MASTER THESIS

THE INTENTION OF HEALTHCARE PROFESSIONALS TO CONTINUE USING TELEREVALIDATIE.NL

Mirka Evers - s1382942

FACULTY OF MANAGEMENT AND GOVERNANCE
DEPARTMENT OF HEALTH TECHNOLOGY AND SERVICES RESEARCH (HTSR)
HEALTH SCIENCES - HEALTH SERVICES AND MANAGEMENT

EXAMINATION COMMITTEE
S. M. Jansen - Kosterink, Msc
K. Markiewicz, Msc
Prof. dr. M. M. R. Vollenbroek - Hutten
Dr. J. A. van Til

UNIVERSITY OF TWENTE.

Roessingh
Research and Development

The Intention of Healthcare Professionals to Continue Using Telerevalidatie.nl

An evaluation of Telerevalidatie.nl after the first implementation phase using the UTAUT model

Evers, M.[1,2], Jansen - Kosterink, S. M.[1], Markiewicz, K.[2], Vollenbroek - Hutten, M. M. R.[1,2], van Til, J. A.[2]

[1] Roessingh Research and Development, Telemedicine Group,

Enschede, The Netherlands

[2] University of Twente, Faculty of Management and Governance, Health Technology and Services Research (HTSR),

Enschede, The Netherlands

Keywords: Chronic diseases, healthcare professionals, remote treatment, telemedicine, acceptance and adoption of healthcare technology, Unified Theory of Acceptance and Use of Technology (UTAUT), intention to use telemedicine.

Abstract: The increased chronic disease prevalence requires a systematic approach and a good organization of care. It is proven that telemedicine can contribute to these requirements. Telerevalidatie.nl is a telemedicine application that aims at increasing access to healthcare for chronic ill patients, and saving a great deal of traveling time and expenses through self-management of the disease at home. In order to evaluate Telerevalidatie.nl and to examine the intention of healthcare professionals to continue using telemedicine applications after the first implementation phase, interviews were conducted with the rehabilitation professionals involved in this implementation phase. The interview protocol was based on the constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) model, as the best fitted one for this research. The results indicated that almost all participating rehabilitation professionals were very positive about the concept of Telerevalidatie.nl and had the intention to continue using it, on the condition that some improvements will be made regarding the usefulness, the user-friendliness, the applicability and the compatibility of the application.

I.   Introduction

Earlier detection of chronic diseases and better treatment possibilities resulted in an increased lifespan of patients and an increased prevalence of chronic diseases[1]. Patients suffering from a chronic disease need intensive healthcare, e.g. regular visits to different medical specialists, and use of a lot of medications. Their treatment requires both a systematic approach and a good organization of care[1]. It is proven that telemedicine can contribute to these requirements by providing care to patients in their own environment via communication technologies[2].

Telemedicine can be defined as: "the delivery of healthcare services where distance is a critical factor, using information and communication technologies for exchange of valid information for diagnosis, treatment and prevention of disease and injuries"[2]. Telemedicine can support and complement healthcare professionals by decreasing the number of visits to medical specialists. It could also improve patients adherence to the treatment by giving a clear overview of the disease progress[3]. Moreover, telemedicine can be an important addition to the treatment of people with a chronic disease; it can support patients to improve their self-management and adherence to the treatment plan by giving the ability to monitor own disease

progression[2, 3]. All these advantages can contribute to a more systematic approach, and a better organization and higher quality of care[2, 3].

Despite all the potential benefits of telemedicine there are also barriers identified. Puskin and Sanders[4] divided these barriers in three categories: technological infrastructure (e.g. an outdated telephone line), organizational infrastructure (in which the acceptance of the healthcare professionals plays an important role) and financing infrastructure (the financing aspect of the telemedicine application). They indicated that the (non)acceptance (element of the organizational infrastructure) of telemedicine by healthcare professionals is one of the barriers recognized against the use of telemedicine. Therefore it is important to examine the factors influencing this acceptance[4].

Telemedicine: acceptance and adoption

Healthcare professionals represent one of the principal groups of telemedicine users, who can influence the use of telemedicine applications with and by patients. Thus, their acceptance of this type of technology is one of the key requirements for the emergence and maintenance of telemedicine use[5]. Keen[6] stated that it is not the software but the human side of the implantation cycle that will potentially block the use of telemedicine.

In order to gain more knowledge regarding the acceptance and adoption of telemedicine applications, several studies focused on the factors influencing the intention to use or actual use of telemedicine by healthcare professionals using different types of models. For example, the Innovation of Diffusion Theory (IDT)[7], the Technology Acceptance Model (TAM)[7] and the Theory of Planned Behaviour (TPB)[8]. All these studies indicated that the models used do not explain the intention to use or actual use of telemedicine applications well enough. These models also do not explain the intention of healthcare professionals to continue using telemedicine applications. Intention to continue

using is a phase which should occur after the first actual use and is essential for the complete implementation and efficient use of a telemedicine application[9]. However, practice shows that this phase often not occurs[10]. So, there still remains a knowledge gap in the factors influencing the intention of the healthcare professionals to continue using telemedicine applications[11-13]. In order to stimulate telemedicine adoption and uptake, it is important to examine this intention and the factors influencing it.

The case study: Telerevalidatie.nl

This research focused on the telemedicine application called Telerevalidatie.nl, which was implemented in 2013 by Roessingh Research and Development (RRD) in Enschede. Telerevalidatie.nl was a part of an overarching project called Tele-Nu[14], which provided two telemedicine applications: Telerevalidatie.nl and Facetalk[14]. The purpose of this project was to increase and accelerate the chances of successful implementation of telemedicine in daily rehabilitation care by equipping each rehabilitation centre in the Netherlands with the necessary technology and education to deliver telemedicine services[14]. Both applications enable communication between healthcare professionals and patients by means of a display screen[15, 16].

Research objective

The aims of this research were, to (1) evaluate Telerevalidatie.nl with regard to performance expectancy, effort expectancy, social influence and facilitating conditions (constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) model), and to (2) study the intention of healthcare professionals to continue using telemedicine applications after the first implementation phase.

II.   Method

Study design

The research had a qualitative design, that highlighted the perspective of the rehabilitation professionals regarding Telerevalidatie.nl[17]. Semi-structured interviews via face-to-face meetings, Skype, and telephone conversations were conducted with the rehabilitation professionals who had the opportunity to use Telerevalidatie.nl for a year (during the first implementation phase). The opinions and experiences of the rehabilitation professionals' on Telerevalidatie.nl provided valuable insight into the factors influencing the intention of the professionals to continue using the online application[17].

Intervention

Telerevalidatie.nl is a web-based training in the everyday environment of the chronic ill patients with asthma, COPD, pain and rheumatism[16]. It focuses on the physical reconditioning of the patients and gives them the opportunity to perform exercises independently. The application also contains a diary function which provides the possibility to monitor own disease progression[16].

Study population

During the implementation of Telerevalidatie.nl, 86 rehabilitation professionals (consisting of physical therapists, occupational therapists and physicians in rehabilitation medicine) from 11 rehabilitation centres in the Netherlands were asked to use the application for a year.

All of those rehabilitation professionals were approached for an interview by means of an e-mail which explained the aim of the research and invited them to participate. The professionals who did not respond to the e-mail were contacted by telephone. The only inclusion criterion for the participants sample was a prior experience with Telerevalidatie.nl.

Research model

In order to select an appropriate research model, various models of acceptance and adoption of healthcare technology were investigated. The results of this investigation are presented in Table 5 Appendix I.

The research model was constructed based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model of Venkatesh[18] (Figure 1). The factors/constructs of that model were most consistent with those most frequently emerged in research about the intention to use new technologies.

Attitude towards technology and *user involvement* were added to the UTAUT model as components of the construct *facilitating conditions*. These two factors also have a significant influence on *intention to use,* according to literature (Appendix I). Finally, it has been reported that in order to make proper use of telemedicine the user must change his own behaviour too, as habits have an important influence on the intention of healthcare professionals to continue using telemedicine[9, 19]. Therefore the "changed behaviour" factor was also incorporated into the UTAUT model as a component of the construct 'facilitating conditions'. This construct is a residual construct for several other factors which might affect user behaviour regarding telemedicine.
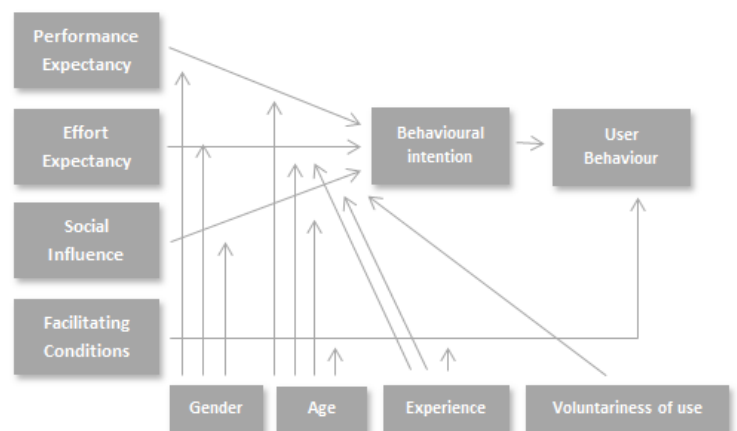
Figure 1 - The Unified Theory of Acceptance and Use of Technology (UTAUT) model developed by Venkatesh[18]

Interview protocol

The interview questions were build based on a validated questionnaire of the UTAUT model as presented by Venkatesh[18] and were supplemented by the construct definitions which are presented in Table 1. Each construct was analyzed separately by asking multiple open questions and there was also room for own input from the rehabilitation professionals themselves. The interview questions regarding the performance expectancy and effort expectancy constructs were divided into two parts: the expectancy and its fulfilment, because they focus on the fulfilment of the expectations of the participants. For instance, the questions related to the construct performance expectancy were formulated as: '*What expectations did you have of the added value of Telerevalidatie.nl?*' followed by the question '*To what extent did Telerevalidatie.nl meet these expectations?*'. This distribution of expectations and actual experiences will be shown in Table 3. Questions regarding the factors *attitude towards technology*, *stage of change* and *user involvement* were added to the interview, although they were not originally included in the UTAUT model. The interview was pilot-tested with two independent and non-clinical individuals. The final interview, which resulted after this pilot test, is included in Appendix II.

