitive industry	8	3		1	12	9	3	12
○ 21. Application Benefits - Syntactic interoperability	12				12	11	1	12
○ 22. Application Barriers & Challenges – Non-standard EHR's	11	1			12	11	1	12
○ 23. Application Barriers & Challenges – Data silos	12				12	11	1	12
○ 24. IT infrastructure Benefits – Technical interoperability	12				12	12		12
○ 25. IT Infrastructure Barriers & Challenges – Complexity of the infrastructure	10	2			12	9	3	12
○ 26. Security Benefits – Patient ownership of the data	7	4	1		12	7	5	12
○ 27. Security Barriers & Challenges - Authentication	12				12	11	1	12
○ 28. Security Barriers & Challenges – Patients trust	11	1			12	11	1	12
○ 29. Security Barriers & Challenges – Doctors trust	11	1			12	10	2	12
○ 30. Legal Benefits - Justifying decision making	9	1	2		12	7	5	12
○ 31. Legal Barriers & Challenges – accessibility and ownership	7	5			12	7	5	12
○ 32. Cost aspects benefits – Expected cost savings	12				12	10	2	12
○ 33. Cost aspects Barriers & Challenges – High initial costs	11	1			12	9	3	12
Total	**225**	**42**	**6**	**3**	**276**	**200**	**76**	**276**

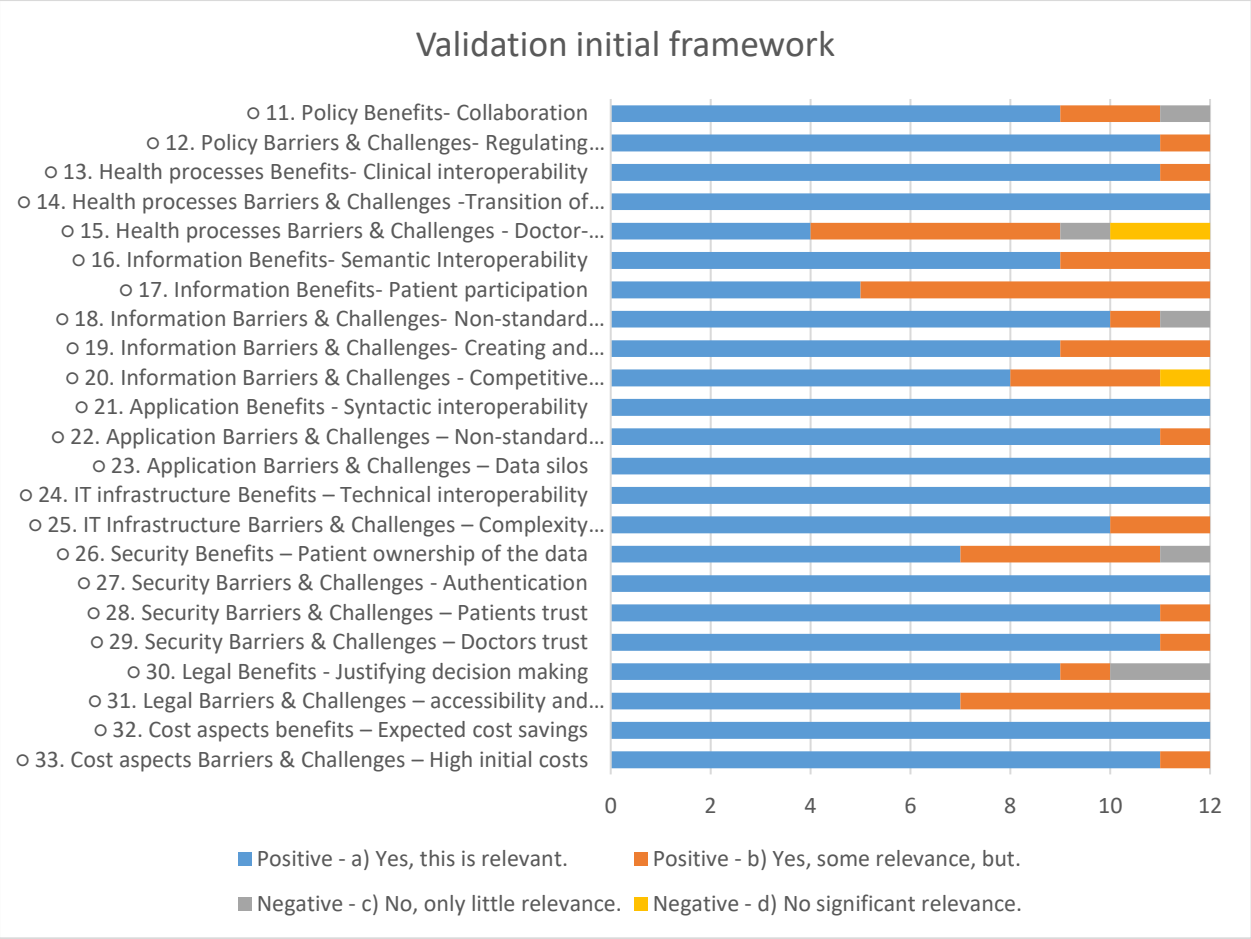


Figure 9, validation initial framework

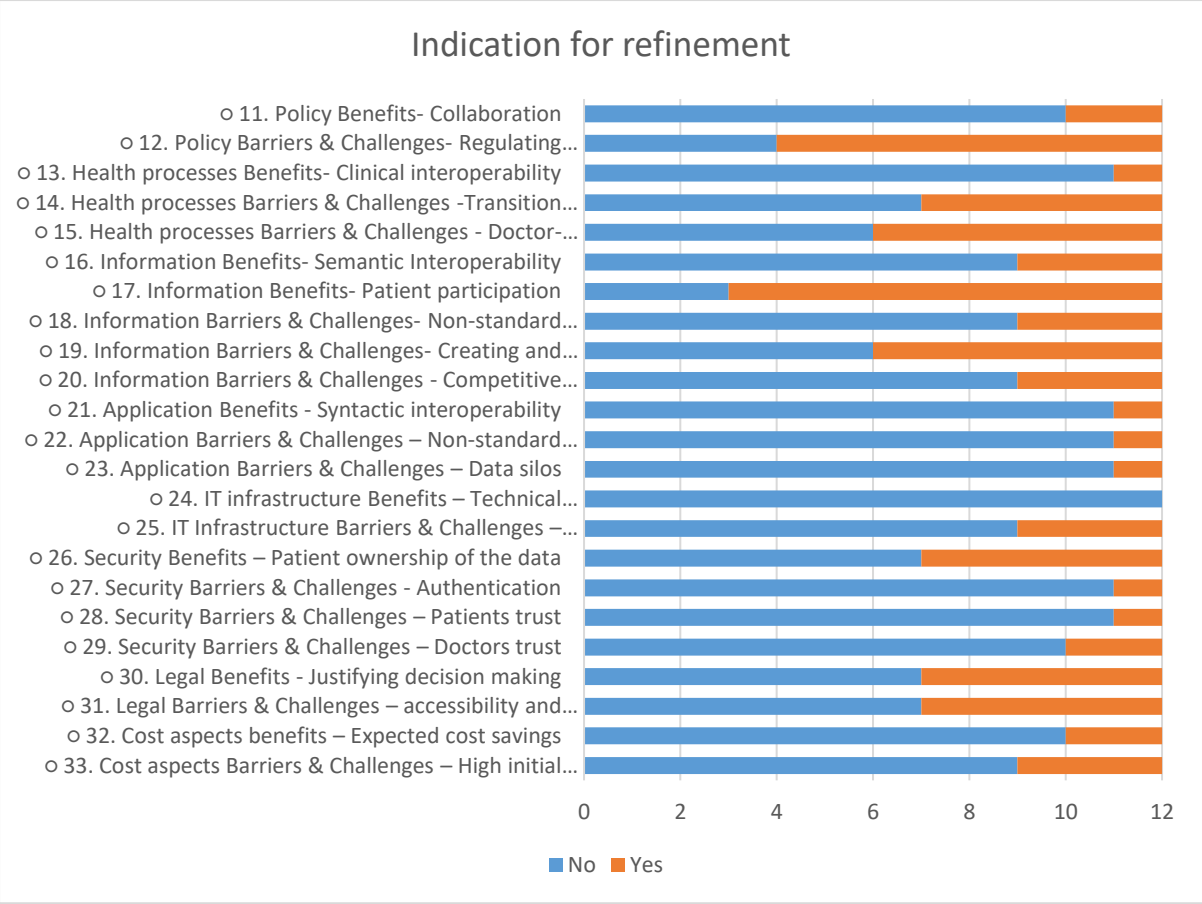


Figure 10, Indication for refinement

Table 12, Validation Q11 – Q33

# Int.	○ **11. Policy Benefits- Collaboration:** ***Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.***	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, agree.	a) Yes, this is relevant.	Positive	2	No
# 02	Partly, the expectation is there, but at an operational level there does not have to be cooperation when data is shared, e.g. lab results. Data exchange can work well but does not have to lead to better collaboration. With hospitals, that can be the case again when we all look at the same data.	b) Yes, some relevance, but.	Positive	2	No
# 03	Yes, otherwise you will get extra actions to retrieve information.	a) Yes, this is relevant.	Positive	4	No
# 04	Agreed	a) Yes, this is relevant.	Positive	4	No
# 05	I think that is in principle true, but we have to watch out for the privacy of patients.	b) Yes, some relevance, but.	Positive	2	No
# 06	Suspect so, wouldn't know why it wouldn't be.	a) Yes, this is relevant.	Positive		No
# 07	Yes, definitely agree. When a client goes from care organization A to B and B already has sufficient information, it helps enormously.	a) Yes, this is relevant.	Positive	5	No
# 08	Yes, I can agree with that, but I also think it is important that we handle information with care.	a) Yes, this is relevant.	Positive	3	No
# 09	Yes, I certainly think so. It will also save time collecting information that is already available elsewhere.	a) Yes, this is relevant.	Positive	5	No
# 10	I don't think collaboration is the primary goal. In the first place it concerns the flow of clients (transfers) and, in addition, the cooperation.	c) No, only little relevance.	Negative		Yes
# 11	Agreed, I see an increasing collaboration with the Hospital (M) where they like to quickly transfer clients to us. The more we know about clients in advance, the better we can respond to that demand. Better information then leads to better coordination, choices and interoperability.	a) Yes, this is relevant.	Positive	5	Yes
#12	Agree with the statement, but not yet very operational. We can now refer digitally with a number of institutions, which immediately ensures better cooperation. It helps, but trust is required beforehand to achieve cooperation.	a) Yes, this is relevant.	Positive	3	No

