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Department of Clinical Medicine
The Faculty of Health Sciences

Success and failure in eHealth

Wouter Janssen

Master's Thesis in Telemedicine and E-health (TLM-3902)

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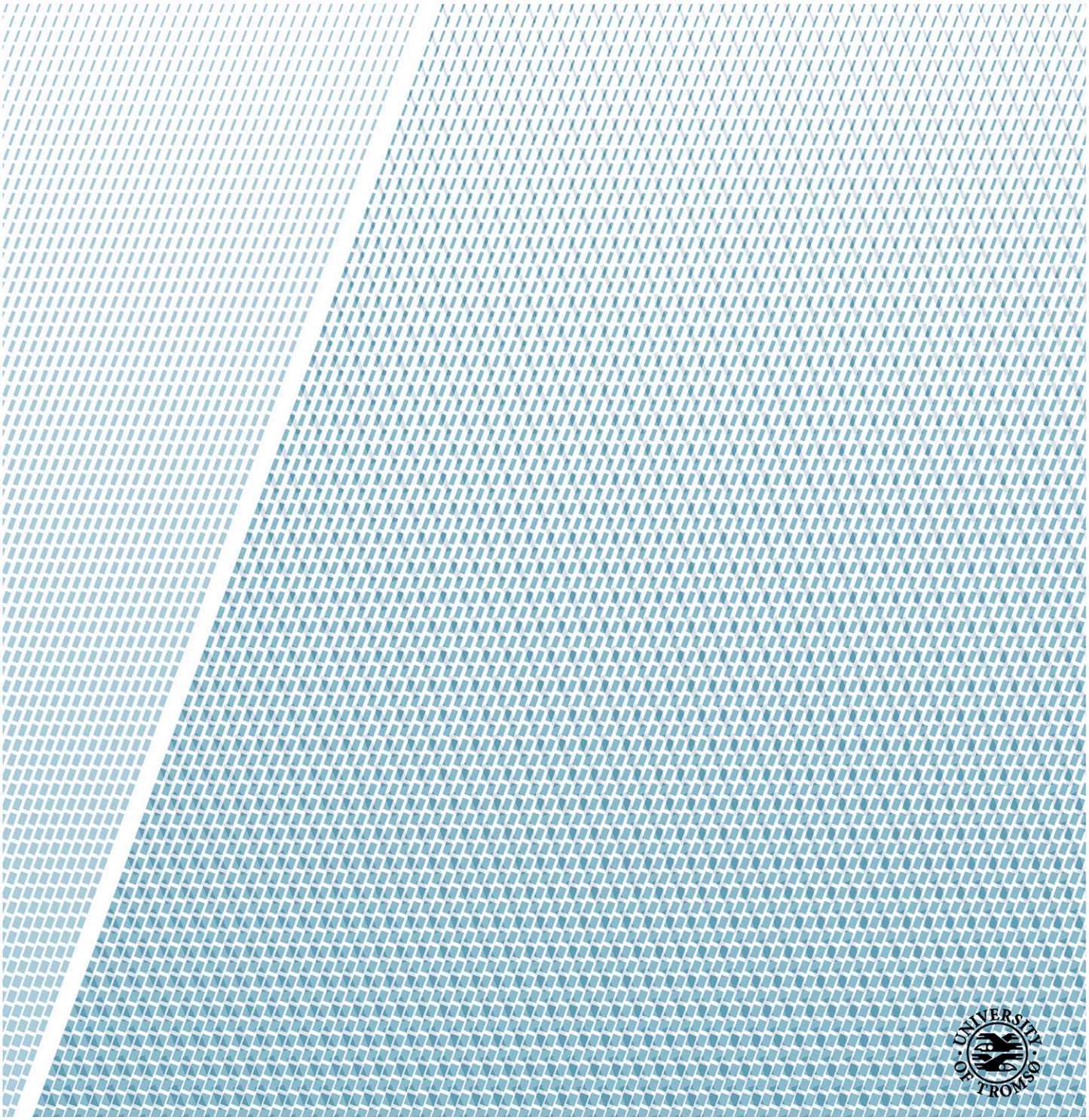

Preface

The research I have conducted in the last year of my master's degree in Telemedicine and eHealth at the University of Tromsø (UiT), led to this thesis. This year of research has given me a deep understanding in the world of research. Due to the broad subject of this thesis, it has also given me a broad yet deep sense of realism in the concept of eHealth.

I would like to thank the University of Tromsø for giving me the chance to pursue a master's degree as an exchange student.

I would like to thank Monika Johansen (Nasjonalt senter for e-helseforskning (NSE) and UiT) and Conceiçao Granja (NSE) for the supervision they have provided. Their expertise and support have been of invaluable importance. Their open-minded (yet strong-willed) attitude has been greatly appreciated.
I would also like to thank Gunnar Ellingsen for the support and discussions about the topic of the thesis, which were several.

Lastly, I want to thank my father, Henk Janssen PMP, for the invaluable support from a business perspective on project management and his encouragement throughout this thesis, and my mother, Karin Janssen, for her motivational support.

Wouter Janssen

Wordlist

Papers/articles:
Papers that are the result of 258 papers after the selection as visualised in figure 1. This includes the contents of the papers.

References:
References as seen in table 3. As opposed to “papers/articles”, references do not include the contents of the papers.

Workflow:
The way people interact with their work, communication pathways and people

Categories:
Topics according to the contents of the abstracts that have been assessed for this thesis. In the categorisation model in table 3, they represent the vertical axis.

Entities:
Target groups according to the contents of the abstracts that have been assessed for this thesis. In the categorisation model in table 3, they represent the horizontal axis.

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Abstract

Introduction

In the field of eHealth, there seems to be a gap between promising research and clinical reality. This master thesis aims to give insight in patterns that can be found regarding the possible outcome in terms of success and/or failure.
An in-depth review of workflow will be done, to get an understanding of the implications of eHealth on workflow.

Methods

Using a systematic article search, papers have been collected regarding the subject of this thesis. Through multiple search strategies, one final search string has been formulated. This final search string led to 903 papers. These papers have been assessed on relevance using qualitative methods. This resulted in 258 papers, which have been categorised by topic, entity and success or failure.
After categorisation, the topic of workflow has been selected for an additional in-depth full-text review.

Results

The categorisation led to 27 categories. The categories are separated among the following entities: patient, health professional, health system and all. The first three have been separated in terms of success and failure as well. This led to a quantitative overview of different categories, for different actors in terms of success and failure.
Workflow appeared to be essential for the possible success or failure of eHealth implementations. It is important to include workflow in the design of the tool as well.

Conclusion

Different categories show a unique combination in success and failure, and to what entity they belong.
The category costs appeared to be mostly based on the health system and is attributed to failure. Therefore it is a pre-requisite for the implementation of eHealth. Other categories like quality healthcare and user expectations seem to target on success. The category legal was smaller than anticipated, which could have been caused by categories that are closely linked to each other.