Data collection

The data was collected from the beginning of April to the beginning of May 2014. The interviews lasted between 30 and 45 minutes. To minimize the change that the answers were misunderstood, the interviews were audio recorded with participants' permission.

Data analysis

All interviews were transcribed verbatim and analyzed with the use of the ATLAST software[20]. Each construct of the research model received a specific family code (e.g. *Experience*), which was further divided into several answer

Table 1 - Operationalization of the UTAUT model

Factor	Definition
Performance expectancy [a]	"the degree to which an individual believes that using the system will help him or her to attain gains in job performance"[18 (p 477)].
Effort expectancy [a]	"the degree of ease associated with the use of the system"[18 (p 450)].
Social influence [a]	"the degree to which an individual perceives that important others believe he or she should use the new system"[18 (p 450)].
Facilitating conditions [b]	"the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system"[18 (p 452)].
Behavioural intention [b]	"a person's perceived likelihood or subjective probability that he or she will engage in a given behavior"[21 (p 31)].
Experience [c]	Prior use/experience with telemedicine[18].
Voluntariness of use [c]	"the extent to which potential adopters perceive the adoption decision to be non-mandated"[22 (p 564)].

Notes: [a] Direct relationship to behavioural intention
[b] Direct relationship to actual user behaviour
[c] Moderating effect

categories/sub-codes (e.g. *prior experience with telemedicine*). This means that these specific sub codes were linked to answers which related to the same factors/constructs of the research model as the sub-codes. Eventually, statements about the factors influencing the intention of the healthcare professionals to continue using telemedicine were made based on these family

and sub-codes. To respect the professionals' privacy, all the identifying information from the quotes were removed.

III.   Results

Sample characteristics

Table 2 outlines the characteristics of the research sample which consisted of 21 rehabilitation professionals distributed throughout the Netherlands. At least one rehabilitation professional of each participating rehabilitation centre, in the first implementation phase of Telerevalidatie.nl, was included in the sample. Fourteen participants were female and 13 participants were physical therapists.

Performance Expectancy

Eight different topics related to the performance expectancy of Telerevalidatie.nl were mentioned (Table 3).

An increased effectiveness of the treatment was one of the two most frequently mentioned by the participants topics as expected added value of Telerevalidatie.nl. They expected that providing the patient an extra practice session at home would increase the effectiveness of the treatment. However, the perceptions of the participants concerning the fulfilment of these expectations were very diverse. A few participants were positive about the added value of Telerevalidatie.nl: "*Due to the use of Telerevalidatie.nl we focused more on the relaxation of the patient, which is definitely of added value*" (female participant, 4). While others commented negatively on its effects: "*I noticed that some patients got annoyed by viewing the videos, because of the various dialects and personalities*" (female participant, 17).

Higher accessibility of healthcare was also frequently mentioned as expected added value of

Table 2 - Characteristics of the research sample (n=21)

Demographics	
Age *(years)*	
Mean	44.4
SD	11.6
Range	25 to 60
Gender *(n)*	
Male	7
Female	14
Location *(n)*	
Antonius Sneek Hospital	1
Sint Maartenskliniek	3
Military Rehabilitation Centre (MRC)	2
Reade	2
Rijndam	5
Rivas	1
Roessingh	1
Tolbrug	1
Trappenberg	1
ViaReva	1
VU Medical Centre Amsterdam (VUMC)	3
Profession *(n)*	
Physical therapist	13
Occupational therapist	7
Physician in rehabilitation medicine	1
Experience in profession *(years)*	
Mean	17.8
SD	10.6
Range	3 to 34

Telerevalidatie.nl. Half of the participants expected an increased access to healthcare by providing remote care. The majority of these participants, however, stated that so far they did not experience that increased access to healthcare. "*After a few times most patients memorized the exercises very easily and therefore they did not feel the need to start the computer and mark the exercises after they were performed*" (female participant, 6).

To accomplish tasks more quickly/increased productivity. A small group of the participants expected to accomplish tasks more quickly and consequently achieve an increased productivity by means of Telerevalidatie.nl. This idea arose from the expectation that the exercises could easily be rotated using Telerevalidatie.nl, which

Table 3 - Topics discussed during the interviews divided into the expectations and actual experiences of the participants, and the frequencies of being mentioned by the participants.

Expectation	Experience	Frequency (n)
Performance Expectancy		
An increased effectiveness of the treatment [a, b] (n=13)	Fulfilled	8
	Not fulfilled	5
Higher accessibility of healthcare [a, b] (n=13)	Fulfilled	4
	Not fulfilled	9
To accomplish tasks more quickly/increased productivity [a, b] (n=12)	Fulfilled	2
	Not fulfilled	10
An increased adherence to the treatment [a, b] (n=11)	Fulfilled	4
	Not fulfilled	7
An addition to the treatment [a, b] (n=8)	Fulfilled	5
	Not fulfilled	3
A cost-effective application [b] (n=4)	Fulfilled	0
	Not fulfilled	4
A more appealing and modern treatment [a] (n=2)	Fulfilled	0
	Not fulfilled	2
An increased self-management of the patient [a, b] (n=2)	Fulfilled	1
	Not fulfilled	1
Effort Expectancy		
Learning to operate the application [a]		
No effort expectancy	Low effort needed	1
Low effort expectancy	Actual effort like expected	9
Low effort expectancy	More effort needed than expected	7
Moderate effort expectancy	More effort needed than expected	2
High effort expectancy	Less effort needed than expected	2
Daily use of the application [a]		
No effort expectancy	Moderate effort needed	2
Low effort expectancy	Actual effort like expected	4
Low effort expectancy	More effort needed than expected	11
Moderate effort expectancy	Actual effort like expected	3
Moderate effort expectancy	More effort needed than expected	1
Social Influence		
	The view of colleagues and supervisors [a]	
	Positive	6
	Negative	9
	Mixed	6
	The view of colleagues and supervisors [a]	
	Important and influential	12
	Important, but not influential	9
	Support of the organization [a, b]	
	Supported	17
	Not supported	4
Facilitating Conditions		
	Attitude towards using technology [a]	
	Positive	17
	Negative	0
	Mixed	4

Expectation	Experience	Frequency (n)
	Resources and knowledge necessary to use the application [a]	
	Necessary knowledge and resources	17
	Necessary knowledge, but an insufficient amount of materials	4
	Compatibility of the application [a, b]	
	Compatible with other systems	5
	Not compatible with other systems	16
	Changed behaviour [a, b]	
	Did change own behaviour	5
	Did not change own behaviour	10
	Did not change own behaviour, perhaps on the long run	6
	Involvement during the development [a]	
	Involved during the development	5
	Not involved during the development	16
Experience with telemedicine [a]		
	Prior experience with telemedicine	9
	No prior experience with telemedicine	12
Voluntariness of Use [a]		
	Free choice	18
	No free choice	3
Intention to use [a]		
Yes		18
No		3

Notes: [a] Original topics related to the constructs of the research model.
           [b] Factors appointed by the rehabilitation professionals themselves as influential to their intention to continue using Telerevalidatie.nl.

should have been less time consuming. However, these expectations were not met, because the employment of the application itself was very time consuming.

An increased adherence to the treatment. About half of the participants expected an increased motivation of the patients to perform the exercises at home using Telerevalidatie.nl. However, it turned out that the increased adherence to the treatment strongly depends on the target group: "*Most of our patients have hand problems and once they understand the instruction, the computer becomes unnecessary*" (female participant, 5).

An addition to the treatment. Some participants stated that Telerevalidatie.nl should not replace the physical treatment, but it should be an addition to the current treatment. The opinions regarding the fulfilment of this expectation varied strongly, and ranged from very positive: "*Very good actually. I gave a lot of advice with the help of the video's from Telerevalidatie.nl*" (male participant, 19) to relatively negative: "*It was disappointing, because the patients only stay for a short period of time in our hospital. So, there was not enough time to make proper use of the application*" (female participant, 6).

A cost-effective application. A few participants claimed that Telerevalidatie.nl should be of added value to the current treatment and that possible financial benefits of the application would play a great role in the purchase of the application. However, all participants who valued

the cost-effectiveness of Telerevalidatie.nl indicated that it is not (yet) cost-effective given its costs and benefits.