# Int.	○ **12. Policy Barriers & Challenges- Regulating standardization It is important that regional and national health policies be established on standardization to assure interoperability of systems.**	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, sounds like a condition that must be there. The challenge will be what freedom an organizations has when standards are made 'mandatory'. We can see this (not) happening with the NEN standard, for example.	a) Yes, this is relevant.	Positive		Yes
# 02	100% agree. It should be noted here that internal exchange can also be a challenge, for example due to the use of different plan systems that are not interchangeable.	a) Yes, this is relevant.	Positive		No
# 03	That is correct and that is probably why the national EPD has probably not been established.	a) Yes, this is relevant.	Positive	3	Yes

# 04	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 05	It seems more like a condition to me. In any case, it is a challenge.	a) Yes, this is relevant.	Positive		Yes
# 06	Once, no doubt. Would almost remove the regional.	a) Yes, this is relevant.	Positive	4	No
# 07	Yes, that's right. This is a task for The Hague that, as far as I am concerned, is not fulfilling this sufficiently and is wrongly handing it over to organizations.	a) Yes, this is relevant.	Positive	5	Yes
# 08	I can imagine that order in which the development would ideally take place regional before national. Our region is really different from other regions and I would think it is important that attention is paid to that in the areas in which we differ. I believe in the power of recognizing and interpreting information and I think it is important that we stand behind it. And if it's organized nationally and we don't support it, it won't work. Standardizing in healthcare really requires a different mindset because we are not used to it.	a) Yes, this is relevant.	Positive	4	Yes
# 09	I would consider that a challenge to organize it internationally. Regional and national rather, although also national will be challenging. You have to think of everything when it comes to different regions. I think otherwise it will remain too basic if it is picked up too large.	a) Yes, this is relevant.	Positive	5	Yes
# 10	Yes, this seems to me to be a condition for arranging this, although this does not immediately show which standards are involved. Where does the responsibility for organizing standardization lie? The further we go with standards, the more we commit ourselves to the choice of suppliers, for example. This can also kill innovation and increase dependence on suppliers. (discuss the role of Governance in shaping the chain). When you talk about interoperability, it takes precedence over organizational policy. There is another level in between to organize and initiate it, that is not done through laws. What will be the role and mandate of regional partnerships such as Conforte and the ICT advisory council? Finding connections and achieving success together.	a) Yes, this is relevant.	Positive	3	Yes
# 11	I hesitate on the word regional. I think the Netherlands is small enough to organize it nationally. We will have to make agreements at national level in which standards we communicate information. If there is no unity of language, we speak too easily past each other. It also applies to training institutes that they teach students the same. ("Are we as institutions able to organize this regionally or do we need the government to a greater or lesser extent?"). I think we should organize this on a national scale. The large software suppliers will really not develop especially for the Rijnmond region, so that world is so small that it is best to tackle this nationally. Do we have enough power to organize this ourselves, I think it's really exciting. At the same time, I also dread the fact that the national government will be a determining factor in this, because input from practice is really necessary. The entire zibb movement helps enormously, but at the same time this comes to a large extent from the hospitals and care is 'harassed' with complexities and that currently fits within long-term care. We have had the debacle with the national EPD and now the government no longer wants to intervene directly, but does want to stimulate it. I think that after the incentive phase, there will also have to be a regulatory phase that will force us to do it the same way.	b) Yes, some relevance, but.	Positive		Yes
#12	yes, agree	a) Yes, this is relevant.	Positive	3	No

# Int.	**○ 13. Health processes Benefits- Clinical interoperability Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, sounds logical.	a) Yes, this is relevant.	Positive	3	No
# 02	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
# 03	yes, agree	a) Yes, this is relevant.	Positive	5	No

# 04	Also agree.	a) Yes, this is relevant.	Positive	5	No
# 05	Yes I think so.	a) Yes, this is relevant.	Positive	4	No
# 06	Yes! Would still be nice to have a name to discuss.	a) Yes, this is relevant.	Positive	5	No
# 07	Totally agree. For the processing time alone, it is important that it saves time when information is available.	a) Yes, this is relevant.	Positive	3	No
# 08	Yes, I do believe that. If the person can see what has happened when a client is standing in front of the counter, it helps both the client and costs reduction enormously.	a) Yes, this is relevant.	Positive	5	No
# 09	Yes, it may also open the door for others to 'interfere' in the care that is provided elsewhere. However, the autonomy of institutions must be monitored.	a) Yes, this is relevant.	Positive		No
# 10	Yes, it seems logical to me that the EMR and agreements on using the EMR should be carefully coordinated.	a) Yes, this is relevant.	Positive	5	No
# 11	Yes, of course it helps. In addition, it is also important to look for the right care in the right place. When we can look more closely in each other's data, that assessment can also take place more effectively.	b) Yes, some relevance, but.	Positive	2	Yes
#12	Yes, absolutely true. Quality of care comes is a part this. Technology should also follow suit	a) Yes, this is relevant.	Positive	5	No

# Int.	**○ 14. Health processes Barriers & Challenges -Transition of care The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, that's a huge risk. Heard it regularly around Covid that clients came in infected and that the transfer information did not follow until later.	a) Yes, this is relevant.	Positive		Yes
# 02	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 03	Also true.	a) Yes, this is relevant.	Positive	5	No
# 04	This also applies to business operations and administration. Seems like a real barrier to me.	a) Yes, this is relevant.	Positive		No
# 05	No idea if that is the case (percentage), but I can imagine that you have to listen carefully, it is sometimes not or not well written on paper, things are then done twice or not properly. I can well imagine that.	a) Yes, this is relevant.	Positive		No
# 06	Yes, although this is not just about whether it is correct but also whether it is complete. With regard to timeliness, you could investigate whether the number of MIC reports decreases when information is available earlier. I do recognize that it is one of the most vulnerable moments.	a) Yes, this is relevant.	Positive	5	No
# 07	This also shows that previously shared information helps in the provision of care.	a) Yes, this is relevant.	Positive		No
# 08	As it is now, agreed. So often it happens around medication that the list has already been printed and changes are still made but ultimately not in the system. I absolutely agree that a lot goes wrong here and we do not sufficiently test whether it is correct. The more concrete we get, the more it will help us. And, good agreements about who is responsible for what.	a) Yes, this is relevant.	Positive		Yes
# 09	Yes, it is now mainly a risk that could be reduced with interoperability.	a) Yes, this is relevant.	Positive		Yes

# 10	In my opinion there are sufficient studies that the EMR is not complete at the time of admission. At least in hospitals, a lot of research has already been done on this.	a) Yes, this is relevant.	Positive	5	No
# 11	During transfers, most errors occur, often in other processes as well. By making information transparent and unambiguous, the boundaries of departments and organizations can be better resolved. There is a great risk at those moments, especially when the hospital 'push' on admissions. So the more interoperable organizations are, the smaller the risks. So I think that helps.	a) Yes, this is relevant.	Positive		Yes
#12	Yes, then you are talking about the classic form of transfer of care, where we see that we are increasingly switching to network care where a client is in care for different care and treatment questions at different institutions.	a) Yes, this is relevant.	Positive		Yes

# Int.	**○ 15. Health processes Barriers & Challenges - Doctor- patient relationship The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, agree.	a) Yes, this is relevant.	Positive	5	No
# 02	Can't say that it can be an administrative burden. Healthcare is now hardly involved in this during work, so that I wonder whether that would be the case with interoperability. Retyping in particular creates an administrative burden. A doctor can explain this better in his/her relationship.	c) No, only little relevance.	Negative		Yes
# 03	That's possible, but we have to talk about that. Capturing the risk of overshooting in everything. Doctor: “I have more ink on my hands than blood”.	b) Yes, some relevance, but.	Positive	4	No
# 04	I do believe that this is something to be aware of so that there is a balance in the contact between doctor and patient.	a) Yes, this is relevant.	Positive		No
# 05	We also have to record more and more. We used to know everything by heart, but that is no longer the case, there is no other way. It is necessary, often for legal reasons. During the consultation I do write something but explain that to the patient but especially try to record it after the consultation.	b) Yes, some relevance, but.	Positive		Yes
# 06	No, I don't think this has so much to do with an EMR or interoperability, but more with control. Whether you do this on paper or digitally, it takes a lot of time. In that sense, there has been a shift in trust and everything needs to be recorded. Working digitally makes it easier to create another questionnaire to record data. Moreover, in the nursing homes we are walking around all day and do most of the administrative work afterwards (unlike general practitioners). For us, we spend a lot of time retyping, especially during intake, and if that information were already available, I would only have to read.	d) No significant relevance.	Negative		Yes
# 07	If the questions have already been asked by the first doctor, it is a pity if they are repeated again. This also applies to checking information in the file.	b) Yes, some relevance, but.	Positive		No
# 08	I can imagine that it is a big risk. I think you should organize this in the work process by, for example, collecting information in advance and not during the consultation. I think it plays a role and I think we need to educate ourselves to integrate it into the work.	a) Yes, this is relevant.	Positive		No
# 09	If interoperability goes well, this should bring more time and attention to clients. The client won't walk away and clients will also find that having less forms to fill out will help them.	b) Yes, some relevance, but.	Positive		No
# 10	Yes, I think there is always a risk in that. The computer will continue to be used so time for a good conversation remains necessary. Good to take action on this.	a) Yes, this is relevant.	Positive	4	Yes
# 11	Double. In demography, it is a social fact that we grow older. I think the aim should be that we promote independence of clients even more so that a doctor can pay attention to where it is really needed. There is, however, a risk that clinicians will increasingly look at the reality of the screen and that the patient will not feel heard.	b) Yes, some relevance, but.	Positive		Yes
#12	No, I do not endorse this. It is a challenge that 45% is lost on administration, but it does not have to directly damage the relationship.	d) No significant relevance.	Negative		Yes