Introduction

According to Berg [1], 75 % of the eHealth implementations fail in clinical practice. Tanriverdi & Lacono [2] reported that most eHealth projects fail during clinical implementation. In this study, eHealth is defined as the use of Information and Communication Technology (ICT) in healthcare.
As Tanriverdi & Lacono [2] show, there is a great deal of research with promising results that did not contribute to clinical practice. When searching in different academic databases regarding the subject, one can find a good amount of scientific articles that argue that the proposed technologies bring great promise to healthcare. The question remains why the argued results are not achieved in practice.

The purpose of this master thesis is to contribute to new knowledge regarding the reasons why eHealth implementations fail in clinical practice. I want to investigate if there are patterns to be found in the implementations failure, or in their success. Based on this I will suggest key-factors for the success of eHealth implementation. This will be achieved by conducting a literature review based on abstracts.

The main research question of this thesis is:
What patterns can be found regarding the possible outcome in terms of success and/or failure?
Additionally, an in-depth full-text review of workflow will be done, with focus in the following two questions:

- What is the importance of eHealth on workflow?
- How are the design and the practical result of eHealth related?

Purpose

Successful eHealth rests on three pillars of healthcare, which is: improved access, improved quality and cost containment [3]. As stated in the background, 75 % of the eHealth implementations fail during the implementation period [1]. Because of this high percentage of failure, the promises of all these 3 pillars are not often reached. To improve the success of eHealth, it is important to identify the factors that contribute to both the possible failure, and success, of projects.

In this master thesis, I aim to identify what patterns can be found regarding the possible outcome in terms of success and/or failure.

The factors could vary from project specific aspects to recurring issues. The expectation is that the above pillars will play an important role in the success or failure of eHealth projects. As the field of medical informatics is situated between the fast-changing field of informatics and the rather conservative field of healthcare, it is expected that organisational and operational aspects will play a role in the implementation. Workflow is expected to be a significant component, due to its role in the design of both organisational and operational aspects, and it's inevitable re-structuring during implementation. Greenhalgh et al [4] reviewed a NHS funded program and concluded that its failure was mainly due to a poor project design. One of the main problems was the way users were expected to use the system, compared to their actual needs and use of the system. Disparities between design

and reality have been found by other authors [5, 6]. Therefore, workflow and project design related to usability will be factors that I will examine in particular. Scientific articles focusing on workflow will be read in full-text, and data will be extracted from the study results, to identify the role of workflow in eHealth projects.

In this thesis, workflow will be defined as followed:
"The way people interact with their work, communication pathways and people"
It should be noted that various professional groups have a different understanding of workflow. As many of the studies found are based on sociological research, logistics of information flows are not included in this thesis.

In literature, two general workflows are often mentioned. The first is the current workflow, defined as the workflow before the implementation of a new eHealth tool in an organisation or at a specific organisational level, e.g. the cardiology ward in a hospital. The second is the new workflow, which describes the workflow after the implementation of a new eHealth tool. In the new workflow, the implementation of an eHealth tool is completed and operational. Different authors have various ideas about this separation. Some authors [7-9] advocate that the workflow will change or is necessary to change in order for the new tool to be successful. Other authors [10-15] argue that new eHealth tools should be adapted in the old workflow in order to succeed. An interesting detail is [15] who mentions that the adoption of new eHealth tools within the old workflow does create problems during the implementation process.
This raises two questions:

- What is the importance of eHealth on workflow?
- How are the design and the practical result of eHealth related?

Methods

This thesis is based on the designing, conducting and documenting of results from a literature review. As this study is conducted by a single person, it cannot be conducted as a full systematic review, due to the absence of a results double checking process. Except for the limitations associated to conducting this review as a single person, I have tried to follow the Cochrane requirements, and base the reporting on the PRISMA guideline [16].

The review is done using a systematic article search on PubMed. PubMed is a search engine that provides a broad selection of both medical and sociological articles. As this study focused on implemented eHealth tools, the need to include papers from a technology perspective was not considered. Including a technology perspective would require a further literature search in additional databases.

Eligibility criteria

Eligibility criteria are developed based on the research question.
Eligible studies: Reviews, randomized controlled trials and case studies in healthcare related fields with focus on studies about success and/or failure (Knockout criteria). The studies should report on a form of eHealth / Medical Informatics. However, eHealth does not have to be the goal or result, but should be a key component in the process. Studies should be written in English, with no restrictions on date or publication.

Information sources

Due to the goal of finding reports of clinical applications of eHealth, the choice was made to search initially on PubMed, and if necessary on Medline. If this would not yield enough results, more databases would be included. The main reason for using PubMed as the main search engine was the vast amount of articles on both medical and sociological viewpoints in medical research. This would include the majority of relevant clinical results for this thesis. The sociological articles would make sure analyses of results would be included. This strategy proved to be useful, therefore no other database besides PubMed have been used.

Search

An initial search[1] has been performed based on articles referenced in the thesis proposal. This initial search was based on prior knowledge obtained from papers that covered success or failure. This led to 658 results. The title and abstract of these results have been evaluated to identify possible useful search terms. This led to two important terms, “lessons” and “challenges”. These terms have been used together with the MESH term Telemedicine to define the search string I, provided in Appendix 1, and identify more articles. Search string I led to 63,299 results. After consulting a UiT librarian at the medical faculty, the choice has been made to specify the terms even more and to create a PIO (Patient Intervention Outcome) scheme. This led to the creation of 3 search term categories. These categories have been created based on the results obtained with search string I. The result was search string II, described in Appendix 2, which led to a total of 11,950 results. Over the course of

[1] Search string: Telemedicine(MESH) + challenges

refining the search results, the search string presented in Table 1 was used in PubMed to achieve the 903 final articles. The search string was based on 3 categories, according to a PIO scheme. These categories were: “healthcare”, “eHealth” and “change/failure/success”. Where healthcare has been used to aim towards clinical implementations that have been used in actual patient care, and eHealth was specifically aimed at finding telemedicine applications.
All terms in each category were combined with an “OR” logical command, and the categories were attached to each other using an “AND” command. The final search string was as provided on Table 1.

Table 1: Final search string.

(P) Healthcare	(I) eHealth	(O) Change/failure/success
((clinical practice[Title/Abstract] OR real use[Title/Abstract] OR real practice[Title/Abstract] OR clinical implication OR health care effect[Title/Abstract] OR health care impact[Title/Abstract] OR practical trials[Title/Abstract] OR clinical trials[Title/Abstract] OR practical clinical implementation[Title/Abstract] OR practical clinical trials[Title/Abstract] OR implemented service[Title/Abstract] OR adoption[Title/Abstract] OR adoption rate[Title/Abstract]))	((("telemedicine"[Mesh] OR medical informatics[TIAB] OR eHealth[Title/Abstract] OR e-health[Title/Abstract] OR telemedicine[Title/Abstract] OR telehealth[Title/Abstract] OR mhealth[Title/Abstract] OR m-health[Title/Abstract] OR health telematics[Title/Abstract] OR tele-health[Title/Abstract] OR e-therapy[Title/Abstract] OR wireless health[Title/Abstract] OR healthcare technology[Title/Abstract] OR telecare[Title/Abstract] OR medical information system[Title/Abstract] OR telemonitoring[Title/Abstract] OR telepresence[Title/Abstract] OR electronic health information[Title/Abstract] OR teleconsultation[Title/Abstract] OR tele-intervention[Title/Abstract] OR e-rehabilitation[Title/Abstract]))	((fail*[Title/Abstract] OR succes*[Title/Abstract] OR barrier*[Title/Abstract] OR interoperability[Title/Abstract] OR usability[TIAB] OR lessons learned[Title/Abstract] OR implications[Title/Abstract] OR experiences[Title/Abstract] OR implementation[Title/Abstract]))

Study selection

Eligibility was evaluated by the author, based on the eligibility criteria as stated in the Methods section.
645 articles have been excluded based on context of abstract and title. Articles have been assessed regardless of the year of publication, to be sure that useful studies would not be discarded due to age.