A more appealing and modern treatment. A few participants expected the treatment to be more in line with the current technological advances, as it provides virtual support instead of physical support. However, these expectations were not fully met. This appeared from the response of female participant, 18: "*The main addition of this application is that it reproduces your activity in percentages, but people are also aware of their own activity rate without using the application*".

An increased self-management of the patient. A few participants considered this expectation as one of the main requirements for their intended continuation to use Telerevalidatie.nl. It was remarkable how the experiences of the participants were complete opposites to each other. One of them was not very enthusiastic about the gained independence of the patients, because he might completely lose contact with some of them, while the other said: "*I really liked the fact that the patients could practice at home independent of the practitioner. This could be a great addition to the current treatment*" (female participant, 21).

Effort Expectancy

Alongside the performance expectancy of Telerevalidatie.nl, some topics were discussed related to the effort expectancy of the application.

Nineteen participants mentioned the user-friendliness of Telerevalidatie.nl as one of the requirements for their intended continuation to use the application: "*The first condition is an intuitive program. This enables both the patient and myself to easily work with the program*" (male participant, 12).

Learning to operate the application. The effort expectancy of the participants related to this topic was relatively low. For example, male participant, 20 said that: "*I expected little effort by getting familiar with the program*". However, there was not so much consensus about the actual effort needed to learn how to operate the application. Most participants devoted these differences to the amount of computer experience and the user-friendliness of the application.

Daily use of the application. The effort expectancy regarding the daily use of Telerevalidatie.nl was also relatively low. For example, male participant, 11 said that: "*I expected the application to be intuitive and therefore easy to use*". The actual effort needed to employ the application daily was in contrast to its expectation: "*Working with the application was very time consuming. Composing a personalized program for the patient and saving it took a lot of time. The program was also very slow*" (female participant, 5)*.

Social Influence

Two different topics were discussed during the interview about the social influence of Telerevalidatie.nl.

First of all, *the view of colleagues and supervisors* regarding Telerevalidatie.nl was very diverse. The difference in opinions might be related to the profession of the rehabilitation professional and his or her colleagues. Female participant, 8 stated that: "*We noticed that Telerevalidatie.nl is mainly useful for fysio- and occupational therapists and less useful for social workers, psychologists and physicians in rehabilitation medicine*".

Participants were also asked about the importance and influence of the views of colleagues and supervisors on their own opinions. A majority of the participants confirmed the importance and influence on their own opinions as opposed to a minority of the participants who expressed a different view: "*The opinion of my supervisor is important to me, because he must*

arrange the money for this project. Apart from that, I mainly depend on my own experience." (male participant, 2).

Support of the organization. Almost all participants felt supported by their organization. This support was expressed in funding the application, purchasing the necessary materials and providing additional time for participants to learn how to use the application.

Facilitating Conditions

Most topics which were mentioned by the participants during the interview related to the facilitating conditions of Telerevalidatie.nl.

Attitude towards using technology. The majority of the participants indicated to be very positive about working with technology. In addition, providing healthcare by means of technology is the future according to half of them. On the other hand, a few participants had a more restrained opinion about working with new technology. Female participant, 17 said that: *"I treat a lot of young adults and it is very normal for them to make a movie. That's how I noticed that such telemedicine services would fit well with the current generation. However, I am not very technical myself"*.

Resources and knowledge necessary to use the application. It was remarkable that most participants who felt supported by the organization also claimed to have the resources and knowledge necessary to use the application. However, some participants stated to have the knowledge, but not the materials necessary to use the application. *"We did not have computers of our own. Therefore we shared computers with colleague's. We did receive Ipads, but Telerevalidatie.nl did not work well on these Ipads"* (female participant, 10). In addition, approximately one third of the participants expressed their concerns on funding the

application in the later stage, as according to them after the end of the first implementation phase, they could only use it if it will be funded by the organization.

Compatibility of the application. In general, the majority of the participants reflected negatively on this aspect of Telerevalidatie.nl. They stated that the application could only be used separately from other systems they currently use. As a response to this missing aspect, participants expressed the desire to integrate Telerevalidatie.nl into the currently used systems (Table 4). *"It would be great if Telerevalidatie.nl is directly connected to our reporting system, then all information can be found in one server"* (male participant, 1).

Changed behaviour. A few participants highlighted the fact that some of their colleagues had difficulties with letting go of old routines and developing different behaviour. These difficulties also appeared from the fact that most participants did not change their behaviour while using Telerevalidatie.nl.

Involvement during the development. The majority of the participants reported not to be involved in the development of Telerevalidatie.nl. Most of them indicated that they would have had some recommendations in case they were involved. Some participants were involved during the development and stated it was of an added value for the technology. A few of them were responsible for most of the content of the application; they recorded the videos of the exercises and wrote the corresponding information.

Table 4 presents the improvements of Telerevalidatie.nl suggested by the participants. Only the most frequently mentioned suggestions were elaborated. First of all, the majority of the participants commented on the *applicability of*

Table 4 - Improvements suggested by the participants mainly related to the facilitating conditions of Telerevalidatie.nl

Suggested improvement	Frequency (n)
Increase the applicability of the application	17
Incorporate Telerevalidatie.nl into the currently used systems	14
Lower the number of technical deficiencies	9
Provide the possibility to gain video contact	4
Create a more attractive layout	3
The innovation should stem from the healthcare professionals	2
One clear guideline regarding the privacy of the patient	2
One clear guideline regarding the vision of Telerevalidatie.nl	2

the application: "*The exercises which were included in the application were probably developed in a centre for patients with rheumatoid arthritis, but we mainly see surgical hand injuries and that is a totally different target group*" (male participant, 12). In addition, the number of available exercises was to low and the exercises were not of good enough quality. Therefore, most of them expressed the desire to being able to add movies to the database themselves.

Secondly, most participants would like to operate all systems from one central server to save time and to consequently work more efficient. In order to achieve this increased efficiency they stated that *Telerevalidatie.nl should be incorporated into the systems they currently use*.

In addition, there were some *technical complaints*. Most of them concerned logging in and the speed of the application. The participants claimed that in order to make the application more user-friendly, improvements need to be made regarding the technical aspects of the application.

Experience with telemedicine

A majority of the participants stated that they had no prior experience with telemedicine before they started using Telerevalidatie.nl. Others, had prior experience with developing and using telemedicine. "*Before I started using Telerevalidatie.nl I was involved in another telemedicine project. During that project we*

developed a telemedicine application " (female participant, 15).

Voluntariness of Use

The results of the interviews showed that a majority of the participants were free to choose whether they wanted to use Telerevalidatie.nl or not. However, three participants did not have a voluntary choice regarding the use of the application: "*To gain experience and to being able to evaluate Telerevalidatie.nl, everyone was imposed to work with the application*" (female participant, 7).

Intention to Use

Almost all participants intended to continue using Telerevalidatie.nl on the condition that some improvements will be made regarding the obstacles they mentioned during the interviews. These obstacles mainly, related to funding the application and to the usefulness, the user-friendliness, the applicability and the compatibility of the application. Furthermore, it was noticeable that an increased productivity rate and an increased effectiveness of the treatment (usefulness) was expected by half of the participants, however they reported that their expectations were only partially met. Besides, the majority of these participants had a low effort expectancy regarding the daily use of Telerevalidatie.nl, but most of them needed more effort while using it. Almost all of them stated to have the resources and knowledge necessary to use the application, but commented

negatively on its degree of compatibility. Furthermore, it was striking that the majority of the participants who wanted to increase their use of the application were not supported by their organization during the first implementation phase of the application.

A few participants reported that they did not want to continue using Telerevalidatie.nl. They mainly dedicated this decision to the absence of perceived usefulness. In addition, it was remarkable that all these participants did not have any prior experience with telemedicine, all their performance expectancies were not met, the actual effort to use the application was higher compared to its expectations and they all stated that the application was not compatible with the systems they currently use.

IV.   Discussion and conclusion

The central aims of this research were, to (1) evaluate Telerevalidatie.nl with regard to performance expectancy, effort expectancy, social influence and facilitating conditions, and to (2) study the intention of healthcare professionals to continue using telemedicine applications after the first implementation phase.

The majority of the participants judged the Telerevalidatie.nl application as very positive. Despite the relatively high number of disadvantages mentioned, almost all participants wanted to continue using the application on the condition that the effort needed to operate it, the performance and the facilitating conditions of Telerevalidatie.nl will be improved.

The main concern expressed by the participants was the usefulness of the application. Although the participants perceived Telerevalidatie.nl to have certain benefits over the traditional physical treatment, none of them would consider it as an autonomous treatment, as it is being implemented at the moment. The majority of the participants stated that they would have to see more usefulness (e.g. higher accessibility to healthcare, an increased productivity) of the application before they decide to continue using it. The importance regarding the usefulness of telemedicine applications is documented in earlier research about telemedicine acceptance and adoption[23-25]. For example, Chau[23] stated that perceived usefulness appeared to be the most significant factor influencing the professionals intention to use telemedicine. In addition, Croteau and Vieru[24] indicated that a professionals' perception of usefulness of a telemedicine application is positively related to his or her intention to use the application.