# Int.	○ 16. Information Benefits- Semantic Interoperability Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, agree. It sounds obvious that this is an important advantage.	a) Yes, this is relevant.	Positive	4	No
# 02	Yes, nothting to add.	a) Yes, this is relevant.	Positive	5	No
# 03	Yes, that makes sense to me. Doesn't just apply in the digital world.	a) Yes, this is relevant.	Positive	2	No
# 04	Yes, of course	a) Yes, this is relevant.	Positive	1	No
# 05	Yes, in principle it is.	a) Yes, this is relevant.	Positive	1	No
# 06	Yes, completely true and at the same time (which you might like not to hear) that won't work because doctors all work in their own field. People are going to abbreviate in letters and different medical fields will keep their own abbreviations.	b) Yes, some relevance, but.	Positive	2	Yes
# 07	Yes, it is important that everyone uses the same terminology to communicate.	a) Yes, this is relevant.	Positive	1	No
# 08	It requires testing information that is received. An unambiguous interpretation is possible in the case of diagnoses, but when it comes to the perception of the care worker about the patient's condition, it is good to be aware that it may concern a subjective opinion and to test the perception. I think it's going to be very difficult to come to an agreement on this when it comes to an interpretation that we do because of the difference in colouring that we do. Even within the standards there is room for interpretation as with NNN. In the end (fortunately) you can't just turn everything black and white. As with Covid, the clients all have positive tests, but the effect is different for everyone.	b) Yes, some relevance, but.	Positive		Yes
# 09	Yes, that's important. Uniformity is always better anyway.	a) Yes, this is relevant.	Positive	3	No
# 10	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
# 11	Yes, even necessary. At the information layer, we need to be semantically interoperable.	a) Yes, this is relevant.	Positive	4	No
#12	I have some difficulty with it because it is not very concrete and tangible. There is always a lot to do about it, but in practice I have had little trouble with it. Until now in transmural exchange it is nice if it is exchanged in standards, but the care worker is already happy if it comes in unstructured format. So yes, it certainly makes sense, but is in development at maturity level 3-4-5.	b) Yes, some relevance, but.	Positive	4	Yes

# Int.	○ 17. Information Benefits- Patient participation Patients will be more engaged in their health with access to their own patient health record (PHR).	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, I can understand that. We have an PHR in which clients can read along. However, this also raises additional questions whether clients can understand their PHR because of the specific language that healthcare workers use. It is important to make good agreements about how information is recorded for the understanding of clients;	a) Yes, this is relevant.	Positive		Yes
# 02	Yes, and in the context of elderly care even more family participation.	b) Yes, some relevance, but.	Positive	3	Yes
# 03	Totally agree.	a) Yes, this is relevant.	Positive	3	No

# 04	Yes, I wonder if everyone needs it. Some will have a greater need to hear from a doctor or specialist what is going on; they won't look in their file. Could be partly an advantage.	b) Yes, some relevance, but.	Positive	3	Yes
# 05	Yes, I think so too. I see people doing that too, interested in their file.	a) Yes, this is relevant.	Positive	3	No
# 06	Yes, we notice that especially family uses the client portal. I have really seen a clear change in this; sometimes to the detriment but usually to the advantage with greater involvement and reassurance.	b) Yes, some relevance, but.	Positive		Yes
# 07	It is a topic that has been the focus of attention for a long time. It can certainly add value by providing transparency. The opposite is that it could lead to discussion if it led to more questions. Important in our sector because family members also read this.	a) Yes, this is relevant.	Positive	2	Yes
# 08	That depends on the person. I think it is very important with which images clients have aged whether they see need or value in them. Moreover, our systems are often difficult to understand for outsiders. In our target group, informal carers are also part of this, but it will still not apply to everyone that this has value. If we can make it easy to see, it helps.	b) Yes, some relevance, but.	Positive	2	Yes
# 09	Yes and no, it depends on the patient. This may be less true for our target group. And if clients can no longer keep up with this, will family be given access to all care from all years? Is that desirable? Not very clearly an advantage as shown here.	b) Yes, some relevance, but.	Positive		Yes
# 10	Yes, I think that's true but also depends on the client population. It is not so bad for our population, but it does help for the partner or environment.	b) Yes, some relevance, but.	Positive		Yes
# 11	Some do and some don't. There really is a target group that can have a lot of value from it. It can be valuable for people who go from specialist to specialist to follow everything, for example also for chronically ill (COPD or diabetics) who also do self-monitoring. There are audiences I believe in, but not all.	b) Yes, some relevance, but.	Positive		Yes
#12	That is certainly relevant for certain groups	a) Yes, this is relevant.	Positive		No

# Int.	**○ 18. Information Barriers & Challenges- Non-standard formats Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, exactly what I just said	a) Yes, this is relevant.	Positive	1	No
# 02	Correct.	a) Yes, this is relevant.	Positive	2	No
# 03	A free text field has no predetermined purpose and then the reader can interpret it differently than the writer intended and you do not want that.	a) Yes, this is relevant.	Positive		No
# 04	Yes, of course.	a) Yes, this is relevant.	Positive		No
# 05	Yes, I think so too.	a) Yes, this is relevant.	Positive	5	No
# 06	Yes absolutely. That does indeed sometimes go wrong, but luckily we can now look up a lot.	a) Yes, this is relevant.	Positive		No
# 07	100%.	a) Yes, this is relevant.	Positive	1	No
# 08	Complicated. It depends on who reads the text. If you want to learn and work on predictability, I learned from you, then you will have to do something with standards. It is also important for which purpose information was recorded. Attention must be paid to the layering in the information (hard and soft data).	b) Yes, some relevance, but.	Positive		Yes
# 09	Certainly	a) Yes, this is relevant.	Positive		No

# 10	Yes, agree, and also costs money. Manual work also plays an additional role in this. Scanning for the wrong client or incorrectly copying data.	a) Yes, this is relevant.	Positive		No
# 11	That is a risk, although not everything can be captured in standards. It is not a forbidden area to use free text to describe a client. There is too much in the body, condition or environment that is relevant but difficult to quantify. Requires a warm transfer. Also reflected in a SOEP report where there is room for this.	a) Yes, this is relevant.	Positive	1	Yes
#12	Disagree. This is not a causal relationship. The digital exchange of unstructured medical data would also improve healthcare. Receiving information takes precedence over the standard in which.	c) No, only little relevance.	Negative		Yes

# Int.	**○ 19. Information Barriers & Challenges- Creating and maintaining standards Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, this harks back to the organizational policy dimension and the challenges mentioned there. If no standards are set at a national level and organizations have the freedom to implement them in their own way, this will be at the expense of the success of interoperability. I see a vicious circle in this. When organizations are held to comply with standards, this presents challenges in all kinds of areas, while designing standards is not a core business.	a) Yes, this is relevant.	Positive		Yes
# 02	Yes, this might well be the most difficult part of the whole subject. We see at NNN that we have one version in use while the next one is already available. How do we deal with our current goals when science says they are already outdated?	a) Yes, this is relevant.	Positive		Yes
# 03	Yes, I think that that is true and you should do that continuously to prevent empty fields from being communicated. It is therefore also difficult when hospitals work with all kinds of different systems.	a) Yes, this is relevant.	Positive		No
# 04	Yes, that's one of the bigger challenges I expect.	a) Yes, this is relevant.	Positive	5	No
# 05	Yes, you do need a standardization.	a) Yes, this is relevant.	Positive	4	No
# 06	First of all, I think the word 'law' is wrong here, but I can see the biggest problem in the written texts around these standards. Because there (free text fields) are going to be abbreviation that no laws and regulations could compete with. I do not recognize this from practice; it would be nice if that would eventually be the case, but it seems to me a very long way. Laws and regulations could even have the opposite effect. It will probably remain a challenge for a long time to come.	b) Yes, some relevance, but.	Positive		Yes
# 07	Yes, here you can see another task for The Hague to align providers of EPD's and to coordinate adjustments. If there is no control and agreements about these standards, which are also maintained, we will be back to square one in a year. (“regional or national approach?”) To do it right, I think The Hague can play an important role, regionally it would take much longer. For example, to properly organize security. It could also be that the biggest players gain the upper hand and things still go quickly. The Hague should, among other things, take responsibility with regard to the revenue models of software suppliers.	a) Yes, this is relevant.	Positive		Yes
# 08	I think that legislation and regulations mainly 'impose' it. I would think it would be much better if we managed to achieve that together. The fact that we are now switching to ONS means that we are coming closer to each other and how nice it would be if we could do this together more often from an intrinsic motivation. Whether we will get there, I dare to doubt.. do we need the government with a stick? Directors too often think from the perspective of their own organizations and not from the joint responsibility for the ecosystem. It would be more powerful if we could do this ourselves, and if that doesn't work, we may still need a stick of legislation and regulations.	b) Yes, some relevance, but.	Positive	3	Yes
# 09	The extent to which standards are elaborated and made mandatory will a determining factor in this regard. Who determines it and whether it will become an obligation for everyone. Testing via a quality mark and/or auditing also demands a lot from organizations. What do we do with the institutions that are unable or unwilling to connect? Accessibility is important for a large group and not just those who have the resources.	b) Yes, some relevance, but.	Positive		Yes
# 10	I think you're saying two things here that are related.	a) Yes, this is relevant.	Positive		No

# 11	I do think it is. Perhaps at some point there will be opportunities to develop standards across professional boundaries where it is still complicated at the moment. There is certainly also a need for legislation and regulations to prevent arbitrariness. Hope the CIZ indicates in the same way in Groningen and Limburg.	a) Yes, this is relevant.	Positive	5	No
#12	Yes, it should be clear what we are talking about.	a) Yes, this is relevant.	Positive	4	No