Data collection process

All abstracts identified by the search have been read by the author, and categorised based on their content [17, 18]. The categories have been defined based on information found in the articles. The result of this can be found in table 3. This was done to minimise the chance of a bias. Pre-determined categories could have led to a model that merely reflected the opinion of the author.

Table 2: reason for excluding and including papers

Excluding	Assumptions for inclusion in categories
Unclear what results are	funding from government/tax money equals influence on society
No research (but a protocol for instance)	policies have an effect on both organisations and availability of tools for patients
No results	Coordination/interoperability problems have consequences for patients/professionals/system
	extra (or changes in) work is seen as “workflow”
	safety is a relative term, interpreted as compared to traditional ways
	Workforce problems are interpreted as “change of workflow”
	(un)familiar with tools is seen as “IT training”
	Paternalism and empowerment is seen as “empowerment/engagement”
	medical (studies) students are seen as “health professionals”
	Time is either seen as “workflow” or “costs”, depending on the context.

Risk of bias in individual studies

As the articles have been categorised based on their abstract, risk of bias has not been assessed at this stage.

Methods II: Review of full-text studies

In addition to the categorisation of patterns for success and failure in eHealth, an in-depth study will be performed on workflow according to the results, presented in Table 3. This is obtained by applying the categorisation model, described in the Results section. After the completion of this model, the category workflow has been examined according to the references that can be found in table 3. The process has been executed as visualised in figure 2.

Study selection

Articles where workflow has been a subject in contributing to success or failure, according to the abstract, are eligible for a full-text review. To prevent bias, no additional parameters are used for selection. According to the inclusion and exclusion criteria an additional selection has been performed.

Inclusion/exclusion

Full-texts have been assessed. Based on in-depth coverage of workflow data, articles have been included. Articles that merely mentioned workflow, but did not go in depth have been excluded. Articles that only suggested that workflow should be included, e.g. only mentioned in the discussion section, have been excluded as well.

Results:

The search string as reported in the methods section provided 903 results. The abstract of each result has been read through by the author. After discarding blanks, duplicates and discarded articles, 258 articles remained (figure 1). This figure is based on the PRISMA requirements. [16].

The resulting articles have been categorised based on topic and to what entity the topics are relevant. The entities are based on major actors within the healthcare system, and have been separated based on success and failure. Based on the outcome, an additional study has been done to go in-depth to the category “workflow” for the entities Health professionals and Health system.

Study selection

Figure 1: Eligible for categorisation

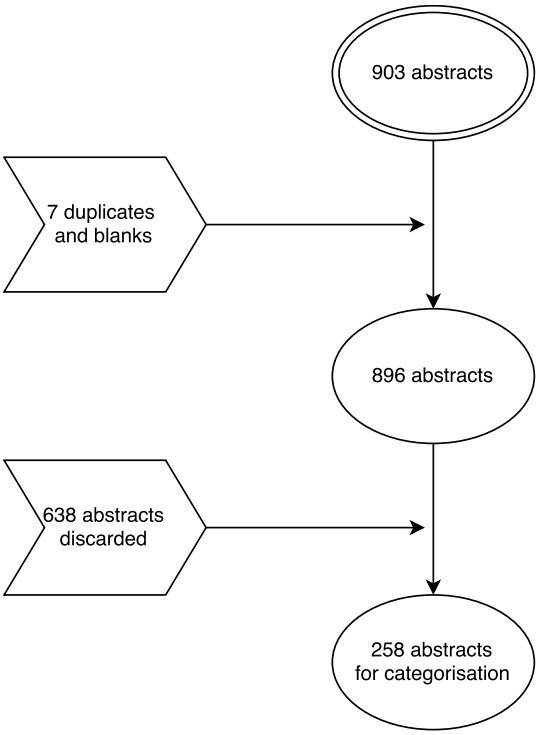
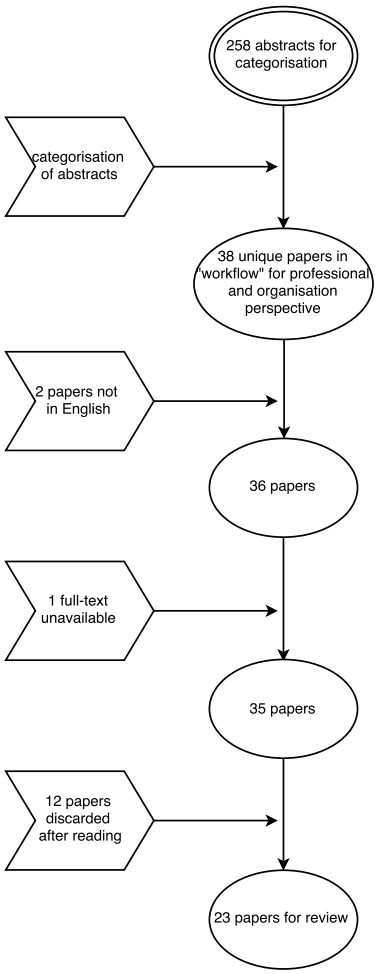


Figure 2: Eligible for full-text review



Explanation of success and failure

As success and failure are an important aspect of this study, it is relevant to note what is seen as failure and success.

Success

Studies that are classified as success if they have achieved their goals. If not all goals are achieved according to the abstract, the study should be interpreted as a success by either the researchers, or by the organisation that decided to implement an eHealth tool. In the latter, this is often managerial personnel within a healthcare organisation. If specific features of the tool have been mentioned as success these are attributed to success, even when the project failed.

Failure

As opposed to success, this means that projects did not meet their goals. If not all goals are achieved, the study should be interpreted as a failure by either the researchers or by the organisation that decided to implement an eHealth tool. If specific features of the tool have been mentioned as a failure, these are attributed to failure, even when the project did succeed.

Explanation of entities

Patients

In this study, patients are people who receive care. Therefore, clients (i.e. people with less urgent problems) or customers (e.g. people who are interested in monitoring their own health) are also included. It also includes people who give care to these patients in a non-professional way (i.e. parents, family, and friends).

Health care professionals

This includes all people who give care in a professional context. This includes physicians, nurses, therapists, mental health workers and other professional groups trained in giving care. It does not necessarily have to be direct care, but they should have to give care for patients. Management personnel is not included in this entity.

Health system

This is the broadest entity. Health system includes management and supporting staff, infrastructure, the technological health systems (both soft- and hardware), and ideological systems like national health plans and systems.

Society

This category includes all people not included in the previous entities, in a given study context.