Another concern of the participants was the low degree of user-friendliness of the application, especially the speed and intuitiveness of Telervalidatie.nl were highlighted as weak points. User-friendliness of Telerevalidatie.nl was found as a very important requirement for the intended continuation to use the application, as most participants related it to the effort needed to employ the application. These findings are confirmed by a study of Croteau and Vieru[24], who reported that professionals have a higher intention to adopt telemedicine applications when they find the application easy to use and consequently more user-friendly.

The majority of the participants also valued negatively the facilitating conditions of Telerevalidatie.nl, especially its applicability and compatibility. They expressed the desire to include more exercises which can be used for several diagnosis groups and to include a function in which professionals can add exercises (videos) themselves. They also suggested to incorporate the application into the systems they currently use. These findings fit with previous studies about telemedicine adoption of different groups of physicians[9, 25], that reported on the positive effects of system flexibility on the intention of the professionals to use telemedicine applications[25]. Ideally, telemedicine applications should be

accessible and applicable anywhere, at any time and preferably in one central server[25].

Limitations of the study

The risk of selection bias might have occurred, and it could have resulted in an over- or underestimation of the results, as all participants were free to choose whether or not they wanted to participate in this research[26]. This possible bias might have been neutralized by the fact that at least one rehabilitation professional of each participating organization was included in the sample[26]. However, the management of a few organizations already decided to continue using Terevalidatie.nl, so the responses of the rehabilitation professionals that already knew they had to continue using the application might have affected the overall results. On the other hand, by means of the interview they still had the opportunity to express their opinion and experience regarding the application[17].

Finally, it is important to remember that the interview questions were partly based on a validated questionnaire of the UTAUT model[18], which was translated to Dutch from English. That might have affected the validity of the results. However, the semi-structured nature of the interview questions allowed for furthers questions if more information related to certain topics was needed or if the questions were not asked in the clear way. That could contribute to more reliable results[17, 27]. However, the interviews were conducted in different manners; by telephone, face-to-face and by using Skype, so the possibility to directly respond to the mimic of the participant in case of miscommunication was limited.

Suggestions for future research

Further research might build on our research to examine the influence of the profession of a healthcare professional on his or her intention to continue using telemedicine applications. This can be done by including different types of healthcare related professions (e.g. physical

---

Clinical implications
To maintain the intention of healthcare professionals to continue using telemedicine applications, the following aspects should be taken into account during the development of telemedicine technologies:
✓ the usefulness;
✓ the user-friendliness;
✓ the applicability and
✓ the compatibility of the application.

---

therapists, occupational therapists) in the research sample to investigate whether patterns in professionals' characteristics explain their intention to continue using telemedicine applications. In addition, the 'changed behaviour' factor (element of the facilitating conditions construct) might be further investigated. As Venkatesh[9] appointed the importance of habits to the continued use of telemedicine applications. Research might extend the UTAUT model and examine the factors influencing and/or breaking habits. This investigation can be done by means of the change model of Prochaska and Diclemente[28], which consists of six different stages of change, ranging from not even being aware that certain behaviour must change to maintaining the changed behaviour[19].

Conclusion

The Telerevalidatie.nl application was valued well by the majority of the participants in terms of perceived benefits and as an addition to the current treatment. However, the weak aspects of the application pointed out: its overall low level of performance, lack of user-friendliness, lack of perceived usefulness and low level of compatibility and applicability. Despite these weak aspects, almost all participants expressed willingness to continue using Telerevalidatie.nl.

Acknowledgement

References

1   N. Hoeymans, R. Gijsen, S. van Oostrom, and F. Schellevis, 'Chronische Ziekten En Multimorbiditeit Samengevat', RIVM, (2013) <http://www.nationaalkompas.nl/gezondheid-en-ziekte/ziekten-en-aandoeningen/chronische-ziekten-en-multimorbiditeit/chronische-ziekten-en-multimorbiditeit-samengevat/> [Accessed February 14 2014].

2   World Health Organization. Group Consultation on Health Telematics, and World Health Organization, *A Health Telematics Policy in Support of Who's Health-for-All Strategy for Global Development: Report of the Who Group Consultation on Health Telematics 11-16 December, Geneva, 1997* World Health Organization, (1998).

3   S. Perdok, 'Een Kwalitatief Onderzoek Naar Inzet Van Telemonitoring Bij Mensen Met Een Chronische Aandoening', (Utrecht: Focus Cura, 2006).

4   D. S. Puskin, and J. H. Sanders, 'Telemedicine Infrastructure Development', *J. Med. Syst.,* 19 (1995), 125-29.

5   A. Cloutier, M. P. Gagnon, G. Godin, C. Gagne, J. P. Fortin, L. Lamothe, and D. Reinharz, 'An Adaptation of the Theory of Interpersonal Behaviour to the Study of Telemedicine Adoption by Physicians', *Int J Med Inform,* 71 (2003), 103-15.

6   P. G. W. Keen, *Shaping the Future: Business Design through Information Technology* Harvard Business School Press, (1991), p. 264.

7   N. Nijhof, 'Telemedicine Bij Zorgprofessionals', Focus Cura BV, (2007).

8   J. Kim, and H. Chang, 'The Model Predicting Telemedicine Adoption by Physicians: Comparison of Theory of Planned Behavior and Technological Acceptance Model', *Health Service Management Review,* 1 (2007), 1 - 12.

9   V. Venkatesh, J. Y. L. Thong, and X. Xu, 'Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology', *MIS Q.,* 36 (2012), 157-78.

10   F.D. Davis, *Toward Preprototype User Acceptance Testing of New Information Systems: Implications for Software Project Management*, (2004).

11   A. G. Ekeland, A. Bowes, and S. Flottorp, 'Effectiveness of Telemedicine: A Systematic Review of Reviews', *Int J Med Inform,* 79 (2010), 736-71.

12   A. G. Ekeland, A. Bowes, and S. Flottorp, 'Methodologies for Assessing Telemedicine: A Systematic Review of Reviews', *I. J. Medical Informatics,* 81 (2012), 1-11.

13   D. Hailey, R. Roine, A. Ohinmaa, and L. Dennett, 'Evidence of Benefit from Telerehabilitation in Routine Care: A Systematic Review', *Journal of Telemedicine and Telecare,* 17 (2011), 281 - 87.

14   Roessingh Research and Development, 'Tele-Nu', Roessingh Research and Development, (2014) <http://www.tele-nu.nl/TeleNu> [Accessed February 28 2014].

15   Roessingh Research and Development, 'Facetalk', Roessingh Research and

Development, (2014) <http://www.tele-nu.nl/FaceTalk> [Accessed February 28 2014].

16 Roessingh Research and Development, 'Telerevalidatie.nl', Roessingh Research and Development, (2014) <http://www.tele-nu.nl/telerevalidatie> [Accessed February 28 2014].

17 N. Mack, and C. Woodsong, *Qualitative Research Methods: A Data Collector's Field Guide* FLI, (2005).

18 V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, 'User Acceptance of Information Technology: Toward a Unified View', *Mis Quarterly,* 27 (2003), 425-78.

19 Pro-Change Behavior Systems Inc., 'The Transtheoretical Model' (2013) <http://www.prochange.com/transtheoretical-model-of-behavior-change> [Accessed 25-3 2014].

20 Atlas Computer Systems, 'Atlas', (2014) <http://atlascode.com/> [Accessed 27-3 2014].

21 *Speaking of Health: Assessing Health Communication Strategies for Diverse Populations*, The National Academies Press, (2002).

22 R. Agarwal, and J. Prasad, 'The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies', *Decision Sciences,* 28 (1997), 557-82.

23 P. Y. K. Chau, and P. J. Hu, 'Investigating Healthcare Professionals' Decisions to Accept Telemedicine Technology: An Empirical Test of Competing Theories', *Information & Management,* 39 (2002), 297-311.

24 A. M. Croteau, and D. Vieru, 'Telemedicine Adoption by Different Groups of Physicians', in *System Sciences, 2002. HICSS. Proceedings of the 35th Annual Hawaii International Conference on*, (2002), pp. 1985-93.

25 T. A. Alrawashdeh, M. I. Muhairat, and S. M. Alqatawnah, 'Factors Affecting Acceptance of Web-Based Training System: Using Extended Utaut and Structural Equation Modeling', *International Journal of Computer Sience, Engineering and Information Technology (IJCSEIT),* 2 (2012).

26 J. J. Heckman, 'Sample Selection Bias as a Specification Error', *The Econometric Society,* 47 (1979), 153-61.

27 C. Pope, and N. Mays, *Qualitative Research in Health Care* Wiley, (2006).

28 J. O. Prochaska, and C. C. Diclemente, 'Toward a Comprehensive Model of Change', in *Treating Addictive Behaviors*, ed. by WilliamR Miller and Nick Heather Springer US, (1986), pp. 3-27.

29 P. Y. K. Chau, and P. J. H. Hu, 'Information Technology Acceptance by Individual Professionals: A Model Comparison Approach', *Decision Sciences,* 32 (2001), 699-719.

30 A. Van Riel, J. Semeijn, and W. Janssen, 'E-Service Quality Expectations: A Case Study', *Total Quality Management & Business Excellence,* 14 (2003), 437-50.

31 J. Hartwick, and H. Barki, 'Explaining the Role of User Participation in Information System Use', *Management Science,* 40 (1994), 440-65.