# Int.	**○ 20. Information Barriers & Challenges - Competitive industry HIT providers are working in a competitive industry which makes cooperation between these providers challenging.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, you want to maintain a national standard against a commercial party. That is indeed challenging.	a) Yes, this is relevant.	Positive		No
# 02	Agreed	a) Yes, this is relevant.	Positive		No
# 03	Yes, it is and does not help.	a) Yes, this is relevant.	Positive		No
# 04	Yes, that's certainly an important part of why we're not there yet. There are too many different interests for that.	a) Yes, this is relevant.	Positive	1	No
# 05	Yes, it's a challenge, for sure.	a) Yes, this is relevant.	Positive	3	No
# 06	From what I notice, I think this is correct. Quickly point at each other and work with different versions of the standard. I don't know whether that is due to the competitive industry, it could also be that they are just very bad at working together. I recognize that it is not easy.	b) Yes, some relevance, but.	Positive		No
# 07	If EPDs can all talk to each other, you can also switch more easily, such as with energy. Therein lies a risk for commercial companies.	a) Yes, this is relevant.	Positive	3	No
# 08	If we all work with the same applications, that could help us. At the same time, I also believe that competition can help improve systems. There is something good when we work unambiguously together and opt for the same systems, but also scary when the position and self-interest of suppliers become too strong. Here too, the hierarchy in health care is reflected. I think that we as VVT should also do something about it. We let the hospitals be our heart, but we are the aorta. If the aorta can't handle it, the heart has a problem.	b) Yes, some relevance, but.	Positive		Yes
# 09	Yes, because they also have to facilitate it.	a) Yes, this is relevant.	Positive	1	No
# 10	Yes, that's in there too. At the same time, we also want different suppliers because competition is good for development and the price.	b) Yes, some relevance, but.	Positive		Yes
# 11	I actually think that the industry is not competitive right now. I think the risk is quite high that it (per sector) is becoming rather monopolistic. Precisely because it is not really competitive, the collaboration is still very challenging. In this, the government could choose to impose more, for example with regard to being open and sharing information. “Mass is cash register”, which in itself is not a bad thing as long as antisocially high profits are not achieved and cooperation and open standards do not stand in the way.	d) No significant relevance.	Negative	4	Yes
#12	Yes, makes it challenging. It is not necessarily the case that they do not want to cooperate with each other, as can be seen with regard to NUTS. Mainly a question of capacity and commitment, also with suppliers.	a) Yes, this is relevant.	Positive		No

# Int.	○ 21. Application Benefits - Syntactic interoperability Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, once again we see, for example, ONS that it is indicated in advance that they have connectors available to connect with other applications.	a) Yes, this is relevant.	Positive		No
# 02	yes, agree	a) Yes, this is relevant.	Positive		No
# 03	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 04	This is of course very important and conditional to be able to share data.	a) Yes, this is relevant.	Positive		Yes
# 05	Yes, I think so.	a) Yes, this is relevant.	Positive		No
# 06	A big yes.	a) Yes, this is relevant.	Positive	3	No
# 07	Agreements are also necessary for this. That coincides with defining the data itself and the way an API is built.	a) Yes, this is relevant.	Positive		No
# 08	I think that's important to do.	a) Yes, this is relevant.	Positive		No
# 09	Yes, this is again about uniform work. It also concerns which data is and is not included.	a) Yes, this is relevant.	Positive	1	No
# 10	Yes, also makes sense because it also makes connections easier to develop.	a) Yes, this is relevant.	Positive	2	No
# 11	Yes agree.	a) Yes, this is relevant.	Positive		No
#12	Yes, of course	a) Yes, this is relevant.	Positive	2	No

# Int.	○ 22. Application Barriers & Challenges – Non-standard EHR's Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, understandable.	a) Yes, this is relevant.	Positive		No
# 02	Recognizable.	a) Yes, this is relevant.	Positive	1	No
# 03	That's right, just talked about it, they should have persevered in 2011.	a) Yes, this is relevant.	Positive	2	No
# 04	Sure!	a) Yes, this is relevant.	Positive	4	No
# 05	Yes, hopeless. For example, this is already the case with a HIS such as Promedico, Medicom and CGM and depending on where I work, there can be different systems. And unfortunately they still don't 'talk' to each other.	a) Yes, this is relevant.	Positive	2	No
# 06	Yes absolutely.	a) Yes, this is relevant.	Positive	1	No

# 07	A number of large software suppliers are slowly gaining the upper hand, which especially large healthcare providers seem to be following. Smaller organizations will still continue to run on-prem and they cannot be forced. Not only different EPDs, but also different versions within them.	a) Yes, this is relevant.	Positive		No
# 08	Yes, that will be a challenge.	a) Yes, this is relevant.	Positive		No
# 09	Agreed	a) Yes, this is relevant.	Positive		No
# 10	From a market perspective you want different systems but with the same syntax. All hospitals in the region use Hix, which is not the most innovative system.	a) Yes, this is relevant.	Positive		No
# 11	I think that's partly true. When it comes to medical devices, this is quite a limited set. There are certainly exceptions, but it helps enormously to standardize more. Preferably driven by content. Nor will it be infinite in scope, as long as there is room for non-standards outside the zibbs.	b) Yes, some relevance, but.	Positive		Yes
#12	There is little variety in the number of EPDs . Currently Chipsoft, Epic, and a little bit of Nexus and Siemens-SAP. What was sold in the boardrooms was that there would be no problems with the exchange between hospitals using the same EHR. Nevertheless, it has still been a matter of concern (..)	a) Yes, this is relevant.	Positive		No

# Int.	**○ 23. Application Barriers & Challenges – Data silos The majority of the data continue to be confined in data silos.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, agree.	a) Yes, this is relevant.	Positive	4	No
# 02	Yes, recognizable. In the training, we show employees how our systems work, but at the moment we do little with all the information that is now available. We collect a lot of information from clients but then do little with it. Also in the applications there is little available for analysis purposes.	a) Yes, this is relevant.	Positive		No
# 03	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 04	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 05	That's true. When GPs are affiliated with Promedico, everything is in the cloud. When you use Promedico, it's all the same for all practices, I thought. All GPs who have CGM also have the same picture.	a) Yes, this is relevant.	Positive		No
# 06	Yes, with a lot of walls around it.	a) Yes, this is relevant.	Positive		Yes
# 07	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 08	Agreed	a) Yes, this is relevant.	Positive		No
# 09	yes, agree	a) Yes, this is relevant.	Positive		No
# 10	Yes, recognizable.	a) Yes, this is relevant.	Positive		No
# 11	Yes, I think that's true.	a) Yes, this is relevant.	Positive		No

#12	Yes, you can say	a) Yes, this is relevant.	Positive	5	No

# Int.	○ 24. IT infrastructure Benefits – Technical interoperability Technical interoperability standards allows data to move over an infrastructure between two systems.	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, here too	a) Yes, this is relevant.	Positive		No
# 02	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 03	Agreed	a) Yes, this is relevant.	Positive		No
# 04	Yes.	a) Yes, this is relevant.	Positive		No
# 05	Yes, that would be nice.	a) Yes, this is relevant.	Positive		No
# 06	Yes, agree.	a) Yes, this is relevant.	Positive	1	No
# 07	Yes, technology has provided the solution. It will probably also become bigger and faster and thus the frequency of exchange can be increased.	a) Yes, this is relevant.	Positive		No
# 08	Yes, I'm following you right here.	a) Yes, this is relevant.	Positive		No
# 09	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 10	Yes.	a) Yes, this is relevant.	Positive		No
# 11	Also agree.	a) Yes, this is relevant.	Positive	3	No
#12	Yes, completely agree	a) Yes, this is relevant.	Positive	1	No

# Int.	○ 25. IT Infrastructure Barriers & Challenges – Complexity of the infrastructure Infrastructural developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Qualification	Validation	Ranking	indication for refinement
# 01	Yes, that would be in the short term. I do wonder whether standards could in the long run ensure that costs are reduced. In the short term, the costs are certainly high. We now also see that conversions and connectors are expensive when you are at the forefront, and ensures that healthcare organizations across the board adopt a wait-and-see attitude. In addition, there is the risk that organizations will stick to existing solutions and that new/better solutions will have few opportunities.	b) Yes, some relevance, but.	Positive	3	Yes
# 02	Yes, agree. Care organizations are hardly involved in this, the willingness to invest time and money in a subject that they do not deal with on a daily basis.	a) Yes, this is relevant.	Positive	4	No
# 03	By reducing the differences between the systems, I assume that the infrastructure can also be simplified. If there will be only a few EPDs in the future, fewer data centres may be needed.	b) Yes, some relevance, but.	Positive		Yes

# 04	Yes, there is indeed a difficulty because we can only spend money once. Joining that chain at the right time is very important.	a) Yes, this is relevant.	Positive		No
# 05	Yes, because that is of course not always the case that everyone accepts that.	a) Yes, this is relevant.	Positive		No
# 06	Yes, and would also mention the time factor in this. When an organization has done something about its infrastructure, they are not ready for the coming years if others also undergo development during that period. Coordination in this regard is therefore also important between organisations.	a) Yes, this is relevant.	Positive		Yes
# 07	Yes, not everyone has fiberglass laying around and an IT department that can organize this. The advantage of verSaaSen is slowly solving this. This barrier is reduced by further SaaS of applications.	a) Yes, this is relevant.	Positive		No
# 08	Yes, nothing to add.	a) Yes, this is relevant.	Positive	1	No
# 09	Yes.	a) Yes, this is relevant.	Positive		No
# 10	Yes, clear. The change management process part is complex. You chose a difficult subject ;)	a) Yes, this is relevant.	Positive		No
# 11	Also totally agree. Infrastructure is very expensive.	a) Yes, this is relevant.	Positive	2	No
#12	yes, agree	a) Yes, this is relevant.	Positive		No

# Int.	**○ 26. Security Benefits – Patient ownership of the data As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	yes, agree	a) Yes, this is relevant.	Positive		No
# 02	Agreed.	a) Yes, this is relevant.	Positive	1	No
# 03	Yes, in some EMR patients can already put together their own treatment team.	a) Yes, this is relevant.	Positive		No
# 04	Yes, for the most part it is.	a) Yes, this is relevant.	Positive		No
# 05	Yes I think so. Doesn't apply to everyone, but on average I think that's true.	a) Yes, this is relevant.	Positive		Yes
# 06	Yes, I think only a small part will actually do this and the majority shrug. What I find complicated is that I sometimes need access to a file during a shift, while the patient does not know or recognize my name when it is looked up (eg in the LSP). Then it may seem like sniffing, but it is indeed justified use.	b) Yes, some relevance, but.	Positive		No
# 07	I wonder if they can control that access. I think that awareness in this regard is important for patients to make conscious choices. In our sector, this is especially true for family members and less so for clients.	b) Yes, some relevance, but.	Positive		Yes
# 08	Depends on the image of humanity and where you were raised. Requires much more than the assumption that it is.	c) No, only little relevance.	Negative	1	No
# 09	Yes, but I also see the other side of that, clients denying access even though that information is needed. I think that people can be hesitant about this and it is important to get them involved. Physicians should not become overly dependent on information that is there but not available because of client consent. The most relevant data should always be available.	b) Yes, some relevance, but.	Positive	2	Yes