All
This entity involves all above categories, in both success and failure. Often these articles are systematic reviews.

Categories
The following categories were identified during the assessment of the 258 articles that contain patterns that are attributed to the potential success or failure of eHealth tools. All abstracts have been analysed for a second time, and all patterns that have been found in individual articles have been identified and noted in the categorisation model. Every time a new pattern was identified, a new category has been created. This led to a final amount of 27 categories. There were no pre-identified categories before the second analysis. Therefore, the categories are an appropriate representation of the contents of the selected abstract according to the understanding of the author. The result can be found in Table 3, below one can find the meaning of the categories according to the contents from the abstracts.

Meaning categories

Ease of use/adoption rate
This category is meant to assess the use of a (new) tool after implementation in an organisation. Ease of use and adoption rate are closely linked to each other. Therefore, they are combined in one category.

Workflow
"The way people interact with their work, communication pathways and people"
It should be noted that various professional groups have a different understanding of workflow. As a lot of the studies found are based on sociological research, logistics of information flows are not included in this definition.

Costs
Costs includes all articles that go in-depth about money, finances and value in financial contexts.

System architecture
System architecture is interpreted as the way different systems communicate with each other.

Policies
Policies is mostly linked to governmental policies. This often involves legal and financial aspects. Finances are often based on subsidies to promote the use of eHealth tools.

Interoperability
The way new/future systems integrate with the already acquired and implemented systems.

Patient empowerment and self-management
Tools and techniques to give patients more control and access over their own health and health data. This category embraces a variety of options, ranging from educational software to devices to collect data.

Infrastructure
This refers to the presence or absence of communication infrastructure. This can be telephone lines, electricity or wireless connection options like 3g networks. This category embraces mostly geographical areas with low urbanisation and demographical density.

Leadership
All managerial levels and the decisions associated with them.

Assessment
The assessment of (future) implemented eHealth tools. Assessment can be in terms of feasibility, efficiency, effectiveness, operational results or other associated outcomes and effects of the implementation of eHealth tools.

Conformity with other health care
Health variant of interoperability. This category will give insight in the magnitude of change when implementing an eHealth tool. Links together with ease of use/adoption rate.

User expectations
The expectations of users, and other actors, about the tools before they are implemented. This is often an indicator of the willingness to use eHealth tools.

ICT training
Training specifically directed to using eHealth tools. This is specifically directed to the actors that will use the eHealth tool discussed in an article.

Holistic approach
This is interpreted in two ways. First, when the holistic approach focus on patient care, it would be about seeing an individual as a person, in contrast of seeing someone as a patient. This would mean that a person is more than a patient. A patient is someone who has contracted a disease or disability. A person is everything about the patient, including thoughts, feelings and emotions.
On the other hand, when the holistic approach focuses on the organisational point of view, the organisation should be seen as a whole. In a hospital this would mean that all departments, wards, and different forms of specialist care, are inter-connected and cannot be seen as separate entities.

Reliability connection/technology
Interpreted as the stability of connections during use. Stability and reliability of eHealth tools, both software and hardware, is included in the category as well.

Standardisation
Use of standardisation protocols of both software and hardware. Linked to interoperability.

Culture
The culture of a country, region or organisation.

ICT vs Traditional methods
The difference between new methods (ICT), often digital, and the already established and used methods (traditional). For instance: videoconferencing vs face-to-face consultations.

Privacy/security
In this thesis, the identified security risks are often related to privacy problems in health care related settings. Therefore, these two categories have been integrated with each other. Privacy is all data relatable to a specific person.

Legal
Legal problems relate to legislation issues. Often these are related to privacy problems.

Safety
Safety from a healthcare perspective. However, if mentioned specifically in an abstract, it can be part of safety from an IT perspective. In this case, it would be related to privacy/security.

Access to healthcare
Access to healthcare should be seen in a way that makes it easier for patients to receive, or come in contact, with healthcare organisations or providers.

Education
Educate people about their health. This can be providing information for education about their disease or disability. Learning about their own specific case in the form of retrieving personalised health data is also a possibility.

Quality healthcare
Improving the quality of healthcare, or changing the delivery of healthcare into a more efficient medium. Both in organisational context as in clinical results.

Patient-provider relationship
The emotional and intellectual relationship between healthcare professionals and patients.

Actor engagement
Engaging all actors in the complete process from initial design to use in clinical setting.

Adherence / loyalty to treatment
Sticking to the treatment plan from a patient perspective.

Categorisation model of patterns for success and failure

Note:
In the model, as shown in table 3, all categories that were present in the assessed abstracts have been placed in the table. Because most assessed abstracts identify multiple categories, most reference numbers have been placed in multiple categories and entities.

Table 3: Categorisation of patterns for success and failure.

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
Adoption rate/ easy to use	[15, 19-33]	[4, 21, 33-42]	[15, 19, 23, 30-32, 43-57]	[38-40, 44, 47, 48, 50, 58-64]	[23, 43, 46, 49, 51, 65]	[38, 39, 60, 66-71]	[23]	[38]	[72-81]
Workflow	[29, 41, 74, 82-88]	[36, 84, 87, 89-92]	[7, 9, 10, 12, 14, 41, 43, 45, 74, 82, 85, 86, 93-99]	[8-10, 12-15, 61, 91, 92, 95, 96, 100-105]	[43, 74, 82, 85, 86, 96, 98, 106-108]	[11, 13, 91, 92, 96, 103, 104, 109-111]	[82, 86, 106]	[92]	[78, 81, 95, 112-117]
Costs (funding, reimbursement, etc.)	[118-120]	[15, 23, 33, 40, 92, 121-126]	[13, 56, 118, 119, 127-134]	[40, 48, 55, 66, 91, 92, 94, 98, 105, 121, 123, 129, 132, 134-144]	[13, 14, 46, 56, 59, 64, 80, 108, 118, 119, 127, 128, 130, 131, 133, 136,	[11, 38, 48, 58, 64, 66, 71, 91, 92, 94, 98, 110, 121, 123, 134, 135,	[118, 149, 173]	[38, 92, 121, 159]	[77, 115, 174-179]

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
					141, 145-158]	137, 140, 145, 148, 151, 152, 154, 155, 157, 159-172]			
System architecture					[180]	[109, 159, 162]			
(Governmental) policies	[120, 181]	[160]	[13, 52, 61, 80, 138, 182, 183]	[138, 141, 142, 183]	[13, 52, 54, 59, 108, 131, 153, 155, 158, 176, 182, 184-192]	[60, 154, 158, 160, 166, 171, 181, 190, 191, 193]	[184, 185]		[4, 115, 117, 149, 178, 194]
interoperability (between care settings)/ compatibility	[23, 195]	[181]	[37, 44, 45, 49, 53, 55, 75, 128, 136, 180, 196, 197]	[44, 53, 100, 101, 137, 140, 181, 188, 197, 198]	[24, 37, 49, 75, 108, 128, 136, 146, 147, 158, 186, 187, 196, 199-201]	[47, 68, 69, 91, 104, 140, 154, 161, 181, 184, 188, 202-204]			[73, 96, 113, 115, 123, 176, 194]
Engaging patients in data access/ patient empowerment and self managing	[181] [15, 19, 23, 28, 29, 31, 37, 39, 83,	[4, 37, 40, 83, 84, 91, 205, 208, 212-216]	[39, 44, 50, 93, 101, 127, 205]	[40, 44, 94, 205, 217]	[65, 187, 218]	[217]			[77, 177, 219]