32 S. Taylor, and P. A. Todd, 'Understanding Information Technology Usage: A Test of Competing Models', *Information Systems Research,* 6 (1995), 144-76.

33 D. S. Staples, and P. Seddon, 'Testing the Technology-to-Performance Chain Model', *Journal of Organizational and End User Computing (JOEUC),* 16 (2004), 17-36.

34 D. Compeau, C. A. Higgins, and S. Huff, 'Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study', *Mis Quarterly,* 23 (1999), 145-58.

35   F. D. Davis, 'Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology', *Mis Quarterly,* 13 (1989), 319-40.

36   M. Igbaria, N. Zinatelli, P. Cragg, and A. L. M. Cavaye, 'Personal Computing Acceptance Factors in Small Firms: A Structural Equation Model', *Mis Quarterly,* 21 (1997), 279-305.

37   V. Venkatesh, and F. D. Davis, 'A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies', *Management Science,* 46 (2000), 186-204.

38   P. J. B. Tan, 'Applying the Utaut to Understand Factors Affecting the Use of English E-Learning Websites in Taiwan', *SAGE Open,* 3 (2013).

39   P. B. Seddon, 'A Respecification and Extension of the Delone and Mclean Model of Is Success', *Information System Research* (1997), 240 - 53.

40   R. L. Thompson, C. A. Higgins, and J. M. Howell, 'Influence of Experience on Personal Computer Utilization: Testing a Conceptual Model', *J. Manage. Inf. Syst.,* 11 (1994), 167-87.

41   D. L. Goodhue, and R. L. Thompson, 'Task-Technology Fit and Individual Performance', *Mis Quarterly,* 19 (1995), 213-36.

42   M. Fishbein, and I. Ajzen, *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research* Addison-Wesley Pub. Co., (1975).

43   V. Venkatesh, and F. D. Davis, 'A Model of the Antecedents of Perceived Ease of Use: Development and Test*', *Decision Sciences,* 27 (1996), 451-81.

44   R. Agarwal, and J. Prasad, 'A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology', *Info. Sys. Research,* 9 (1998), 204-15.

45   E. M. Rogers, *Diffusion of Innovations* Fourth edn (New York: The Free Press 1995).

46   G. J. Doyle, B. Garrett, and L. M. Currie, 'Integrating Mobile Devices into Nursing Curricula: Opportunities for Implementation Using Rogers' Diffusion of Innovation Model', *Nurse Education Today* (2013).

47   P. Deshaies, J. Cuerrier, C. Mongeau, L. G. Pelletier, and R. J. Vallerand, 'Ajzen and Fishbein's Theory of Reasoned Action as Applied to Moral Behavior: A Confirmatory Analysis', 62 (1992), 98-109.

48   I. Ajzen, 'The Theory of Planned Behavior', *Organizational Behavior and Human Decision Processes,* 50 (1991), 179-211.

49   F. D. Davis, and V. Venkatesh, 'Measuring User Acceptance of Emerging Information Technologies: An Assessment of Possible Method Biases', in *System Sciences, 1995. Proceedings of the Twenty-Eighth Hawaii International Conference on*, (1995), pp. 729-36 vol.4.

50   A. Bandura, 'Self-Efficacy: Toward a Unifying Theory of Behavioral Change', *Psychol Rev.* (1977), 191 - 215.

51   A. D. Stajkovic, and F. Luthans, 'Social Cognitive Theory and Self-Efficacy: Going Beyond Traditional Motivational and Behavioral Approaches', *Organizational Dynamics,* 26 (1998), 62-74.

Appendix I.

The theoretical framework

The research model was selected based on factors identified by literature as influential to intention to use technologies. This search to relevant literature was aimed at first, increasing the knowledge regarding various acceptance and adoption theories and second, at identifying the factors which could negatively or positively influence the intention of the professionals to continue using telemedicine. Finally, a suitable research model was composed based on these factors.

The literature search was performed on the basis of the following keywords: healthcare professionals, healthcare technology, telemedicine, acceptance and adoption and intention to use. This resulted in several relevant articles which in turn also gave good references about: acceptance and adoption theories of telemedicine. In these articles, several factors were mentioned (explicitly or implicitly) which possibly influence the acceptance and adoption of telemedicine by healthcare professionals. Just the factors which have a significant influence on the acceptance and adoption of telemedicine were included in Table 5. Subsequently, these identified factors were linked to the matching theories. Finally, a model was selected based on the factors which have, according to the literature, a significant influence on intention to use. The factors which also have a significant influence on intention to use, but were missing in the selected model were added to the research model.

Table 5 consists of four columns: 'Factor', 'Definition', 'Article' and 'Matching theory'. The first column describes the factor. The second column gives a definition per factor. The third column shows the articles in which each factor has a significant effect on the acceptance and adoption of telemedicine. Finally, the last column indicates the matching theories in which this factor is shown.

Table 5 – An overview of the factors which influence the acceptation and adoption of telemedicine by healthcare professionals

Factor	Definition	Article	Matching theory
Attitude towards technology	"a positive or negative evaluative affect about using the technology"[29 (p 701)].	Chau & Hu (2001)[29] Chau & Hu (2002)[23] Riel, et al. (2003)[30] Hartwick & Barki (1994)[31] Taylor & Todd (1995)[32] Staples & Seddon (2004)[33]	TRA [a], DTPB [a], TPC [a] and TPB [a]
Perceived Behavioural Control	"a perception of the availability of skills, resources, and opportunities necessary for using the technology"[29 (p 701)].	Chau & Hu (2001)[29] Chau & Hu (2002)[23] Taylor & Todd (1995)[32] Compeau, et al. (1999)[34] Venkatesh, et al. (2012)[9] Alrawashdeh, et al. (2012)[25]	TPB, DTPB, 'Facilitating conditions' of UTAUT [a] and 'Self-efficacy' of SCT [a]
Perceived Usefulness	"the degree to which a person believes that using a particular system would enhance his or her job performance"[35 (p 320)].	Chau & Hu (2001)[29] Chau & Hu (2002)[23] Taylor & Todd (1995)[32] Igbaria, et al. (1997)[36] Davis (1989)[35] Venkatesh & Davis (2000)[37] Venkatesh, et al. (2012)[9] Tan (2013)[38]	'Relative advantage' of IDT [a], TAM [a], DTPB, TAM2 [a] and 'Performance expectancy' of UTAUT
Performance Outcome Expectations	Seddon[39] argued (as in[34 (p 146)]) that Performance Outcome Expectations is "the net benefits (realized or expected) accruing from use of the system".	Chau & Hu (2001)[29] Compeau, et al. (1999[34] Venkatesh, et al. (2012)[9] Alrawashdeh, et al. (2012)[25] Tan (2013)[38]	SCT and 'Performance Expectancy' of UTAUT
Technology-Practice Compatibility	"the degree to which the use of telemedicine technology is perceived by a physician to be consistent with his or her work practices"[29 (p 704)].	Chau & Hu (2001)[29] Nijhof (2007) [7] Venkatesh, et al. (2012)[9] Alrawashdeh, et al. (2012)[25]	DTPB, IDT and 'Facilitation conditions' of UTAUT

| Factor	Definition	Article	Matching theory
Experience/Prior usage	Prior use/experience with Telemedicine[18].	Nijhof (2007)[7] Taylor & Todd (1995)[32] Thompson, et al. (1994)[40] Venkatesh & Davis (2000)[37] Venkatesh, et al. (2012)[9]	UTAUT and TAM2
User involvement	"user involvement has traditionally referred to participation in the system development process and has been measured as a set of activities that users or their representatives have performed"[31 (p 441)].	Hartwick & Barki (1994)[31] Goodhue & Thompson (1995)[41]	TRA, TPC
Subjective Norms	"an individual's perception of relevant others' opinions on whether or not he or she should perform a particular behaviour"[29 (p 702)].	Hartwick & Barki (1994)[31] Taylor & Todd (1995)[32] Venkatesh & Davis (2000)[37] Venkatesh, et al. (2012)[9] Alrawashdeh, et al. (2012)[25] Tan (2013)[38] Staples & Seddon (2004)[33]	TRA, TPB, DTPB, TAM2 'Image' of IDT, TPC and 'Social influence' of UTAUT
Behavioural intention to use telemedicine	"the subjective probability that one will perform some behaviour"[42 (p 288)].	Hartwick & Barki (1994)[31] Taylor & Todd (1995)[32] Venkatesh & Davis (2000)[37] Tan (2013)[38]	TRA, TPB, DTPB, TAM, TAM2 and UTAUT
Perceived ease of use	"the degree to which a person believes that using a particular system would be free of effort"[35 (p 320)].	Nijhof (2007)[7] Taylor & Todd (1995)[32] Igbaria, et al. (1997)[36] Venkatesh & Davis (2000)[37] Venkatesh, et al. (2012)[9] Alrawashdeh, et al. (2012)[25] Tan (2013)[38] Venkatesh & Davis (1996)[43]	DTPB, TAM, TAM2, IDT and 'Effort expectancy' of UTAUT

Factor	Definition	Article	Matching theory
Perceived voluntariness/external pressure	"the extent to which potential adopters perceive the adoption decision to be non-mandated"[22 (p 564)].	Agarwal & Prasad (1997)[22] Hartwick & Barki (1994)[31] Venkatesh & Davis (2000)[37] Goodhue & Thompson (1995)[41] Staples & Seddon (2004)[33]	IDT, TAM2, UTAUT and TPC
Personal innovativeness	"such an individual can serve as key change agent and opinion leader to facilitate further diffusion of a new technology"[44 (p 205)].	Agarwal & Prasad (1998)[44]	IDT and UTAUT
Task technology fit	"the degree to which a technology assists an individual in performing his or her portfolio tasks"[41 (p 216)].	Goodhue & Thompson (1995)[41] Staples & Seddon (2004)[33]	TPC

Notes: [a] Innovation Diffusion Theory (IDT), Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Technology Acceptance Model (TAM), Decomposed Theory of Planned Behaviour (DTPB), Technology Acceptance Model 2 (TAM 2), the Social Cognitive Theory (SCT), Unified Theory of Acceptance and Use of Technology (UTAUT), Technology-to-Performance Chain model (TPC).