# 10	Yes, can be more difficult. A chance..	a) Yes, this is relevant.	Positive	1	No
# 11	I can see a bit of both in this. I really like the development towards PHR's in which you are the owner of your own data. Also that you determine who does or does not have access to your data. However, when there's a GP who doesn't like you and denies you entry, I'm glad he has his own HIS with information to help him take his medical responsibility. I am in favour of transparency on this theme, but there may also be situations in which healthcare organizations must properly protect their own file.	b) Yes, some relevance, but.	Positive		Yes
#12	There are some assumptions in that.. in the end this is a truth like a cow. If they can manage it, they can grant access too. However, as healthcare providers, we should not be dependent on the access that patients have established as this can compromise the quality of care. Some colleagues are on the line that clients are allowed to determine this, but if EDs do not have access to information, that is one thing. There is a parallel in this with a CPR statement.	a) Yes, this is relevant.	Positive		Yes

# Int.	**○ 27. Security Barriers & Challenges - Authentication Healthcare organizations and individuals must be authenticated and identified before accessing medical information.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, agree. Already a challenge for ourselves. Not so much for us in technology, but for organizing.	a) Yes, this is relevant.	Positive		No
# 02	That's right.	a) Yes, this is relevant.	Positive		No
# 03	A treatment relationship is conditional, but sometimes this is only clear at the last minute, for example with a new employee or temporary worker. Giving a client a role in this could help. In that case, a way out is necessary for acute situations.	a) Yes, this is relevant.	Positive		No
# 04	Yes, of course.	a) Yes, this is relevant.	Positive		No
# 05	Yes, that will eventually be an advantage. It also demands what to do with logins and passwords that have to be changed every time. This also includes an Uzi pass.	a) Yes, this is relevant.	Positive		No
# 06	Yes, but in a way that continues to work without too many obstacles. Develop in collaboration with employees to prevent it from inciting undesirable behaviour because of the obstacles.	a) Yes, this is relevant.	Positive		Yes
# 07	yes, agree	a) Yes, this is relevant.	Positive		No
# 08	Agree, it is important to handle private data with care.	a) Yes, this is relevant.	Positive		No
# 09	yes, agree	a) Yes, this is relevant.	Positive	4	No
# 10	Yes, clearly.	a) Yes, this is relevant.	Positive	1	No
# 11	Yes, all the laws and regulations such as AVG point in that direction. And apart from that, it's just right thing to do!	a) Yes, this is relevant.	Positive		No
#12	At sometime	a) Yes, this is relevant.	Positive	2	No

# Int.	**○ 28. Security Barriers & Challenges – Patients trust To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**

# 01	Yes, logically and agree.	a) Yes, this is relevant.	Positive		No
# 02	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 03	Totally agree.	a) Yes, this is relevant.	Positive		No
# 04	Yes, it is important that good agreements are made about granting permission and sharing information.	a) Yes, this is relevant.	Positive		No
# 05	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 06	yes, agree	a) Yes, this is relevant.	Positive		No
# 07	That will be one of the bigger challenges. The more that is shared, the more likely it is that things will go wrong. Unfortunately, this is most often caused by the object between the screen and the keyboard.	a) Yes, this is relevant.	Positive		No
# 08	Yes, but I think that is also now the case.	a) Yes, this is relevant.	Positive		No
# 09	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 10	Yes.	a) Yes, this is relevant.	Positive		No
# 11	Doubt.. I'm not exactly sure what kind of standards it would be. It does help enormously to have agreements about the communication between doctor and patient. Suppose there are suspicions, to what extent could they be shared or not with other doctors. I think patients have the right to ask what is being recorded and what is done with it.	b) Yes, some relevance, but.	Positive		Yes
#12	yes, agree	a) Yes, this is relevant.	Positive		No

# Int.	**○ 29. Security Barriers & Challenges – Doctors trust Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Agree here too. In addition to concerns about privacy, sometimes there is also a lack of knowledge of what can be recorded and when. Another security point is already what information employees are allowed to see. When there is only 1 source, it becomes challenging who can access the information if there is no treatment relationship yet. How to ensure that access is only available when it is actually a patient of the practitioner.	a) Yes, this is relevant.	Positive		No
# 02	Correct.	a) Yes, this is relevant.	Positive	3	No
# 03	Yes, it is important that the information is up to date. That applies to all disciplines. It is about good, current and timely information. When the client comes through the swinging door, all information must be available.	a) Yes, this is relevant.	Positive	1	No
# 04	Yes, of course. There is always a risk, but this also applies to sharing in our own organization. The basic principle must be that information is correct and reliable.	a) Yes, this is relevant.	Positive	3	No
# 05	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 06	The first sentence is clear with the addition that I also like to receive a signal when new information has been added to the file. The other, that if there is nothing, there really is no information. The second sentence is a bit unclear to me in relation to the first. When	b) Yes, some relevance, but.	Positive	2	Yes

	it comes to trust in other doctors that they handle confidential information in the same way and do not share it with, for example, the food service, or recognizable.				
# 07	I can imagine this is quite a challenge. There is room for assumptions, however.	a) Yes, this is relevant.	Positive		No
# 08	Yes, as discussed. So this is indeed important. If we don't pay enough attention to this, it won't be a success.	a) Yes, this is relevant.	Positive	2	No
# 09	Yes, I gave birth in the hospital over the summer and when registering beforehand it turned out that most of the information was quite outdated. It is important who is responsible for keeping the information up to date. It is important to make good agreements about this. The question of who is responsible for what and where does that responsibility extend in the case of transfer of care.	a) Yes, this is relevant.	Positive		Yes
# 10	Yes, clear.	a) Yes, this is relevant.	Positive		No
# 11	From the position of doctor, it seems important to me to know what the last measurements have been, who measured the measurements and it must be clear that measurements have been taken in a safe and uniform manner. Needed to give meaning to the values that are there. This may be easier to trust from a fellow doctor than measurements from clients. This trend seems to me to be the most important.	a) Yes, this is relevant.	Positive		No
#12	Yes, definitely true	a) Yes, this is relevant.	Positive		No

# Int.	**○ 30. Legal Benefits - Justifying decision making Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	yes, agree	a) Yes, this is relevant.	Positive	1	No
# 02	Yes… (doubt)	b) Yes, some relevance, but.	Positive		Yes
# 03	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 04	Yes, rightly so.	a) Yes, this is relevant.	Positive		No
# 05	Yes I think.	a) Yes, this is relevant.	Positive	5	No
# 06	The first part of the sentence yes. The second part of the sentence raises questions about the justification of the decision-making process. It's not so much that it's not right, but the words are a bit large in proportion.	c) No, only little relevance.	Negative		Yes
# 07	Yes, clear agreements are definitely necessary.	a) Yes, this is relevant.	Positive		No
# 08	You hear me sigh because I find this complicated. There are so many elements in this sentence that you can look at differently. They are big themes as described here. I think this is going to make everyone gasp because it's about the way we'd like to look at care. Needs some elaboration here...	c) No, only little relevance.	Negative		Yes
# 09	Yes, of course. Or at least how we can handle data. When we organize it regionally, there is more room than when it is organized nationally. National regulation does, however, give a little more confidence in what is expected and what the working method is.	a) Yes, this is relevant.	Positive		Yes
# 10	Yes.	a) Yes, this is relevant.	Positive		No

# 11	That helps enormously when there is a third independent party that monitors and assesses that we have our affairs in order. This would help enormously for the trust between the parties, especially if there is a legal framework for this.	a) Yes, this is relevant.	Positive		Yes
#12	At sometime	a) Yes, this is relevant.	Positive		No

# Int.	**○ 31. Legal Barriers & Challenges – accessibility and ownership Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	I think we should work towards more substantive ownership of the patient himself. It is his/her data, but security is difficult for patients themselves.	b) Yes, some relevance, but.	Positive		Yes
# 02	Agree	a) Yes, this is relevant.	Positive		No
# 03	Certainly true. We are jointly responsible for having good agreements in the healthcare chain and incorporating certainties to prevent loss of data.	a) Yes, this is relevant.	Positive		No
# 04	Yes, agree. Ownership threatens to become more mixed up so this is a relevant aspect.	a) Yes, this is relevant.	Positive		No
# 05	Yes, I understand.	a) Yes, this is relevant.	Positive	1	No
# 06	It doesn't matter to me whether it is in the Cloud, but whether it is recorded who has had access. Intuitively, a cloud solution seems even better than direct communication to the EHR of other providers.	b) Yes, some relevance, but.	Positive		Yes
# 07	Yes, 100% agree. As a client, you are the owner, but if your data is held by multiple types of healthcare institutions, they must all have their business in order.	a) Yes, this is relevant.	Positive	4	No
# 08	I know too little about it.	b) Yes, some relevance, but.	Positive		No
# 09	It must be prevented that commercial companies or insurers gain access to client information and that premiums could be determined on this basis.	a) Yes, this is relevant.	Positive	3	Yes
# 10	Yes.	a) Yes, this is relevant.	Positive		No
# 11	A cloud solution is little more than a computer located somewhere else. I don't think cloud solutions would pose any specific legal issues. Perhaps a cloud setup is even safer than on prem. In this one I trigger on the word 'Cloud'. If that is less relevant in this statement then agree. Sharing information between different entities does indeed present legal problems, apart from the fact that it happens in the Cloud. Organizational boundaries are also increasingly blurred when we share clients and treatment results. The question 'Whose does the patient belong to?' is becoming increasingly difficult to answer. It is also increasingly true for employees that the boundaries are gradually becoming diffused. It is increasingly about what a patient needs and we can organize around it.	b) Yes, some relevance, but.	Positive		Yes
#12	No, it doesn't necessarily have to be true. You make agreements about this with each other. A cloud solution is a means, but there are also other aspects involved. Sharing information on premise poses also legal issues. I disagree that those are problems. The fact that people may not have enough knowledge about this may make it problematic	b) Yes, some relevance, but.	Positive	1	Yes