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
	84, 107, 122, 169, 205-211]								
infrastructure		[42, 122, 126]	[9]	[9, 134, 135, 166, 188]	[54, 59, 201]	[38, 58, 59, 119, 164, 166, 188, 220, 221]		[38, 164]	[176]
Leadership			[127, 141, 189, 197]	[143, 197]	[59, 141, 158, 167, 189, 190, 222, 223]	[41, 110, 111, 163, 167, 170]			[78, 224]
Assessment	[23]		[23]	[161]	[23, 199]	[161]			[114]
Conformity with other health care	[34]		[34, 75, 128]	[100]	[34, 75, 128, 146, 225]	[47]	[34]		[95, 112, 226]
User expectations	[21, 22, 26, 37, 39, 42, 54, 87-90, 107, 131, 155, 156, 191, 201, 208, 209, 216, 220, 227-238]	[4, 21, 35, 39, 87, 88, 90, 98, 107, 122, 125, 126, 134, 140, 162, 176, 185, 191, 193, 208, 212, 215, 229-231,	[8, 10, 31, 50, 56, 61, 66, 95, 97, 99, 104, 105, 108, 131-133, 137, 144, 156, 190, 193, 197, 220,	[8, 10, 41, 50, 56, 61, 94, 95, 98, 99, 132, 134, 135, 140, 162, 176, 185, 190, 197, 229, 230, 239, 242,	[65, 108, 131, 133, 227, 242]	[68, 140, 242]	[227, 234]	[234]	[64, 76-78, 80, 96, 116, 136, 175, 177, 224, 225, 248]

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
		234, 239-241]	227-230, 242-245]	244-247]					
ICT training	[96, 209, 229, 249, 250]	[32, 33, 36, 42, 92, 126, 169, 214, 215, 229, 241, 251]	[14, 52, 56, 57, 96, 142, 184, 242]	[10, 41, 55, 91, 92, 138, 141, 143, 162, 242, 243, 245] [171]	[54, 184, 201]	[68, 70, 91, 92, 109, 185, 204, 220]	[173]	[92, 204]	[77, 79, 81, 175]
Holistic approach	[83]	[83]	[44]	[44]	[252]	[184, 252]			[73]
Reliability connection/technology	[236, 253]	[42, 126, 240]	[53, 247]	[45, 53, 123, 144]	[64, 247]	[71, 166, 184]			[72, 74]
Standardisation	[20, 48]		[85, 97]	[101, 142]	[85, 147, 154, 168, 176, 184, 203, 252]	[38, 43, 101, 142, 168, 172, 202, 203, 252]	[85, 184]		
Culture		[35, 162, 185, 235]		[45, 162, 185]		[162, 176, 185, 220]		[162, 185]	[177, 179]
ICT vs traditional methods	[83, 131, 227, 248]	[32, 36, 83, 126, 238]	[45, 46, 55, 75, 83, 131, 151, 227, 228, 248]	[8, 13, 50, 83, 103, 135, 140, 151, 254]	[46, 62, 75, 131, 151, 227, 248]	[13, 103, 140, 151, 254]	[227]		[79, 226]
Privacy/ security	[28, 48, 130, 229, 231, 232,	[28, 33, 37, 91, 122, 123, 215,	[12, 105, 130, 257]	[10, 12, 37, 45, 49, 91,	[54, 130, 157, 158, 258]	[37, 66, 69-71, 91, 123,	[232, 249]	[91, 232, 249]	[64, 77, 116]

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
	249]	229, 231-233, 235, 240, 241, 248, 249, 253, 255, 256]		123, 135, 137, 142, 183, 245, 248, 255, 256]		172, 202, 248]			
Legal				[217]	[85, 152, 258]	[66, 152, 163, 164, 170, 171, 182, 217, 258]	[85]		[174]
Safety	[52, 195, 227]	[122, 248]	[52, 227, 259]	[137, 248]	[98, 227]	[248]	[227]		[30]
Access to healthcare	[25, 26, 39, 54, 91, 119, 122, 179, 235, 238, 255]	[7, 23, 33]	[39, 45, 50, 61, 91, 99, 119, 128, 134, 217, 255]	[23, 49, 61, 96, 243]	[91, 217, 260]	[23, 69, 220]		[23]	[174, 226]
Education	[80, 96, 101, 130, 207, 255, 261]	[36]	[32, 46, 61, 96, 105, 128, 134, 166, 187, 255, 261]	[61]	[261]				[174]

Category	Patient + success	Patient+ failure	Health care prof. + success	Health care prof. + failure	Health system + success	Health system + failure	Effects for society + success	effects for society + failure	All categories
Quality healthcare	[15, 29, 33, 34, 39, 86, 118-120, 130, 131, 148, 210, 237, 262, 263]	[23, 33, 237]	[7, 10, 15, 34, 39, 50, 54, 85, 86, 91, 93, 99, 104, 105, 118, 119, 128-131, 134, 137, 138, 143, 148, 183, 211, 257, 262, 263]	[61, 96, 129, 134, 171]	[7, 34, 39, 85, 86, 91, 102, 108, 118, 119, 130, 131, 148, 168, 169, 211, 260, 263]	[70, 262]	[34, 85, 86, 91, 118, 263]		[30, 73, 114, 174, 261]
Patient-provider relationship	[31, 33, 131, 222]	[35, 40, 122, 235]	[12, 31, 105, 131, 222]	[12, 40, 94]	[131, 222]				[77, 78, 112]
Actor engagement in developing	[31, 74, 87, 106, 136, 195, 213, 219]	[182, 221]	[9, 13, 74, 106, 127, 219, 222, 264, 265]	[9, 154, 182, 221, 264]	[13, 74, 106, 167, 219, 222, 266]	[69, 221, 266]	[106, 219]		[14, 73, 81, 112, 116, 175, 218]
Adherence/ loyalty to treatment	[20, 123, 150, 155]	[216]	[179]						[114]

Analysis of the abstracts

An overview of the model presented in table 3, leads to the deduction of some patterns inside the categories. Below I will mention the most prominent from a quantitative perspective. The analysis will be mainly from a quantitative viewpoint, but there will be some qualitative elements included as well.

General comment

While identifying the different patterns for success or failure, it seems the majority of assessed articles are based on data that has been gathered before or during the implementation of eHealth project. Because of this, one cannot be sure if the results of these articles are a good representation of reality. Given the amount of articles that have been assessed in this study, there was not sufficient time to go through all articles again and quantify this.
To provide more answers to this interpretation, this reassessment has been done for the category costs, as this is regarded as one of the most important promises for eHealth. Because costs can only be calculated from a retrospective point of view, it is plausible that the category costs has a higher rate of retrospective data compared to the rate of the total amount of articles. To be sure of this, all included articles must be reassessed for the moment of data gathering, based on the status of the project.