Acceptance and adoption theories

There are several major acceptance and adoption theories which are widely used in research about the acceptation and adoption of innovations/new technologies by people (these theories are also presented in Table 5). The following sections summarize these major theories.

Innovation Diffusion Theory (IDT). Rogers[45] developed this diffusion theory (Figure 2). According to Rogers[45] (p 35) diffusion can be defined as 'the process by which an innovation is communicated through certain channels over time among the members of a social system'. Rogers also makes a distinction in adopter categories, which depends on the degree to which an individual is relatively early in adopting new ideas related to other members of a social system (innovativeness). These categories are ordered from the highest degree to the lowest degree of innovativeness: 1) innovators, 2) early adopters, 3) early majority, 4) late majority and 5) laggards[45]. In conclusion, IDT characterises people based on their degree of innovativeness and their likelihood to adopt technology[46].
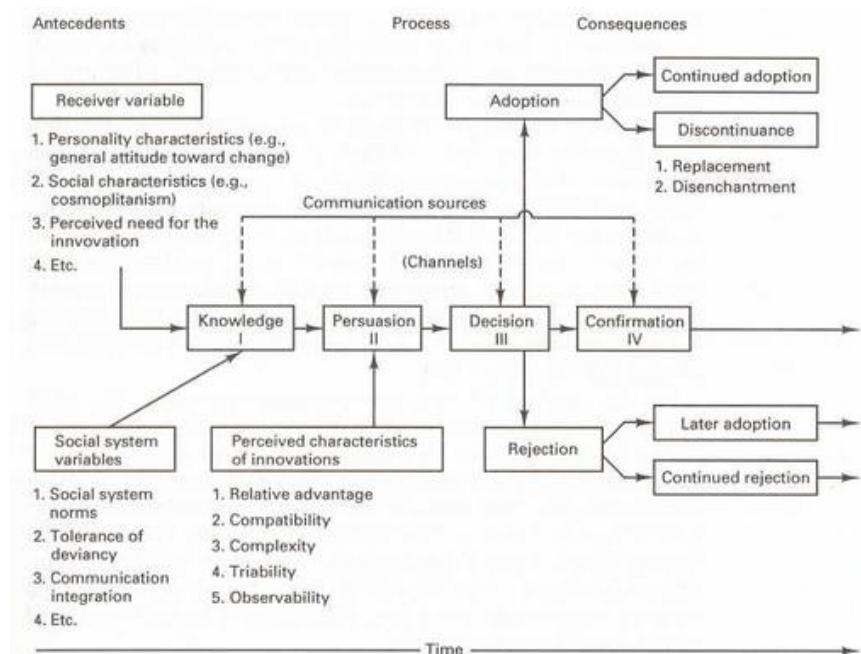
**Figure 2** – Innovation Diffusion Theory (IDT) developed by Rogers[45]

Theory of Reasoned Action (TRA). Fishbein and Ajzen[42] developed this intention-based theory (Figure 3). According to this theory, behaviour is determined by behavioural intention and behavioural intention is in its turn jointly influenced by attitude toward certain behaviour and subjective norms[47].

The following two theories, TAM and TPB, both originated from TRA[29]. These theories will be further clarified later on in this sub-chapter.
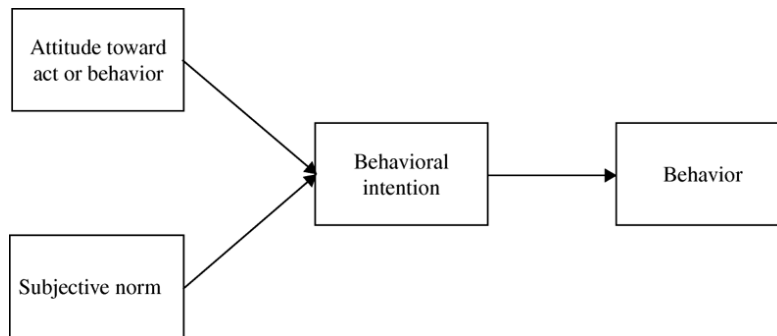

Figure 3 – Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen [42]

Theory of Planned Behaviour (TPB). Ajzen[48] developed this intention-based theory (Figure 4), which originated from TRA. TPB extends from TRA by including the construct perceived behavioural control, as an antecedent of both intention and behaviour. According to this theory, the behaviour of an individual is directly influenced by his or her intention and perceived behavioural control. Intention can be collectively predicted by attitude, subjective norms and perceived behavioural control[29]. TPB provides a useful model in order to cope with difficulties of human social behaviour[48].
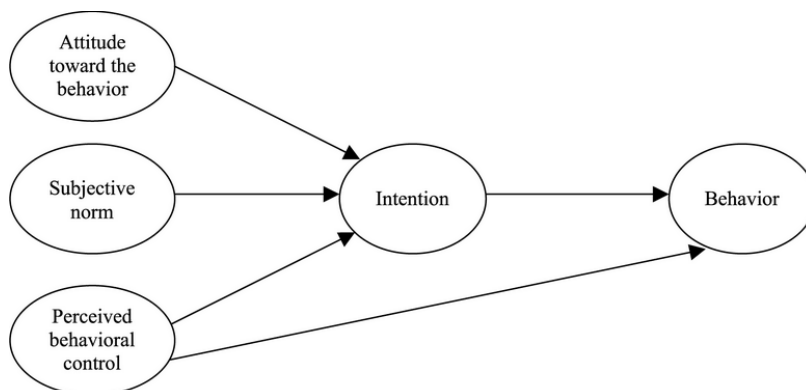
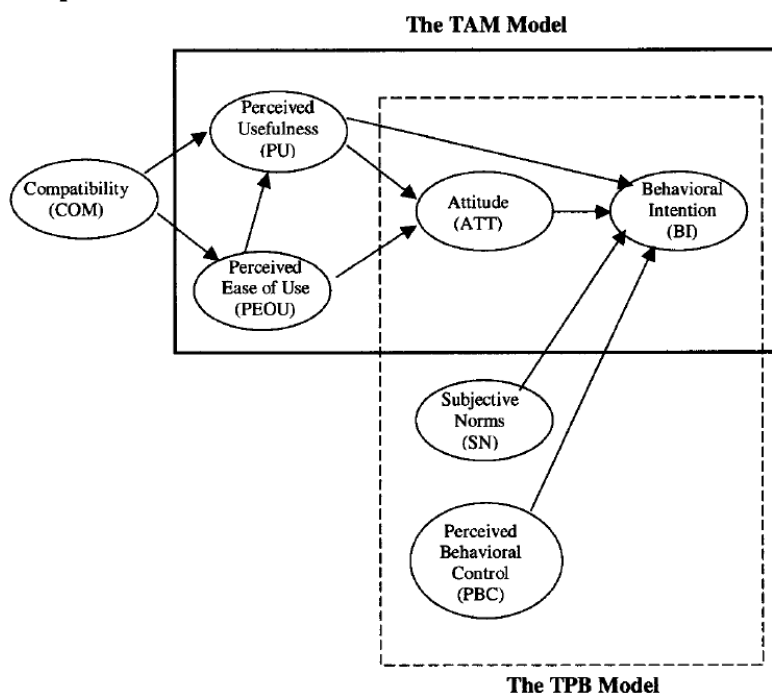**Figure 4** – Theory of Planned Behaviour (TPB) developed by Ajzen[48]