# Int.	**○ 32. Cost aspects benefits – Expected cost savings Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**

# 01	Yes, which we started with.	a) Yes, this is relevant.	Positive	5	No
# 02	yes, agree	a) Yes, this is relevant.	Positive		No
# 03	Yes, absolutely true.	a) Yes, this is relevant.	Positive	1	No
# 04	Secure.	a) Yes, this is relevant.	Positive	2	No
# 05	Well, I certainly think so, because that saves a lot of time.	a) Yes, this is relevant.	Positive		No
# 06	Yes, of course! And that doesn't even include the costs of repairing (almost) errors.	a) Yes, this is relevant.	Positive	4	Yes
# 07	Yes, agree. Recently changed dentist and had to pay costs for transferring the information. This allows the administrative employee to be paid. So could definitely save costs	a) Yes, this is relevant.	Positive	4	No
# 08	Agreed	a) Yes, this is relevant.	Positive	4	No
# 09	Yes.	a) Yes, this is relevant.	Positive	4	No
# 10	Yes, fantastic and if you also indicate where we can get the savings. How can we recoup the investments of these kinds of projects? Or do we reduce the workload with this? It makes a difference when we need fewer employees for retyping or a desk saving spread across all departments.	a) Yes, this is relevant.	Positive	3	Yes
# 11	And the software parties concerned do not make enormous profits. There will certainly be savings because retyping is avoided and we can rely more on the quality.	a) Yes, this is relevant.	Positive	1	No
#12	Yes	a) Yes, this is relevant.	Positive		No

# Int.	**○ 33. Cost aspects Barriers & Challenges – High initial costs Healthcare organisations are reluctant to committing on implementation because of the initial costs.**	**Qualification**	**Validation**	**Ranking**	**indication for refinement**
# 01	Yes, agree.	a) Yes, this is relevant.	Positive	2	No
# 02	Agree, it is unclear how high the administrative burden is based on the transfer of data and how does the time of employees relate to the effort required for interoperability?	a) Yes, this is relevant.	Positive	5	No
# 03	I think they (Management) don't know. I think that it's now no more than a feeling because otherwise we would sooner say yes to a subsidy such as VIPP Inzicht. But when no one has calculated this and made it concrete, it becomes more difficult to make decisions about it. If it had been clear how much it could have yielded, there would probably have been a different choice. Now (probably) chosen to postpone it out of ignorance of the cost.	a) Yes, this is relevant.	Positive		Yes
# 04	Yes, don't just think of a cost aspect, but certainly play a part in the consideration.	b) Yes, some relevance, but.	Positive	2	No
# 05	Yes, agree.	a) Yes, this is relevant.	Positive		No
# 06	Yes, and due to ignorance of the hidden costs. I don't think the MT know how much time I spend retyping and what the costs are.	a) Yes, this is relevant.	Positive	3	No

# 07	Yes, the supplier has to invest and will pass the costs on to the healthcare provider.	a) Yes, this is relevant.	Positive	2	No
# 08	I think that definitely plays a role. An ECD is visible but what you are doing is much less visible.	a) Yes, this is relevant.	Positive	5	No
# 09	Costs but also resources such as time.	a) Yes, this is relevant.	Positive	2	Yes
# 10	Yes	a) Yes, this is relevant.	Positive	2	No
# 11	I think there is also some reluctance about who is in charge, comparable to legislation and regulations. The in-between area does not belong to anyone and how do we organize it together. I think this will still be a big challenge. Who will take the lead and how are we going to do that? I think this is also one of the reasons why it is difficult to get started. The proceeds lie in the future and are now difficult to cash in. I do believe in it. Certainly in the logistical area, benefits can be gained very quickly. Just by preventing a doctor from having to call '24' institutions to get a client placed. In the case of referral aid 010, this resulted in a shortening of the length of stay of 1.4-1.5 days. That is really gigantic and that is quite easy to convert into money. It is important for the further development of referral aid 010 in the intermediate area to determine growth together.	a) Yes, this is relevant.	Positive	3	No
#12	Yes, and don't rule out the structural costs	a) Yes, this is relevant.	Positive		Yes

F3 Part 2 Analysis for refining the initial framework

Policy Benefits- Collaboration: *Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment*. This aspect has been validated 11 times in the interviews. There were 2 suggestions for refinement adding 'transfers' to the description and it got the second best ranking with 35 point. The interviews showed that this is an important aspect in the framework and will benefit organizations greatly when this is established.

#7 Yes, definitely agree. When a client goes from care organization A to B and B already has sufficient information, it helps enormously. #9 Yes, I certainly think so. It will also save time collecting information that is already available elsewhere. #11 Agreed, I see an increasing collaboration with the Hospital (M) where they like to quickly transfer clients to us. The more we know about clients in advance, the better we can respond to that demand. Better information then leads to better coordination, choices and interoperability.

Policy Barriers & Challenges- Regulating standardization: *It is important that regional and national health policies be established on standardization to assure interoperability of systems.* This aspect has been validated in all interviews. There were eight suggestions for refinement and it got the second highest ranking for barriers and challenges with 27 points showing this to be an important barrier in the framework.

The interviewees thought of this aspects as conditional for the success of interoperability and a probable cause why the national EPD was unsuccessful in 2011. The regional or national approach was discussed several times, also in part three and four. A regional approach was considered best since collaboration takes place on a regional level but there were also strong arguments for the role of the government to regulate standards on a national level.

#8 I can imagine that order in which the development would ideally take place regional before national. Our region is really different from other regions and I would think it is important that attention is paid to that in the areas in which we differ. #11 I think the Netherlands is small enough to organize it nationally. We will have to make agreements at national level in which standards we communicate information.

Health processes Benefits- Clinical interoperability: *Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.* This aspect has been validated in all interviews. There was one suggestion refinement (the right care at the right place) and with 46 points this was the biggest benefit scored in the interviews meaning that an elderly care ecosystem will benefit most from this aspect.

#7 Totally agree. For the processing time alone, it is important that it saves time when information is available. #11 Yes, of course it helps. In addition, it is also important to look for the right care in the right place.

Health processes Barriers & Challenges -Transition of care *The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.* This aspect was validated in all interviews. There were 5 suggestions for refinement and the ranking was average with 15 points. Refinement was suggested to describe it more as a challenge instead of a risk and to add network care in case care is shared between organizations, similar to the first aspect.

#1 Yes, that's a huge risk. #6 Yes, although this is not just about whether it is correct but also whether it is complete. #12 Yes, then you are talking about the classic form of transfer of care, where we see that we are increasingly switching to network care where a client is in care for different care and treatment questions at different institutions.

Health processes Barriers & Challenges – Doctor- patient relationship *The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.* This aspect was validated in 9 interviews. Two of the interviews scored this aspect with no significant relevance. There were 6 suggestions for refinement and it scored average with 13 point.

The interviewees questioned the description for elderly care since there is little screen time in the presence of patients. However, the amount of information required to register is increasing over the years. We reviewed the literature on this aspect again (Janett & Yeracaris, 2020) and decided that this aspect was justly criticised since it is more related to the development of EMR then interoperability. Since we aim to validate our framework for interoperability we believe this aspect is **not valid** and excluded it in the final framework.

#5 We also have to record more and more. .. It is necessary, often for legal reasons. #6 No, I don't think this has so much to do with an EMR or interoperability, but more with control. …Moreover, in the nursing homes we are walking around all day and do most of the administrative work afterwards (unlike general practitioners). For us, we spend a lot of time retyping, especially during intake, and if that information were already available, I would only have to read. #12 No, I do not endorse this. It is a challenge that 45% is lost on administration, but it does not have to directly damage the relationship.

Information Benefits- Semantic Interoperability: *Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.* This aspect was validated in all interviews. There were 3 suggestions for refinement and it scored the third biggest benefit from interoperability with 31 points. Since this aspect describes the benefit of the information level it is not surprising that it had a high score. Access to timely, reliable and good information is essential for all involved in healthcare. Two interviewees reasoned the importance of free text field and abbreviations within the standards to describe the patient's condition. The subjective perception of the patient's condition from the patient as well as the clinicians point of view is an essential part of healthcare. The interviewees argued the importance of this perception and the need to test the perception when care is shared or patients are being transferred. Furthermore interviewee 12 argued that semantic standards are relevant but that healthcare will benefit more from receiving unstructured information than no information at all, advocating this aspect as relevant but not the most urgent.

#6 Yes, completely true and at the same time (which you might like not to hear) that won't work because doctors all work in their own field. People are going to abbreviate in letters and different medical fields will keep their own abbreviations. #8 An unambiguous interpretation is possible in the case of diagnoses, but when it comes to the perception of the care worker about the patient's condition, it is good to be aware that it may concern a subjective opinion and to test the perception. #12 There is always a lot to do about it, but in practice I have had little trouble with it. Until now in transmural exchange it is nice if it is exchanged in standards, but the care worker is already happy if it comes in unstructured format.

Information Benefits- Patient participation *Patients will be more engaged in their health with access to their own patient health record (PHR).* This aspect was validated in all interviews. There were 9 suggestions for refinement and it scored an average with 16 points.

The main reason for refinement is in the target group. Within elderly care, patients are less digital minded and in case of dementia less involved. The target group is slowly increasing but it is still mainly family that is engaged in the PHR.

#9 Yes and no, it depends on the patient. This may be less true for our target group. #11 Some do and some don't. There really is a target group that can have a lot of value from it.

Information Barriers & Challenges- Non-standard formats *Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.* This aspect was validated in 11 interviews. There were 3 suggestions for refinement and in scored below average with 10 points.

The main suggestion, as we saw before, was on the importance of free text to describe the patient's condition and a preference for unstructured information above no information.

#8 Complicated. It depends on who reads the text. If you want to learn and work on predictability, I learned from you, then you will have to do something with standards #11 That is a risk, although not everything can be captured in standards. It is not a forbidden area to use free text to describe a client. #12 The digital exchange of unstructured medical data would also improve healthcare. Receiving information takes precedence over the standard in which.

Information Barriers & Challenges- Creating and maintaining standards *Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.* This aspect was validated in all interviews. There were 6 suggestions for refinement and it scored above average with 21 points.

The answers confirmed the importance of a regulatory body to develop and maintain standards as well as to align providers of EPD's in their developments. The use of free text is seen as an obstacle here which might enhance the duration in which these standards are developed.

#2 Yes, this might well be the most difficult part of the whole subject. #9 The extent to which standards are elaborated and made mandatory will be a determining factor in this regard.

Information Barriers & Challenges – Competitive industry *HIT providers are working in a competitive industry which makes cooperation between these providers challenging*. This aspect has been validated 11 times. There were 3 suggestions for refinement and it got an average score with 12 points.

It is important for HIT providers to maintain a competitive position. Since most EPD's are developed for a specific domain the challenge is mainly to cooperate between domains. Interviewee #11 stated justly that competition within sectors is actually low due to the amount of providers left. This is a negative development for healthcare organization depended on these systems.