Looking at the distribution of references in table 3, it seems that there is no distinct difference in the total distribution between failure and success. However, looking at different categories, it appears that certain categories (for instance: costs, quality healthcare or access to healthcare) tend to show an overrepresentation to either failure or success. A similar pattern can be seen when looking at the entities. This means that the categories are mostly directed to a distinct combination of entity on one side and failure or success on the other side. An important note is that this representation is based on the quantity as mentioned in the abstracts. Therefore, it is possible that fewer mentioned categories or entities have an important role in eHealth, even when not classified as such.

Mostly mentioned:

Costs

As mentioned in the Purpose, costs is one of the main pillars of the promises of eHealth. Based on the categorisation of 258 papers, costs is a theme that is mentioned frequently. Looking on the representation between the various entities, it appears to be centred on the health system. As the health system includes organisations and governmental bodies in this paper, this is a logical result. The health system needs to have a certain degree of financial health to distribute their services.

Another interesting aspect in this category is the difference between success and failure. Every entity puts more emphasis on failure, compared to success. Combine this with the previously mentioned financial health, one can deduct that the importance is not to make a profit from eHealth, but to not lose money. Therefore, costs can be seen as a prerequisite to incorporate eHealth in their services.

Looking in-depth in this category, it appears that only 13 unique references in this category include results of projects after the project has ended. As many 78 unique references are based on expectations, potentials and other future possibilities. These articles are for the majority based on sociological research in which actors have been asked about their opinions and/or wishes about eHealth. According to the research, they appear to have the idea that eHealth brings cost reductions along with the implementation. Negative feelings are often projected on time, reimbursement, and implementation costs. Positive feelings have not been specified thoroughly. It appears to be a general belief that it 'just does'.

User expectations

In user expectations the opposite happens, compared to costs. In this category one can see that Patients and Health professionals are the most important entities. As user expectations are based on opinions and, therefore, susceptible to emotional arguments and ideas, this is a logical result. As these are expectations, the results are never derived from a retrospective study design. The expectations are also mixed in terms of outcome measure. For instance: some expectations are based on costs, where others can be based upon quality of care. To understand one specific concept or idea, it is necessary to go through all articles individually.

Privacy/security

In this category one can see that the majority of articles focus on failure. As privacy is a constitutional right [267, 268], privacy cannot be part of negotiations in study or implementation design. If privacy standards are not met, implementation is not possible without taking significant risks from a legal perspective. Thanks to this, privacy is a prerequisite in order to be able to use technology without facing significant legal risks.
As security if often related to privacy, these two cannot be seen as separate entities.

Quality healthcare

Quality of healthcare is showing the opposite pattern compared to privacy/security. Where privacy and security are mostly seen as factors contributing to the possible failure of eHealth projects, quality of healthcare is being seen as a factor contributing to the possible success of eHealth projects. It should be noted that the difference in the number of articles classified as success or failure is significant to an extent that one could argue that this category is solely purposed for the potential success of projects.

Least mentioned:

System architecture

System architecture has received a total amount of only 4 references. All of these references have been in the first 50 examined papers. This leads to the question if there has been a change in appraisal in the process. Given the closely linked Interoperability, it is possible that references eligible for this category have been placed in interoperability instead. If Interoperability would be included, the amount of articles would rise multiple-fold, but it would still not be more than average.

Assessment

This category has, like system architecture, only 4 unique references. This is a notable result. Given the pillars that are mentioned in the purpose section (reduce costs, improved access and improved quality) [3], assessment is a tool that is vital to assess the possible outcomes. As a lot of research and projects are government sponsored, it is important to make sure that the funds allocated are spent on projects that improve healthcare. Without proper assessment this is impossible to identify.

Holistic approach

This category has a total of 5 unique references. All of these references belong in the first half of assessed studies. As with the category Assessment, it is possible that there is a chance of a selection bias in this category.
As holistic approach is interpreted as a means to see people or organisations as a complex and inseparable concept, this does bring some difficulties. One of the main problems in research, is the idea to investigate one variable or only one part of a system. A holistic approach on the other hand is the complete opposite. This approach states that everything is connected and therefore, one cannot separate it. Therefore, a holistic approach is less detailed and more suitable for managing complexity. It is expected that if other technology based databases would have been used, this category would have had higher representativeness.

Culture

The initial reason to include this category was the fact that the national cultural implications were explicitly mentioned in Alajlani et al [162]. Shortly after, another article [185] mentioned the impact of culture embedded in a specific country, towards the potential success or failure as well. Both articles had their geographic origin in the Arabian Peninsula. This led to the idea that culture could have been a major factor contributing to the potential success or failure of eHealth projects. However, there was only a total of 9 unique articles mentioning the concept of culture in their abstracts. Although this is not near the median of the different categories, I want to put emphasis on the fact that in [185] and [162] the different cultures were an explicit reason for the general support for eHealth projects. As stated in Alajlani et al [162] the cultural component was seen as a greater problem than the technology itself. Based on the articles found in this thesis, it should be included in further analyses in specific regions of the world.

Legal

Although this category was only considered when it was first mentioned, or referred to, in the selected studies, it was expected that the category Legal would be one of the major categories. However, there is only a total of 11 unique articles in this category. Of these, 9 unique articles discuss the combination of “health system + failure”. The second-most mentioned entity is “health system + success”. Other entities mentioned only have 1 article listed.
Based on these quantities it is safe to argue that legislation is mostly a factor that contributes to the possibility of failure. As explained in Privacy/security above, legislation is a prerequisite to be able to implement a tool in healthcare organisations. As legislation in medical fields is mostly based on patient safety and confidentiality, this is closely linked to Privacy/security.

Loyalty to treatment

With a total of 7 unique articles (and a total of 7 references) this is one of the least mentioned categories. A possible reason for this is the focus of loyalty to treatment. First of all, the tool should focus specifically on treatment. Furthermore, the study should be concerned with the amount of people using it. Lastly, it should be a longitudinal study design, as loyalty to treatment often decreases as time goes by.

Taking a closer look at some articles [20, 123, 211], it seems the articles are mostly future-oriented and not based on actual experiments. To get a realistic view on the potential of this category, it is important to treat telemedicine applications as regular health-related interventions.

Looking more specifically to ICT in healthcare, eHealth projects appear to be rather technical. They do not seem to concern much in terms of end user experience. For ICT tools, the end user experience is vital for patients to keep themselves motivated. Based on this, one could argue this category is heavily interlinked with Patient empowerment and self-management.

Results II: workflow

"Experience in the business community has indicated that users who try a system that does not work are most likely to never use it again, without complaining" Abbot et al [43]

In this section I will answer the research questions as stated in the introduction regarding workflow:

- What is the importance of eHealth on workflow?
- How are the design and the practical result of eHealth related?

The answers below are based on a full-text review of the 23 included workflow papers as show in figure 2, and a content analysis focusing on the research questions [17, 18].

What is the importance of eHealth on workflow?