Technology Acceptance Model (TAM). Davis[35] invented this intention-based theory (Figure 5). During the 1980's TAM was used to gain insight in the market potential for several PC-applications related to multi-media, image processing and pen-based computing in order to provide advice related to investments in development activity[49]. TAM stems from TRA and is aimed at predicting and explaining the acceptance and adoption of information technologies[35]. According to Davis, perceived usefulness and perceived ease of use jointly influence behavioural intention. Subsequently, Davis believes that behavioural intention explains the actual system use[37].
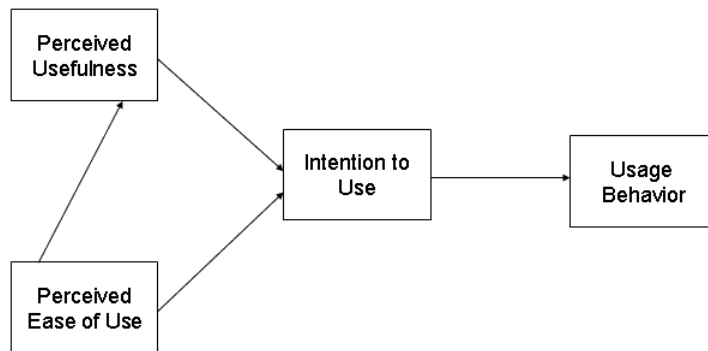
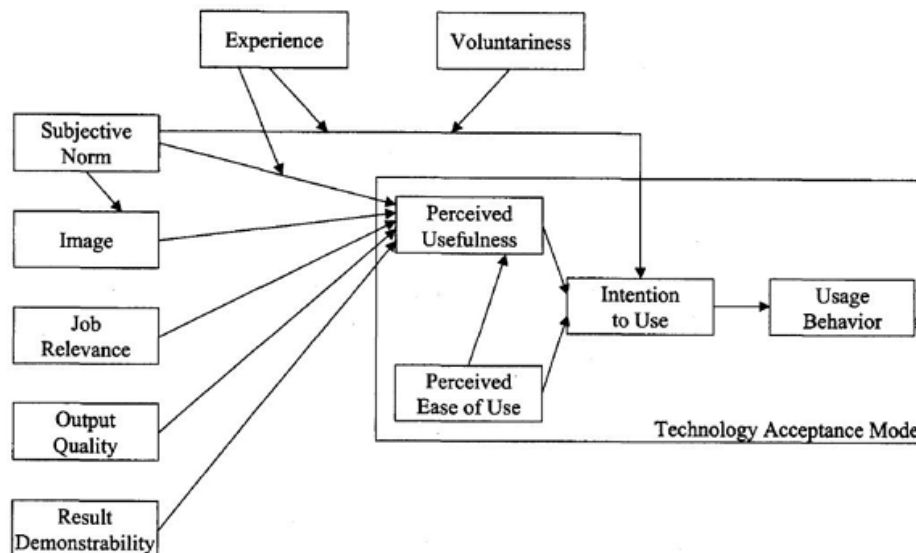**Figure 5** - Technology Acceptance Model (TAM) developed by Davis [35]

Decomposed Theory of Planned Behaviour (DTPB). Taylor and Todd[32] developed this adapted model (Figure 6). DTPB is a combination between TAM and TPB, however TPB serves as a basic structure for this model. Next to that, compatibility is included in the model as antecedent for perceived usefulness and perceived ease of use. Compatibility is included in the model, because according to Taylor and Todd it is an important factor for innovation adoption[32].


Figure 6 - Decomposed Theory of Planned Behaviour(DTPB) developed by Taylor and Todd [32]

Extended Technology Acceptance Model (TAM 2). Venkatesh and Davis[37] developed this expanded model (Figure 7). TAM 2 has extended TAM by the collected influence of social influence processes and cognitive instrumental processes on perceived usefulness. According to TAM 2, social influence progresses is a collective term for subjective norm, image and voluntariness. Under the cognitive instrument processes term the following items are included: job relevance, perceived ease of use, output quality and result demonstrability. In short, TAM2 expanded TAM with five factors influencing perceived usefulness and added two moderating factors: experience and voluntariness[37].

Figure 7 – Extended Technology Acceptance Model (TAM 2) developed by Venkatesh and Davis [37]

Social Cognitive Theory (SCT). Bandura[50] developed this model for individual behaviour (Figure 8). According to SCT user behaviour is in a triangle relationship with personal factors (e.g. personality and demographic characteristics) and environmental influences (e.g. social pressure and unique situational characteristics), also referred to as Bandura's Triadic Reciprocal Determinism[34]. This theory offers large advantages in the area of organizational behaviour and psychology. The social part of the theory refers to the things which people learn by being part of a society. The cognitive part of the theory addresses the thought processes which influence human attitude, motivation and action. SCT focuses on the capacity of people to create environments which matches with the purposes they had in mind for themselves and on the human capacity for collective action, additionally to an individual's ability to interact with their environment[51].
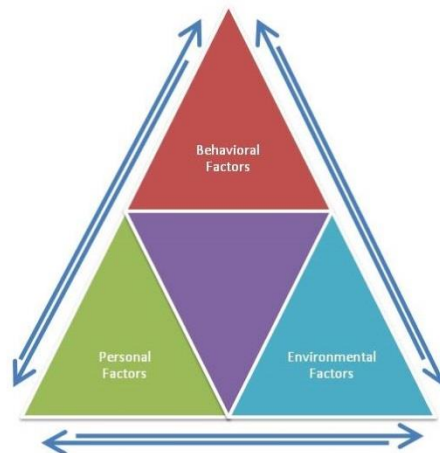
**Figure 8** – Social Cognitive Theory (SCT) developed by Bandura[50]

Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh[18] developed this model (Figure 9) as a comprehensive synthesis of former technology acceptance theories . This theory is invented for an employee acceptance and use setting[9]. UTAUT is created on the basis of eight different models: the theory of reasoned action, the technology acceptance model, the motivational model, the theory of planned behaviour, a model combining the technology acceptance model and the theory of planned behaviour, the model of PC utilization, the innovation diffusion theory, and the social cognitive theory. These models were empirically compared. The empirical similarities across the models were used to develop UTAUT, a model that identifies three constructs which directly influence the intention to use: performance expectancy, effort expectancy and social influence. It also identifies two constructs which directly influence user behaviour: intention to use and facilitating conditions. The four key constructs of the model are performance expectancy, effort expectancy, social influence and facilitating conditions. Other significant moderating constructs are experience, voluntariness, gender and age. These moderating constructs function as integral features of UTAUT[18].
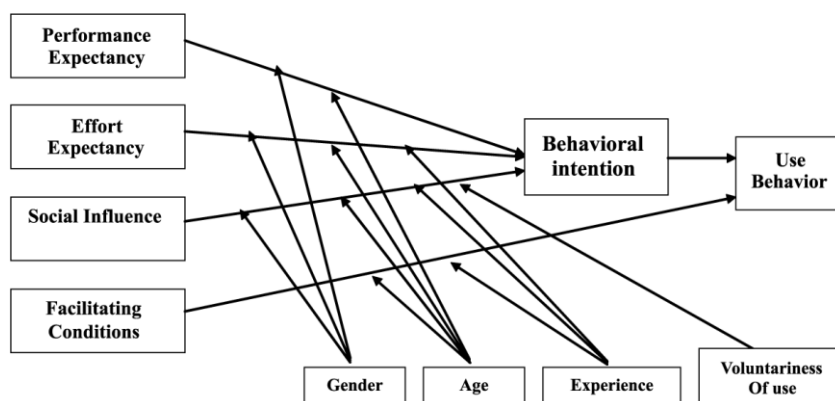
Figure 9 – Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh[18]

Technology-to-Performance Chain model (TPC). Goodhue and Thompson[41] developed this model (Figure 10) to assist the organization and end-users in understanding and making more efficient use of information technology. TPC tries to predict the effect of an information system on the performance of an individual user[33]. According to TPC, performance impacts can be predicted by utilisation and task technology fit. The precursors of task technology fit are a combination between task characteristics, technology characteristics and individual characteristics. At the same time, the degree of utilization is affected by the expected consequences of use, the affect towards using the technology, social norms, the habits of an individual and the facilitating conditions of an application.
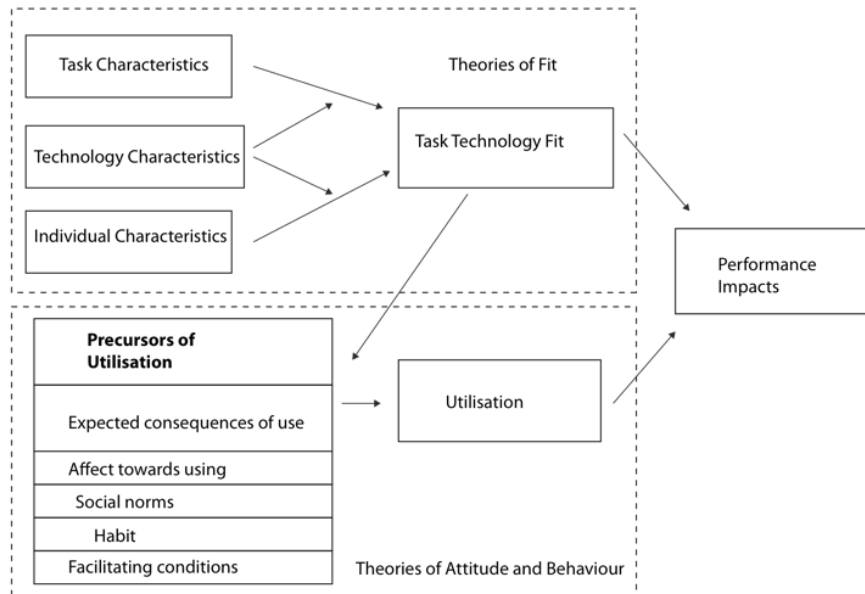
Figure 10 – Technology-to-Performance-Chain model (TPC) developed by Goodhue and Thompson[41]

The research model

The UTAUT model served as a theoretical basis for this research. This model was selected, because its factors/constructs were most consistent with those most frequently emerged in the research about the intention to use new technologies. The constructs of the UTAUT model have a (in)direct or moderating effect on intention to use, which fitted well with the aim of the research. The only two factors missing in the UTAUT model were 'attitude towards technology' and 'user involvement'. These factors also have a significant influence on 'intention to use' and were therefore also incorporated into the model as components of the construct 'facilitating conditions'.