#8 If we all work with the same applications, that could help us. At the same time, I also believe that competition can help improve systems. #11 I actually think that the industry is not competitive right now.

Application Benefits – *Syntactic interoperability:* *Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure*. This aspect was validated in all interviews. There was one suggestion and it scored below average with 8 points. The suggestion for refinement was about this aspect being conditional for the success of interoperability.

#4 This is of course very important and conditional to be able to share data.

Application Barriers & Challenges – Non-standard HER's *Many healthcare organizations have different HER systems with different (syntactic) standards in use.* This aspect was validated in all interviews. There was 1 suggestion for refinement and it scored below average with 10 points. The refinement suggested was that certain standards could be implemented faster due to a limited set of variables, such as for medical devices.

#11 I think that's partly true. When it comes to medical devices, this is quite a limited set.

Application Barriers & Challenges – Data silos *The majority of the data continue to be confined in data silos.* This aspect was validated in all interviews. There was 1 suggestion for refinement and it scored below average with 9 points.

#6 Yes, with a lot of walls around it.

IT infrastructure Benefits – Technical interoperability *Technical interoperability standards allows data to move over an infrastructure between two systems*. This aspect was validated in all interviews. There was no suggestion for refinement and it scored below average with 5 points.

IT Infrastructure Barriers & Challenges – Complexity of the infrastructure *infrastructural developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.* This aspect was validated in all interviews. There were 3 suggestions for refinement and it scored below average with 10 points.

A suggestion for refinement was that infrastructure developments are costly and complex on the short-term but might be reduced once standards are incorporated and fewer EPD's are in use.

#1 Yes, that would be in the short-term. I do wonder whether standards could in the long run ensure that costs are reduced. #3 By reducing the differences between the systems, I assume that the infrastructure can also be simplified. If there will be only a few EPDs in the future, fewer data centres may be needed.

Security Benefits – Patient ownership of the data *As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.* This aspect was validated in 11 interviews. There were 5 suggestions for refinement and it scored below average with 5 points.

The suggestion for refinement, likewise to the use of a PHR might not apply to elderly care since the target group will be less involved in managing their health data. A concern was expressed when this would cause doctors not to have the information they need. A need for a separate EPD in which doctors can access information independently from the patients permission will still be needed.

#5 Yes I think so. Doesn't apply to everyone, but on average I think that's true. #7 I wonder if they can control that access. I think that awareness in this regard is important for patients to make conscious choices. In our sector, this is especially true for family members and less so for clients.

Security Barriers & Challenges – Authentication *Healthcare organizations and individuals must be authenticated and identified before accessing medical information.* This aspect was validated in all interviews. There was 1 suggestions for refinement and it scored below average with 7 points.

#6 Yes, but in a way that continues to work without too many obstacles. Develop in collaboration with employees to prevent it from inciting undesirable behaviour because of the obstacles.

Security Barriers & Challenges – Patients trust *To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.* This aspect was validated in all interviews. There was 1 suggestions for refinement and it scored no points meaning this aspects was validated but with little importance.

The suggestion was to refine with the standards for sharing information between doctors and patient, with the remark that patients have a right to know what is recorded.

#11 I think patients have the right to ask what is being recorded and what is done with it.

Security Barriers & Challenges – Doctors trust *Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact HER implementations.* This aspect was validated in all interviews. There were 2 suggestions for refinement and it scored average with 11 points.

The suggestion for refinement came from the second sentence with the question on who is responsible for updating information and signalling when information has been updated. Furthermore, it was indicated that this rule also applies within an organization where agreements need to be in place on sharing information.

#4 Yes, of course. There is always a risk, but this also applies to sharing in our own organization. The basic principle must be that information is correct and reliable.

Legal Benefits – Justifying decision making *Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.* This aspect was validated in 10 interviews. There were 5 suggestions for refinement and it scored below average with 6 points.

This aspects was considered too difficult and needed explanation in each interview. The overall impression however was that the use of standards supported with legislation and audited will help trust between organizations.

#11 That helps enormously when there is a third independent party that monitors and assesses that we have our affairs in order. This would help enormously for the trust between the parties, especially if there is a legal framework for this.

Legal Barriers & Challenges – accessibility and ownership *Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.* This aspect was validated in all interviews. There were 5 suggestions for refinement and it scored below average with 9 points.

Refinement suggested here was that cloud solutions do not pose extra legal issues. However the interviewee agreed that legal issues (challenges) are present the more we share information. The question 'Who does a patient belong to?' becomes increasingly more difficult to answer in network care as well as who is responsible for the accuracy of the data shared.

#3 Certainly true. We are jointly responsible for having good agreements in the healthcare chain and incorporating certainties to prevent loss of data.

Cost aspects benefits – Expected cost savings *Cost savings are expected when (semantic) standards are used, practitioners use the same HER and there is a one-time entry of data, cutting out repeated work.* This aspect was validated in all interviews. There were 2 suggestions for refinement and it scored above average with 28 points.

One suggestion for refinement was to describe where cost saving could be found and materialized. If cost savings should come from time reductions, it is essential to quantify these savings in further research to convince decision makers.

#5 Well, I certainly think so, because that saves a lot of time. #6 Yes, of course! And that doesn't even include the costs of repairing (almost) errors.

Cost aspects Barriers & Challenges – High initial costs *Healthcare organisations are reluctant to committing on implementation because of the initial costs.* This aspect was validated in all interviews. There were 3 suggestions for refinement and it scored above average with 26 points.

Refinement was suggested because the initial costs are probably unknown to management. Same goes for the cost now involved in retyping information from other systems. The overall impressions however was that cost play an important role in decision making and clarifying cost would help decision makers.

#3 If it had been clear how much it could have yielded, there would probably have been a different choice. Now (probably) chosen to postpone it out of ignorance of the cost. #12 Yes, and don't rule out the structural costs.

F4 Part 3 & 4 Completeness and Practicality for implementation

The tables below show the result of analysis for refinement from the interviews for Q34-Q36 and Q37-Q39.

Table 13, Refinement for completeness

Number of Interview	**indication for refinement**		
Dimension - sublevel	**No**	**Yes**	**total**
○ 34. Your overall impression on the initial framework?	3	9	12
○ 35. Are the eight levels in the initial framework sufficient?	9	3	12
○ 36. Any missing Benefits, barriers & challenges?	9	3	12
Total	**21**	**15**	**36**

Table 14, Refinement for practicality

Number of Interview	**indication for refinement**		
Dimension - sublevel	**No**	**Yes**	**Total**
○ 37. Do these benefits influence implementation?	3	9	12
○ 38. Do these barriers & challenges influence implementation?	9	3	12
○ 39. Do these aspects Influence decision making?	7	5	12
Total	**19**	**17**	**36**

Table 15, indications for refinement Q 34 - Q39

#Int	**Overall impression and completeness Q34-Q36**	**Practicality for implementation Q37-Q39**
#1	A general concern from ICT is if this data has to be hosted somewhere, the government also has a role to organize this properly;	It helps to know what benefits there are. To start with, whether the benefits outweigh the costs
#2	I wonder what a healthcare employee really gains from all that healthcare data. We say it's an advantage, but that's what the literature shows	At the organizational level, it is mainly in the costs
#3	It is important to submit more hard data, preferably in euros, if they want to work with this in the hectic schedule of their agenda. Or, let us know what keeps going wrong. In the case of medication transfer, for example, this is huge with a wrong or missing transfer. And yet so far that hasn't been enough to solve it.	I think we are almost paralyzed by the multiplicity of systems.
#4	The general impression of the framework is that when interoperability is set up properly it can yield many benefits, but that there are also many variables and it is very complicated to implement this in a healthcare chain in which so	Decision-making is often mainly a cost-benefit story, but the most important thing is how this could improve the care process. In practice we have to do with all kinds

#Int	Overall impression and completeness Q34-Q36	Practicality for implementation Q37-Q39
	many parties play a role. The tricky part is that the government should play a central role in this, but there are changes every four years, which sometimes means that different (policy) choices are made.	of short-term business goals and money that we can only spend once and then perhaps prefer real estate to a new server.
#5	If you want to implement these kinds of things, there must also be room for it. Not only financially (you can of course also hire people), but in smaller organizations there are often so many issues that this leads to a shortage of time	In a small practice I certainly think that helps and if legislation and regulations indicate that it's a 'must', that will help. Without any regulatory demand, it sometimes turns out to be a very long process.
#6	When it's not your job, it helps a lot to separate and organize these topics It helps in raising awareness before we start developing.	A translation is still needed, but unravelling which facets the diamond consists of, I think it could remove a lot of confusion of tongues. and further concretization helps
#7	The client dimension might still be allowed because he/she is the owner of the data.	I hope it's approached this way more often because it gives a much better picture so that if you run into barriers during the process and you've already defined them in advance, you can act on them better.
#8	It's also fun to be involved in such a development!	What it does through the simplification always helps. To know whether all elements have been identified for a complex issue and to think about it sufficiently. For me it's about the added value and that may well lie further in the future
#9	I think further elaboration and deepening is necessary. I still miss the patient or client in this, could be a separate dimension.	Working towards what is possible in the short term might help. organizations hardly know where to start due to differences in maturity on this subject.
#10	Like a touchstone, it helps to check that you are complete	.
#11	It is quite a comprehensive subject that cannot be introduced today or tomorrow. This should lead to lower costs and higher quality.	Precisely by looking at it at different levels, you have the opportunity to reach different people. shredding the complexity
#12	… Should there be a separate layer for governance or the patient? We've talked about that extensively in the past but kept it to this model.	As a model it is an excellent effect. Yes, the question is whether it can be raised as a reference

F5 Ranking the aspects in the framework

Tables 16 and 17 show the results of question 40 in which the interviewees were asked to rank the top 5 benefits and barriers & challenges from the initial framework from 1-5; 1 being a low benefit and 5 a high benefits (equal to the barriers)