Kruse et al [11] examined barriers in eHealth research on a quantitative basis for several consecutive years. In this work, it is stated that workflow has been one of the most mentioned barriers.
Based on the results of a full-text review, patterns within workflow have been identified. On of these is that the implementation of eHealth tools in healthcare organisations seem to create a change in workflow [82, 103]. This change is not limited to the directly involved staff, but also influences others within the organisation [82].
Most organisations were not created with eHealth in mind. Therefore, workflow has the potential to change the organisation in a negative or a positive way [13, 41, 93, 96, 109].
It is also possible that an initial positive change can lead to a rather negative outcome. In three articles is mentioned that an overabundance of data led to an inability to use the data due to time constraints [93, 94, 101].
Professional values and personal feelings should also be considered as barriers to eHealth implementation. Personal and professional values can conflict with the use of technology [13, 41]. In these works, feelings of healthcare staff about the technology result in negative thoughts and scepticism. Because of this the technology never became a full part of the workflow.
In order to integrate eHealth successfully in the workflow of healthcare staff, they have to get accustomed to the eHealth tool [91, 109]. Furthermore, a clear purpose and a noticeable effect seems to help [43]. On top of this, there should be no possibility to fall back on the old workflow [43, 91, 109].

How are the design and the practical result of eHealth related?

If eHealth does not meet the expectations or requirements from healthcare personnel, it is possible that the eHealth tool will not be used as anticipated [10, 13]. This is caused by a difference between the prospects, that are often made by management personnel, and the reality of healthcare personnel. This can be tracked down to the design phase.
A significant problem around the difference between prospect and reality is the technical perspective [95, 100, 109]. In Declerck et al [95] the term “technocentrism” is mentioned. By this they mean that the design is focused on technology. Other actors, mainly healthcare personnel, are secondary concerns in the design phase.
In addition to healthcare personnel being secondary concerns, it appears that different professions within healthcare have different needs from eHealth tools [12, 92, 103]. These different needs have to be addressed in order to make eHealth applications operate successful in healthcare organisations.
Time constraints appear to be an important aspect as well. Especially for continued success this appears to be essential [93, 94, 101]. Although there was initial success, the lack of time available for the additional workload was not sufficient to ensure success on the long term.
Another pattern for failure is when projects are designed from a top-down perspective [10, 100, 109]. These projects appear to have connections with the earlier mentioned technical perspective. An important finding is that the most successful study has been created from a top-down perspective [43]. This was probably the consequence of a relatively small scale project, with great compliance from the working field, a minimum of change in terms of workflow and a high development and implementation speed.

To sum up, the design and the practical result of eHealth is clearly related, and it appears that involving different actors from the healthcare system (mainly actors delivering healthcare) in the design, is the most important success factor within the domain of workflow. Technology should improve the workflow of the people working within organisations, compared to the workflow changing because of technology.

Discussion

Initial pattern based on chronology

While evaluating the 903 results, a pattern was found in the chronology of the results. This pattern is based on 3 “era’s”. The first era is pre 2000. The second era is from 2000 to 2010. The third is from 2010 up to the present.
In the first era, it seems the articles, in their majority, address the technology with focus on aspects like functionality and infrastructure.
In the second era, it seems that there is a shift in perspective from technology focused, to organisation focused. In this setting an organisation can be a healthcare organisation or a community (local/ regional/ national/ international). The first two eras are supported by Nielsen et al [13].
The third era seems to have a focus on individuals. In this, researchers investigate on how people work, often from a bottom-up perspective, compared to a top-down scope to the complete organisation.

Reflection search strategy

After the initial 903 results were found, a closer look was taken on the search. In this, there was a mistake in the evaluation of the “PIO” structure. Initially, the “Patients” group was seen as ‘eHealth’, the ‘Intervention’ as the ‘failure/success/change’ and the ‘Outcome’ was ‘clinical practice/ Healthcare’. However, this is incorrect. The ‘Patients’ group should be ‘Clinical practice/ Healthcare’, the ‘Intervention’ group was ‘eHealth’ and the outcome is ‘Failure/success/change’. As this does not change the search results in any way, no further changes have been made.

Culture

When the category of “culture” became visible, it seemed that this was focused on certain geographical regions of the world. As the first two articles [162, 185] in this category were focussed in Saudi-Arabia, the idea emerged that this could be an important aspect for the middle-east. However, after these initial articles, only seven new papers have been found. Although it has not been copiously mentioned, it should not be diminished. As Alajlani et al [162] mentions in their paper, culture is more important than technology according to their findings. Therefore, it should be taken in regard in order to adjust the plan if cultural problems could arise. This could be either a company culture, national or regional.

Less results in “legal” category than expected

In society, there is a big focus on the legal perspective for the implementation of eHealth tools in healthcare. In the categorisation model this is not reflected in the quantitative result. However, the legal issues are mostly based on the privacy of patients. As privacy is a different category, one can assume that these 2 categories contribute to the same problem. Therefore, if one goes in depth in legal issues or privacy, both categories should be included.

Why is “quality healthcare” this big?

Taking a selection of various entities in the category “quality healthcare” [10, 108, 114, 129, 131, 148, 183], it seems that most articles are from after 2012. Only one article in this

selection of 7 is not from 2013 or later [131]. As explained in “chronology of articles” these articles would fall in the third era. This means that there is an increased focus on the individual, which could explain the increase in focus on the quality of care. Taking all 258 selected articles in regard, 63 articles are published before 2010. This would mean about 1 in 5 articles are published before 2010, compared to 1 in 7 in “quality healthcare”, assuming this selection is representative for the entire category.
Given these numbers, it seems that the main reason for the size of “quality healthcare” is the shift in focus from organisational point of view to an individualistic perspective, that is present in the literature in the field of medical informatics.

Costs seem to be based on expectations.

While reading the abstracts for the categorisation model, the author got the strong feeling that the majority (>50%) of the reports on the category “costs” were based on expectations. An important aspect of expectations is that they are defined before the results are clear. The actual costs and benefits can only be measured after the project (or trial) has ended. Most research has been done during the project, often at the start. This means that the researchers are gathering data at a phase in which money/funding is still not a problem. However, an organisation’s first priority in order not to fail is to ensure a financially healthy administration. In other words, they should write “black numbers”. This does not necessarily mean that the eHealth project itself has to be profitable. If the quality is high enough, indirect effects could be positive enough to keep the project going on. But in general, one expects to get at least a break-even in terms of financial gains, or prevention of losses compared to the traditional way of providing healthcare. To achieve this, the efficiency of healthcare providers has to be increased, which could lead to more stress and a less forgiving working environment. In other words: they have to get results. The only way to get this information is to research after the project has ended, regardless of success or failure. This should be based both on direct and indirect results. As an organisation is changing continuously, indirect results will be hard to evaluate, but nevertheless there should at least be an interpretation of the total results from a retrospective point of view.