Furthermore, it has been reported that in order to make proper use of telemedicine the user must change his own behaviour too, as habits have an important influence on the intention of healthcare professionals to continue using telemedicine[9, 19]. Therefore the "changed behaviour" factor was also incorporated into the UTAUT model as a component of the construct 'facilitating conditions'. This construct is a residual construct for several other factors which might affect user behaviour regarding telemedicine.

Appendix II.

Nederlandse versie - Interview revalidatieprofessionals

<u>Instructie en toestemming</u>

1. Vooraf controleren of het opnameapparaat werkt.
2. Vragen rustig voorlezen.
3. Maak gedurende het interview gebruik van de volgende open aanmoedigingsvragen:
   - *Kunt u daar iets meer over zeggen?*
   - *Wat bedoelt u daar precies mee?*
   - *Kunt u dat toelichten?*
   - *Kunt u voorbeelden noemen?*
4. Stel jezelf voor. Beschrijf het doel, de inhoud en tijdsduur van het interview kort.
   - Doel van het onderzoek is Telerevalidatie.nl te evalueren en de intentie van zorgprofessionals om telemedicine applicaties na de eerste implementatiefase te blijven gebruiken te onderzoeken;
   - Er zullen vragen worden gesteld over uw mening en ervaring met telemedicine in het algemeen en met Telerevalidatie.nl in het bijzonder. Tot slot zullen er wat achtergrond gegevens worden gevraagd.
5. Het interview zal ongeveer 30 minuten duren.
6. Vraag toestemming voor de opname van het gesprek.
7. Heeft de professional nog vragen? Zo niet, start interview.

<u>Noteer datum en tijdstip begin:</u>

Schakel het opnameapparaat in.

1. *Wat vindt u van Telerevalidatie.nl? (Voordelen/nadelen)*
   -

2. *Welke punten zijn voor u van invloed op uw besluit om Telerevalidatie.nl wel of niet te blijven gebruiken?* (own input)
   -

3. *Welke ervaring had u met telemedicine voordat u gebruik ging maken van Telerevalidatie.nl? (Kunt u dat verder toelichten?)* (experience)
   -

4. *Hoe bent u in contact gekomen met Telerevalidatie.nl?*
   -

5. *In hoeverre was u vrij in uw eigen keuze om gebruik te maken van Telerevalidatie.nl?* (to use voluntariness)
   -

6. *PERFORMANCE EXPECTANCY*
   - *Welke verwachtingen had u van de toegevoegde waarde van Telerevalidatie.nl? (Bijv. verhoogde productiviteit, sneller taken vervullen; graag benoemen welke)*
     -
   - *In welke mate voldeed Telerevalidatie.nl aan deze verwachtingen?*
     -

7. *EFFORT EXPECTANCY*
   - *Welke verwachtingen had u van de inspanning die het zou kosten om te leren werken met Telerevalidatie.nl?*
     -
   - *En hoe heeft u dat uiteindelijk ervaren?*
     -
   - *Welke verwachtingen had u van de inspanning die het zou kosten om Telerevalidatie.nl dagelijks in te zetten?*
     -
   - *En hoe heeft u dat uiteindelijk ervaren?*
     -

8. *FACILITATING CONDITIONS*
   - *Hoe staat u tegenover het werken met technologie? (mobiele telefoon, laptop, ..) (interessant/leuk, …) Kunt u daar iets meer over zeggen?* (Attitude towards technology)
     -
   - *Heeft u het idee dat u over de juiste bronnen en kennis beschikt om gebruik te maken van Telerevalidatie.nl? Waarom wel/niet? (zo niet, kunt u iemand om hulp vragen?)*
     -
   - *Hoe past Telerevalidatie.nl bij andere systemen die u gebruikt tijdens uw werk?*
     -
   - *Is er iets veranderd in uw eigen handelswijze/gedrag tijdens het gebruik van Telerevalidatie.nl? Zo ja, wat en waarom?* (stage of change)
     -

- *Bent u betrokken bij de ontwikkeling van Telerevalidatie.nl?* (*user involvement*)
    - *Zo wel, wat vond u daarvan?*
        - ▪
    - *Zo niet, wat was dan uw feedback geweest?*
        - ▪

9. *SOCIAL INFLUENCE*
    - *Wat vinden uw collega's en leidinggevenden van Telerevalidatie.nl?*
        - -
    - *Hoe belangrijk is hun mening voor u? Welke invloed heeft hun mening op u?*
        - -
    - *Hoe heeft uw organisatie u ondersteund bij het gebruik van Telerevalidatie.nl? (Voldoende tijd om de applicatie te leren gebruiken? Werd u gemotiveerd om het te gebruiken?)*
        - -

10. *BEHAVIOURAL INTENTION*
    - *Hoe kijkt u aan tegen uw gebruik van Telerevalidatie.nl in de toekomst? (meer/minder/gelijk/stoppen)*
        - -

11. *Zou u Telerevalidatie.nl aanraden aan andere revalidatieprofessionals?*
    - -

Achtergrondgegevens

Naam: _____

Adres: _____

_____

Telefoonnummer: _____

Geslacht: ☐ man ☐ vrouw

Geboortedatum: _____/_____/_____

Functie: _____

Aantal jaren ervaring in functie: _____

Afsluiting

Heeft u nog vragen of opmerkingen?

-

Ik wil u hartelijk bedanken voor uw tijd en antwoorden.

English version - Interview rehabilitation professionals

Instruction and permission

1. Pre-check the recording device.
2. Pronounce the questions calmly.
3. Use the following open incentive questions during the interview:
   - *Could you say a little bit more about it?*
   - *What do you mean by that exactly?*
   - *Could you clarify that a little bit more?*
   - *Could you give some examples?*
4. Introduce yourself. Describe shortly the purpose, the content and the duration of the interview.
   - The aims of the research are, to evaluate Telerevalidatie.nl and to study the intention of healthcare professionals to continue using telemedicine applications after the first implementation phase;
   - Questions will be asked about your opinion and experience with telemedicine in general and Telerevalidatie.nl in particular. Finally, some background information will be asked.
5. The interview will take about 30 minutes.
6. Ask permission to record the conversation/interview.
7. Are there any questions left from the professional? If not, start the interview.

Note the date and the starting time:

Start the recording device.

1. *What is your opinion about Telerevalidatie.nl? (advantages/disadvantages)*
   -

2. *Which factors/aspects influence your decision to continue using Telerevalidatie.nl or not? (own input)*
   -

3. *What experience did you have with telemedicine before you started using Telerevalidatie.nl? (Could you clarify that a little bit more?) (experience)*
   -

4. *How did you came in contact with Telerevalidatie.nl?*
   -

5. *To which extend could you choose whether you wanted to use Telerevalidatie.nl or not? (voluntariness to use)*
   -

6. *PERFORMANCE EXPECTANCY*
   - *What expectations did you have of the added value of Telerevalidatie.nl? (E.g. increased productivity, accomplish tasks more quickly; please appoint the topics which apply to you)*
     -
   - *To what extent did Telerevalidatie.nl meet these expectations?*
     -

7. *EFFORT EXPECTANCY*
   - *Which expectations did you have of the effort needed learning to operate Telerevalidatie.nl?*
     -
   - *And how was your experience regarding the actual effort needed to learn how to operate the application?*
     -
   - *Which expectations did you have of the effort needed to use Telerevalidatie.nl daily?*
     -
   - *And how was your experience regarding the actual effort needed to employ the application daily?*
     -

8. *FACILITATING CONDITIONS*
   - *What is your position regarding working with technology? (mobile phone, laptop, …) (interesting/fun, …) Could you say a little bit more about it? (Attitude towards technology)*
     -
   - *Do you believe you have the proper resources and knowledge to use Telerevalidatie.nl? why? (If not, could you ask someone for help?)*
     -
   - *How does Telerevalidatie.nl fit with the other systems you use during your work?*
     -

- *Did something change in your own behaviour during the use of Telerevalidatie.nl? If so, what and why?* (*stage of change*)
    -
- *Were you involved in the development of Telerevalidatie.nl?* (*user involvement*)
    - *If so, what did you think of it?*
        -
    - *It not, what would have been your feedback?*
        -

9. *SOCIAL INFLUENCE*
    - *What do your colleagues and supervisors think of Telerevalidatie.nl?*
        -
    - *How important and what influence does their opinion have on you?*
        -
    - *How did your organization support you during the use of Telerevalidatie.nl? (Did you receive enough time to learn how to operate the application? Did they motive you to use the application?)*
        -

10. *BEHAVIOURAL INTENTION*
    - *How do you view your future use of Telerevalidatie.nl? (more/less/equal/quitting)*
        -

11. *Would you recommend Telerevalidatie.nl to other rehabilitation professionals?*
    -

Background information

    Name: _____

    Address: _____

                                    _____

    Telephone number: _____

    Gender: ☐   male   ☐   female

    Date of birth: _____/_____/_____

    Profession: _____

    Years of experience in profession: _____

Closing the interview

Do you have any questions or remarks left?

    -

I would like to warmly thank you for your time and answers.