Table 16, Ranking the benefits

Dimension	Sub level	Description	#1	#2	#3	#4	#5
Policy	Collaboration	Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.		25%	17%	17%	25%
Health processes	Clinical interoperability	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.		8%	17%	17%	50%
Information	Semantic interoperability	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	25%	17%	8%	33%	8%
Information	Patient participation	Patients will be more engaged in their health with access to their own patient health record (PHR).		17%	33%		
Application	Syntactic interoperability	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	8%	17%	8%		
IT Infrastructure	Technical interoperability	Technical interoperability standards allows data to move over an infrastructure between two systems.	17%		8%		
Security	Patients ownership of the data	As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	25%	8%			
Legal	Justifying decision making	Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	8%				8%
Cost aspects	Expected cost savings	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	17%	8%	8%	33%	8%

Table 17, Ranking of the barriers and challenges

Dimension	Sub level	Description	#1	#2	#3	#4	#5
Policy	Regulating standardization	It is important that regional and national health policies be established on standardization to assure interoperability of systems.			25%	17%	17%
Health processes	Transition of care	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.					25%
Health processes	Doctor- patient relationship	The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.				17%	8%
Information	Non-standard formats	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	25%	8%			8%
Information	Creating and maintaining standards	Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.			8%	17%	17%
Information	Competitive industry	HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	17%		17%	8%	
Application	Non-standard EHR's	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	17%	17%		8%	
Application	Data silos	The majority of the data continue to be confined in data silos.				8%	8%
IT Infrastructure	Complexity of the infrastructure	Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	8%	8%	8%	8%	
Security	Authentication	Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	8%	8%		8%	
Security	Patients trust	To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.					
Security	Doctors trust	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	8%	17%	17%		
Legal	Accessibility and ownership	Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	17%		8%	8%	
Cost aspects	High initial costs	Healthcare organisations are reluctant to committing on implementation because of the initial costs.		42%	17%		17%

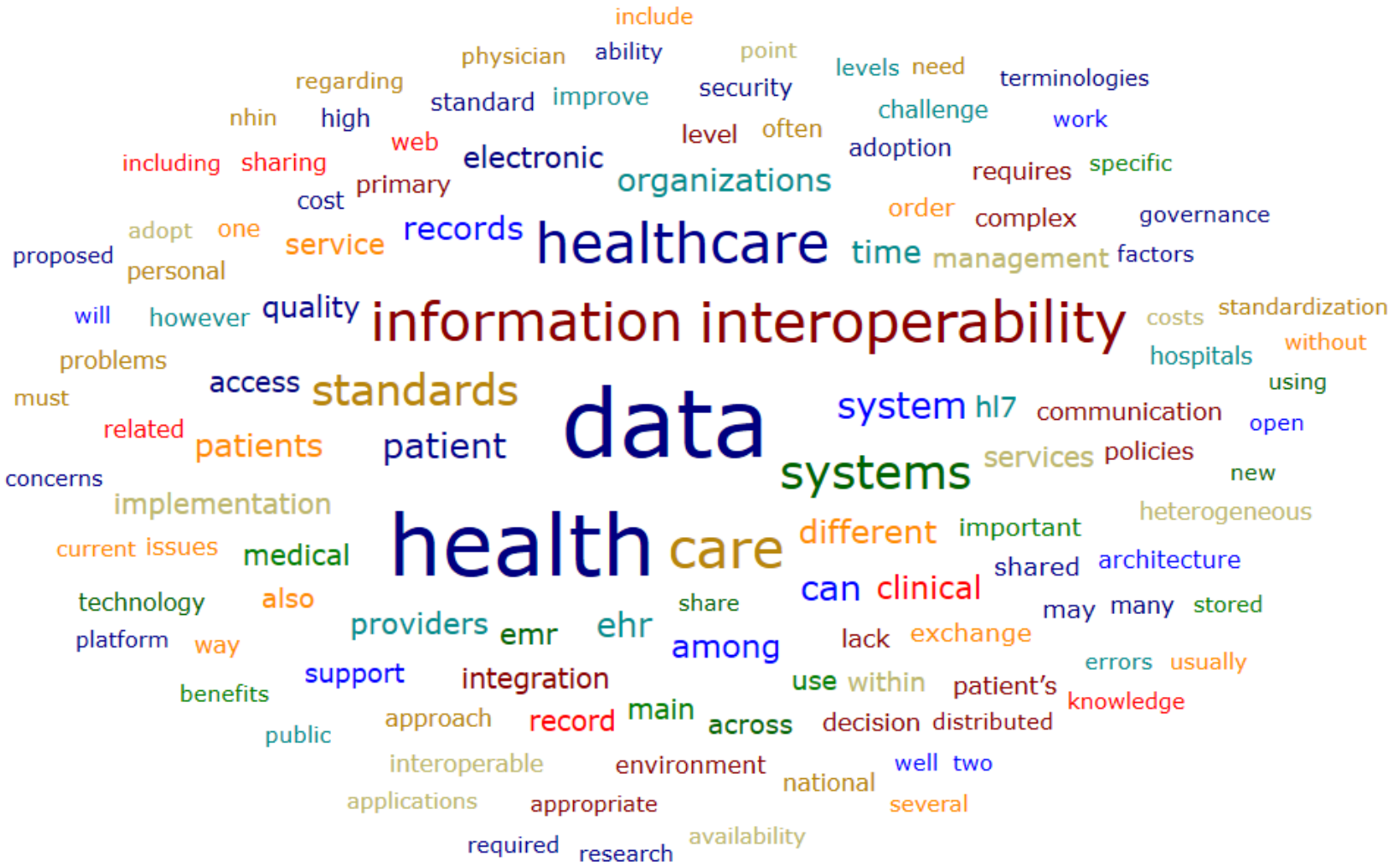
F6 Comparison initial and empirical framework

Table 18, Comparison initial and empirical framework

Level/ Dimension	Sublevel	Description Initial framework	Description- empirical framework
Policy Benefits	Collaboration	• Collaboration between healthcare organizations will improve if information is shared in an open, interoperable environment.	Collaboration, shared care and transfers between healthcare organizations will improve if information is shared in an open, interoperable environment.
Policy Barriers & Challenges	Regulating standardization	• It is important that regional and national health policies be established on standardization to assure interoperability of systems.	It is conditional that standardization is regulated nationally with attention to regional differences to assure interoperability of systems.
Health processes Benefits	Clinical interoperability	• Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care.	Sharing information between clinicians across organizational boundaries will help advance delivery of best possible care, at the right place.
Health processes Barriers & Challenges	Transition of care	• The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers.	The transition of care (and information) is a time of high risk. It is estimated that 80% of serious medical errors result from miscommunication during these transfers so good agreements are needed for this process.
	Doctor- patient relationship	• The move toward EMR and interoperability can be a threat to the physician patient relationship and an administrative burden for the healthcare system.	--Excluded--
Information Benefits	Semantic interoperability	• Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency.	Semantic interoperability ensures meaningful en reliable use of information received from other systems, for patients health with better data quality and consistency and room for the (subjective) perception of the patient condition.
	Patient participation	• Patients will be more engaged in their health with access to their own patient health record (PHR).	Depending on the type of care, patients and family will be more engaged in the health process with access to the patient's health record (PHR).
Information Barriers & Challenges	Non-standard formats	• Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors.	Data sharing in non-standard formats can take considerable time to understand and can lead to interpretation errors. Non-standard information is still better than no information at all.
	Creating and maintaining standards	• Choosing and maintaining standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.	Choosing, maintaining and mandatory of standards requires a fundamental understanding of the information at hand and without a legislative force it will be extremely difficult to align healthcare organization in choosing the same standards.
	Competitive industry	• HIT providers are working in a competitive industry which makes cooperation between these providers challenging.	Healthcare organizations depend on an increasingly smaller number of HIT providers operation and competing in a specific health sector, diminishing the development of interoperability between sectors.

Level/ Dimension	Sublevel	Description Initial framework	Description- empirical framework
Application Benefits	Syntactic interoperability	• Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.	Syntactic interoperability standards allow for data sharing over the technical interoperability infrastructure.
Application Barriers & Challenges	Non-standard EHR's	• Many healthcare organizations have different EHR systems with different (syntactic) standards in use.	Many healthcare organizations have different EHR systems with different (syntactic) standards in use.
	Data silos	• The majority of the data continue to be confined in data silos.	The majority of the data continue to be confined in data silos.
IT Infrastructure Benefits	Technical interoperability	• Technical interoperability standards allows data to move over an infrastructure between two systems.	Technical interoperability standards allows data to move over an infrastructure between two systems.
IT Infrastructure Barriers & Challenges	Complexity of the infrastructure	• Infrastructure developments are costly and complex. For the success of interoperability, wide adoption is needed to make these platforms a success.	Infrastructure developments are costly and complex, especially on the short term. For the success of interoperability, wide adoption is needed to make these platforms a success.
Security Benefits	Patients ownership of the data	• As patients become the owner of their health records, they can manage and grant permissions for access or share their health data with third-parties.	As patients become the owner of their health records, they can, depending on the patient, manage and grant permissions for access or share their health data with third-parties. It is important that doctor will be able to access the patient files independently
Security Barriers & Challenges	Authentication	• Healthcare organizations and individuals must be authenticated and identified before accessing medical information.	Healthcare organizations and individuals must be authenticated and identified without to many obstacles before accessing medical information.
	Patients trust	• To reduce the risk of damaging the doctor patient relationship standards for sharing information need to be in place.	To reduce the risk of damaging the doctor patient relationship standards for sharing information between doctors and patients need to be in place.
	Doctors trust	• Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations.	Clinicians need to trust that their information is up to date even if the update has taken place elsewhere. Privacy and security concerns seem to negatively impact EHR implementations when it is unclear who is responsible for updating information.
Legal Benefits	Justifying decision making	• Adoption of standards supports legal use of the electronic health record and enhanced justification for healthcare decision making.	Adoption of standards in legislation helps organizations trust in each other. Monitoring these standards by a third independent party would increase trust even more.

Level/ Dimension	Sublevel	Description Initial framework	Description- empirical framework
Legal Barriers & Challenges	Accessibility and ownership	• Sharing medical information in cloud solutions brings legal issues over accessibility and ownership.	Sharing medical information brings legal issues over accessibility and ownership when the information is being shared with multiple organizations and systems.
Cost aspects Benefits	Expected cost savings	• Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.	Cost savings are expected when (semantic) standards are used, practitioners use the same EHR and there is a one-time entry of data, cutting out repeated work.
Cost aspects Barriers & Challenges	High initial costs	• Healthcare organisations are reluctant to committing on implementation because of the initial costs.	Healthcare organisations are reluctant to committing on implementation because of unknown initial and structural costs.

Word cloud Literature review

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