Mental capabilities for text messaging, combined with legal repercussions

Some articles argue that emails and/or text messages can save time and thus costs.
One article points out that only 22% of all messages sent are reimbursed [91]. This raises the question if this lack of reimbursement is viable in the long term. As it is hard to create unambiguous messages, the benefits of less contact time do not meet the costs of time and mental effort. This is important for a variety of reasons. The first is the fact that the jargon used in the medical field is not known by patients. The jargon is understood by medical professionals, but this is not always the case for patients.
In addition to jargon, a lot of the work of medical professionals is routine based. In order to make certain decisions or actions clear to patients, these routines have to be divided into separate parts. The deconstruction of routines takes time to note down and to think of the appropriate wordings.
The last part has to do with legal repercussions. As everything is noted down, and sent to the patient, it is fixed and cannot be changed after sending. This means that possible inconsistencies have a potential legal consequence. This idea enforces the previous mentioned importance of taking the mental capabilities of the people writing messages into regard.

New generation (gen-Y / millennials)

Some articles, such as Biggs et al [100], propose that the next generation health care professionals are more technology savvy compared to the current workforce. The question arising is what this claim is based on. Although it is evidently that the new generation is more accustomed to the use of technology, they are being trained by the older generation. This happens mainly in internships and early work experiences where professionals still have to learn. This increases the chance that they are influenced to use more traditional methods. Additionally, it seems that the concept of eHealth is seen as a goal, rather then a method to reach a goal (i.e. better healthcare). If this is correct it means that eHealth is not only about improving healthcare, but that eHealth is partly motivated by political goals.

Should we continue to push eHealth, given that it is mostly from a political point of view?

As a few articles point out, eHealth appears to have connections to politics [89, 110, 131]. Based on this, and the rather disappointing results up to this point, the question rises if eHealth should be pushed at the same pace as it is now. As appeared in the category "assessment", there is not much emphasis on assessing and evaluating results. This leads to the possibility of an increased rate of failure, due to a lack of learning from previously made mistakes. Apparently current strategies are not yielding optimal results. Therefore, a thorough assessment of major and minor eHealth projects is necessary to learn from previously made mistakes and successes. These lessons can be used to improve the implementation process and improve the operational success of eHealth tools in healthcare related settings.

As Nielsen & Mathiassen [13] state in one of their interviews, having a modern image appears to be a reason to implement eHealth in healthcare. It did have some side effects in the form of easier workflow due to being able to order medication online. However, the fact that improving healthcare was not the initial goal, nor was saving costs or improving efficiency, raises some doubts about the current state of eHealth.

If personnel are preferring face-to-face contact, why should videoconferencing be implemented?

According to Kapadia et al [92] healthcare personnel has a preference to face-to-face contact over digital long-distance systems. Nielsen & Mathiassen [13] mention the loss of contact between personnel. In this instance, it was due to less meetings among healthcare personnel. Minimising the amount of meetings was in fact a demand from the government of Denmark to get funding to implement eHealth in the organisation. This implies that there is an assumption that face-to-face contact is the same as videoconferencing and text messaging. Assumptions like this degrade healthcare to a collection of technical skills. Physical contact, non-verbal communication, group decisions; all will get lost with the above implication. Healthcare will become health without the aspect of care. Which is, in contrast, probably the most important skill being trained in healthcare-related educational programs.

Limitations

As this thesis is based on a categorisation of abstracts, it is possible that data is incomplete. As an abstract is a brief summary of the article, it is very plausible that information gets lost due to an absence of context.

Another limitation is that this model is created by a single person. If an additional author would have been used, the model might have been different. At an early stage, this has been thought of. However, the decision has been made to not do this, as the second author would have been of a different level of expertise. This means that that person would either have less or more experience in the field of telemedicine and/or science. Additional, this would not have been allowed in context of a master's thesis, according to the knowledge of the author.

The categorisation model has been designed while assessing the abstracts. Therefore, it is possible that articles could have been assessed in a different manner in the end, compared to the beginning of reading the abstracts.

Due to limitations in time, no second search (using the same search parameters) has been conducted. Therefore, it is possible that additional articles have been published after the initial search, that would fit well in this categorisation model.

Conclusion

The main research question of this article was:
What patterns can be found regarding the possible outcome in terms of success and/or failure.
Different categories show a different representation in terms of failure and success. A similar pattern has been found in the different entities. These two combinations lead to a unique combination for every category. This is based on a quantitative analysis and qualitative differences have not been added to the equation.
Costs is one the main pillars of eHealth. Costs seems to be centred around the health system and seems to attribute mainly to the possible failure of eHealth. More specific, costs is a prerequisite for the implementation of eHealth. The same pattern appears around privacy/security. On the opposite of this, quality healthcare and user expectations seem to be centred around success. However, the results of user expectation are based on prospective results, therefore it cannot be used as a measure of success.
In contrast to the expectation, the category legal has not been a major part of the reviewed abstracts. A possibility for this is that it is closely linked to different parts of eHealth research.

What is the importance of eHealth on workflow?

Changes in the workflow extend further than the directly involved. Because multiple processes are linked together, changes in the organisation have indirect consequences for other links in the chain.
eHealth can also affect the workload. Added workload in combination with an unchanged organisation means choices have to be made. Those choices will affect either the new or old workflow.
Negative feelings of healthcare personnel towards a tool leads to scepticism, resulting in the tool never becoming a full part of the workflow. The newly implemented tool should have a clear purpose and a noticeable result to make sure that it stays in use. An important requirement is that the staff is accustomed to the use of the tool.
Lastly, parallel workflows should not exist. The old workflow should be abolished and only the new workflow should be used in clinical practice. This will also improve the fact that the staff is familiar with the tool, further increasing its potential success.

How are the design and the practical result of eHealth related?

There appears to be a difference in prospects of eHealth and its use in reality. eHealth should meet the requirements of involved healthcare staff. A problem for not meeting requirements is that there is a focus around technology, rather than healthcare. Different professions have different needs, all of which should be met. For continued success, time constraints of healthcare professionals have to be solved. A last pattern seems to be that the design of most studies is top-down. This seems to have connections with the focus on technology, however not all top-down studies fail.

Appendix 1: search string (I)

(P) Healthcare	(I) eHealth	(O) Change/failure/success
	(((eHealth OR e-health OR telemedicine OR telehealth* OR mHealth OR health telematics OR wearable OR tele-health OR e-therapy OR wireless health OR wearable sensor system OR healthcare technology OR telecare OR medical information system OR telemonitoring OR telepresence OR electronic health information OR teleconsultation OR tele-intervention OR e-rehabilitation)))	((fail OR failure OR succes* OR barriers OR interoperability OR usability OR lessons learned OR implications OR experience* OR implement*))

Appendix 2: search string (II)

(P) Healthcare	(I) eHealth	(O) Change/failure/success
"last 10 years"[PDat] AND Humans[Mesh])) AND (clinical practice OR real use OR real practice OR clinical production OR clinical implication OR health care effect OR health care impact OR clinical trials OR practical clinical trials OR practical clinical implementation OR implemented service) Sort by: Relevance Filters: published in the last 10 years; Humans	((((((eHealth OR e-health OR telemedicine OR telehealth* OR mHealth OR health telematics OR wearable OR tele-health OR e-therapy OR wireless health OR wearable sensor system OR healthcare technology OR telecare OR medical information system OR telemonitoring OR telepresence OR electronic health information OR teleconsultation OR tele-intervention OR e-rehabilitation)))	((fail OR failure OR succes* OR barriers OR interoperability OR usability OR lessons learned OR implications OR experience* OR implement*)))

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